

2018

Proceedings of the 10th Sacro Occipital Technique Research Conference

Kauai, Hawaii

February 28, 2018 - March 2, 2018

Sacro Occipital Technique Research Conference

Kauai, Hawaii
February 28 – March 2, 2018

Hosted by:

Sacro Occipital Technique Organization – USA

CONFERENCE PROCEEDINGS



Conference Chair
Charles L. Blum, DC
Research Director: Sacro Occipital Technique Organization – USA

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PO Box 1357, Sparta, NC 28675 Telephone: 335-793-6524
Fax: 336-372-1541 Web: www.soto-usa.org E-mail: drcblum@aol.com

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2018 SOT RESEARCH CONFERENCE

Proceedings of the Sacro Occipital Technique Research Conference

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Pederick FO. **Effects of pregnancy on cranial structures.** 1st Annual Sacro Occipital Technique Research Conference Proceedings: Las Vegas, NV. 2009: 65-8. **71-74**

Remeta EM, Blum CL. **Chiropractic cranial treatment protocol increases successful outcome of the multidisciplinary care model for traumatic brain injury (TBI) patients: A case series**. 1st Annual Sacro Occipital Technique Research Conference Proceedings: Las Vegas, NV. 2009: 69-71. **75-77**

Salem AR. **Sacro occipital technique treatment of patient with pervasive craniofacial and body pains secondary to chronic TMD: A case report**. 1st Annual Sacro Occipital Technique Research Conference Proceedings: Las Vegas, NV. 2009: 75-8. **78-80**

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Greer M. **A Shared Legacy: early cranial manipulation in osteopathy and chiropractic**. 5th Annual SOT Research Conference. Atlanta, GA. May 2, 2013: 90-92. **131-133**

Pollard R. **Chiropractic care and its effects on a patient with a moderate traumatic brain injury**. 5th Annual SOT Research Conference. Atlanta, GA. May 2, 2013: 156-166. **134-143**

Remeta EM, Blum CL. **Chiropractic sacro occipital technique (SOT) and cranial treatment model for traumatic brain injury along with monitoring and supplementing for neurotransmitter balance: A case report**. 5th Annual SOT Research Conference. Atlanta, GA. May 2, 2013: 170-172. **144-146**

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Hochman JI. **Post-migraine chronic daily headache relieved with coccygeal and sphenoidal manipulation: A case report**. 7th Annual SOT Research Conference Proceedings: New Orleans, Louisiana. May 7, 2015: 142-147. **205-210**

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Scoppa J. **Treatment of acute TMJ pain and dysfunction with sacro occipital technique and cranial (vector point) techniques: A case report.** 8th Annual Sacro Occipital Technique Research Conference: New Orleans, Louisiana. May 13-14, 2016: 168-175. **238-245**

Scoppa J. **Treatment of knee pain in an athlete sprinter with sacro occipital technique and cranial (vector point) techniques: A case report.** 8th Annual Sacro Occipital Technique Research Conference: New Orleans, Louisiana. May 13-14, 2016: 160-167. **246-253**

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King HH. **Cranial osteopathic manipulative medicine's growing evidence base.** Journal of the American Osteopathic Association. 2012;112(1):9. [Reprinted within 9th Annual Sacro Occipital Technique Research Conference: Marina Del Rey, California. May 12-13, 2017:55.] **262**

King HH. **Osteopathy in the cranial field: Uncovering challenges and potential applications**. Journal of the American Osteopathic Association. 2002;102(7):367-369. [Reprinted within 9th Annual Sacro Occipital Technique Research Conference: Marina Del Rey, California. May 12-13, 2017:56-58.] **263-265**

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Introduction



For Major Bertrand DeJarnette, DO, DC, research was an essential part of being a chiropractor and essential to the future of the chiropractic profession. As early as July 1935 Major Bertrand DeJarnette was a featured speaker at the 40th Anniversary Convention 1895-1935 of the National Chiropractic Association presenting clinical research. Always research was his passion and in an interview in 1982 DeJarnette reiterated, "as far back as chiropractic college, I saw the need for a more scientific basis for chiropractic theory. My own personal physical problems had not been solved by medicine, osteopathy, or chiropractic; so I began experimenting on myself. I'm still at it, and I can see no end of the need for continuous research in chiropractic [1]."

Dr. DeJarnette saw the importance of sharing clinical experience through case report and self-analysis. This started as he first began to find that things he instinctively did for a patient would disappear from his memory if he did not outline them carefully. So before our day and age of computers, he recommended that to begin the first step in research, you would need to buy a notebook, an eraser and long pencil. He emphasized that, "those would be your first three pieces of research equipment. You use your notebook because it is not expensive. You use a pencil because it can be erased, and of course mistakes will be made so you must own an eraser [2]." With those three pieces of equipment he sat down one evening and wrote his first case report of an unusual patient presentation and his treatment rendered. He recollected that he did not sit down to write until perhaps three months after that patient's presentation. Dr. DeJarnette could not believe how much he had forgotten about the details. The lesson he learned was "write the unusual down now [2]".

When Dr. DeJarnette began to study the treatment he had rendered he realized that if any meaningful information were to evolve from his experience, he would have to resolve it himself. Dr. DeJarnette suggested that research has to be a free agency. Basically he saw a need and worked to fulfill that need. He realized that explaining how his discoveries evolved was more difficult than the process of developing new diagnostic and therapeutic interventions [2].

Chiropractic techniques, innovative integrative collaborations, and methods such as sacro occipital technique, temporomandibular disorder co-management, chiropractic manipulative reflex technique, and cranial techniques need an arena to share clinical and other forms of research. Critical study of techniques and innovative methods are what will help propel healthcare forward in this era of evidence informed practice and best practice research.

The SOT Research Conference looks to offer a venue for research papers; specifically those, which investigate sacro occipital technique, dental chiropractic co-treatment, cranial techniques, viscerosomatic/somatovisceral, reflex techniques, and new ground-breaking creative ways of helping humanity without necessarily the use of drugs or surgical intervention. This year's proceedings, like all prior conferences, will be shared with the chiropractic profession, for review, dissemination, and in-depth study.

> "*Research is a study of what you have, and what you need to make it better, and how to make it better is the final research step. S.O.T. never wants to be just good. It always wants to be better and best and greatest and most dependable* [3]."

> "*Research in Chiropractic must go on forever. Someone must do this type work, for it simply will not take care of itself. A profession cannot stand still. Momentum must constantly be generated. Chiropractic research needs many things it does not now have* [4]."""*Sacro Occipital Technic, like all Chiropractic Technics, needs further study. We certainly do not have all the answers to all of man's problems, and neither does any other group of people* [4]."

As a parting comment for his chiropractic colleagues Dr. DeJarnette said, "We must respect each other's beliefs. We must support our colleges and associations. We must work together and unite as a profession. And we must at all times be proud of chiropractic and proud of our calling as chiropractors [1]."

---

1. DeJarnette MB. **Cornerstone**. *The American Chiropractor*. Jul/Aug 1982; 82: 22,23,28,34.

2. DeJarnette MB. **The Sacro Occipital Technique Bulletin**. Mar 1975.

3. DeJarnette MB. **The Sacro Occipital Technique Bulletin**. Mar 1978: 2-3.

4. DeJarnette MB. **The History of Sacro Occipital Technic**. Private Practice: Nebraska City, NB. 1958:27.

Evidence-Based Practice

Evidence-based practice (EBP) refers to a decision-making process which integrates the best available research, clinician expertise, and client characteristics. EBP is an approach to treatment rather than a specific treatment.

Evidence-based practice (EBP) involves complex and conscientious decision-making which is based not only on the available evidence but also on patient characteristics, situations, and preferences. It recognizes that care is individualized and ever changing and involves uncertainties and probabilities [1].

EBP develops individualized guidelines of best practices to inform the improvement of whatever professional task is at hand. Evidence-based practice is a philosophical approach that is in opposition to rules of thumb, folklore, and tradition. Examples of a reliance on "the way it was always done" can be found in almost every profession, even when those practices are contradicted by new and better information [1].

> "*It's about integrating individual clinical expertise and the best external evidence* [2]."

However, in spite of the enthusiasm for EBP evinced over the last decade or two, some authors have redefined EBP in ways that add other factors to the original emphasis on empirical research foundations. For example, EBP may be defined as treatment choices based not only on outcome research but also on practice wisdom (the experience of the clinician) and on family values (the preferences and assumptions of a client and his or her family or subculture) [1].

---

1. Buysse V, Wesley PW. **Evidence-based practice: How did it emerge and what does it really mean for the early childhood field?** *Zero to Three*. 2006;27(2), 50-55.

2. Sackett DL, Rosenberg WMC, Muir Gray JA, Haynes RB, Richardson WS. **Evidence based medicine: what it is and what it isn't.** *BMJ.* 1996;312:71-72.

Evidence Based Practice: The Hierarchy of Evidence

In biomedical science there is general agreement over an evidence based hierarchy: the higher up a methodology is ranked, the more robust and closer to objective truth it is assumed to be. The orthodox hierarchy looks something like the following table:

Rank:	Methodology	Description
1	Systematic reviews and meta-analyses	Systematic review: review of a body of data that uses explicit methods to locate primary studies, and explicit criteria to assess their quality. Meta-analysis: A statistical analysis that combines or integrates the results of several independent clinical trials considered by the analyst to be "combinable" usually to the level of re-analyzing the original data, also sometimes called: pooling, quantitative synthesis.
2	Randomized controlled trials	Individuals are randomly allocated to a control group and a group who receive a specific intervention. Otherwise the two groups are identical for any significant variables. They are followed up for specific end points.
3	Cohort studies	Groups of people are selected on the basis of their exposure to a particular agent and followed up for specific outcomes
4	Case-control studies	"Cases" with the condition are matched with "controls" without, and a retrospective analysis used to look for differences between the two groups.
5	Cross sectional surveys	Survey or interview of a sample of the population of interest at one point in time.
6	Case reports	A report based on a single patient or subject; sometimes collected together into a short series.
7	Expert opinion	A consensus of experience from the “good and the great.”
8	Anecdotal	An interesting story.

Evidence Informed Practice

The term evidence based medicine (EBM) has traditionally been used to describe a means of treating patients based on research published in biomedical journals. Even though EBM also incorporated expert opinions and a doctor's clinical experience, it was common that insurance companies and other agencies - presumably seeking to protect patients or save money - would focus solely on the randomized controlled trial as the backbone of EBM.

When EBM appeared to be too restrictive or just clearly misinterpreted new terms such as Evidence Based Practice and now Evidence Informed Practice (EIP) have appeared. The value of EIP is that it takes research into account when making a clinical decision but also utilizes patient values and preferences, risk benefit ratio of related or chosen therapy, and the doctor's clinical experience. Because this represents a clearer depiction of an actual clinical experience and at the same time seeks to offer the patient the highest level of care, the belief is that EIP is the best of what EBM has to offer.

It is important that a practitioner is aware of the current research on effectiveness of their care so that they do not inadvertently make false or exaggerated claims regarding the potential benefits of the treatment rendered. Therefore keeping up to date on the research and literature, while time consuming, is an ethical obligation of doctors in practice.

Ideally doctors practicing EIP would best be able to predict and provide outcome expectations against which progress could be measured. In essence we all, as patients or doctors, should receive or offer treatment based on research and clinical experience. New research can uncover therapeutic interventions or benefits of certain types of care that were never before discovered. Also this research may determine that prior care that was customarily rendered is now inappropriate.

The challenge with chiropractic and its various techniques is that we are functioning from a situation where we have limited funds and limited methods to adequately study our innovative therapeutic applications. This conference attempts to offer a tempered and reasonable voice for practitioners on the forefront of care, such as has been the case with Sacro Occipital Technique (SOT) for years. Incorporating current research performed in the patient's best interest with one's own clinical experience is the hallmark of a responsible and ethical physician. Allied healthcare practitioners, chiropractors, and particularly SOT doctors have a responsibility to lead the way with EIP and focus first and foremost on patient based care.

Major Bertrand DeJarnette DO, DC developed SOT with outcome based assessment protocols and with research accountability as its backbone. The onus is upon us, those who learn and utilize his methods, to be informed of the evidence and evolving research and utilize this in the clinical application of SOT and its related methods.

The Case Report: How the Doctor in Practice Communicates to the Research Community

While low on the evidence-based practice hierarchy of evidence the case report is an extremely valuable manner for doctors in clinical practice or "in the trenches" to communicate what is taking place in their practices. Until the doctors in clinical practice publish their case reports, researchers in a college setting can only attempt to guess what is taking place out there in the field.

There are significant limitations to case reports, such as no control subjects, the doctor and subjects are not blinded to the study, and the doctor's bias may cloud the study. So while the case report is an important tool for communication, the doctor authoring these studies needs to exercise caution to not over-interpret his or her findings. Dr. Robert Ward of Southern University of Health Sciences and past editor of *The Journal of Chiropractic Education* answers the question:

"Why it is important to write a case report?"

"Most persons believe that the case report is used to describe unique, or at least highly rare, clinical presentations or diagnostic entities (e.g., "prostatic hypertrophy mimicking as ingrown toenail"). This is the most common use of the case report. However, equally important is the use of the case report to describe novel management approaches to more ordinary conditions.

"Another aspect of why case reports are written involves the audience. Case reports are generally considered as a communication from clinicians to scientists. The pointy-headed ivory tower population doesn't get to see the interesting things that happen in clinical practice. They often rely on case reports from the field in deciding what sorts of pilot studies to run, and those often lead to real full-scale clinical trials (the sort of research that field clinicians generally don't have the time, resource or interest to undertake).

"Case reports are a vital aspect of our literature base, and more of our practitioners need to write them. Until you write up that wonderful method that works in your office, the rest of the world cannot share in its benefits. Without publication, when you die or retire, your discoveries die with you [1]."

1. Ward RW. **Why it is Important to Write a Case Report**. *Dural Connection Internet Edition*. 2006;3(3). [http://soto-usa.com/writing-a-case-report/] Last accessed April 30, 2018.

Defining the Role of Authors and Contributors

1. Why Authorship Matters

Authorship confers credit and has important academic, social, and financial implications. Authorship also implies responsibility and accountability for published work. The following recommendations are intended to ensure that contributors who have made substantive intellectual contributions to a paper are given credit as authors, but also that contributors credited as authors understand their role in taking responsibility and being accountable for what is published.

Because authorship does not communicate what contributions qualified an individual to be an author, some journals now request and publish information about the contributions of each person named as having participated in a submitted study, at least for original research. Editors are strongly encouraged to develop and implement a contributorship policy, as well as a policy that identifies who is responsible for the integrity of the work as a whole. Such policies remove much of the ambiguity surrounding contributions, but leave unresolved the question of the quantity and quality of contribution that qualify an individual for authorship. The International Committee of Medical Journal Editors (ICMJE) has thus developed criteria for authorship that can be used by all journals, including those that distinguish authors from other contributors.

2. Who Is an Author?

The ICMJE recommends that authorship be based on the following 4 criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

2. Drafting the work or revising it critically for important intellectual content; AND

3. Final approval of the version to be published; AND

4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he or she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their co-authors.

All those designated as authors should meet all four criteria for authorship, and all who meet the four criteria should be identified as authors. Those who do not meet all four criteria should be acknowledged. These authorship criteria are intended to reserve the status of authorship for those who deserve credit and can take responsibility for the work. The criteria are not intended for use as a means to disqualify colleagues from authorship who otherwise meet authorship criteria by denying them the opportunity to meet criterion #s 2 or 3. Therefore, all individuals who meet the

first criterion should have the opportunity to participate in the review, drafting, and final approval of the manuscript.

The individuals who conduct the work are responsible for identifying who meets these criteria and ideally should do so when planning the work, making modifications as appropriate as the work progresses. It is the collective responsibility of the authors, not the journal to which the work is submitted, to determine that all people named as authors meet all four criteria; it is not the role of journal editors to determine who qualifies or does not qualify for authorship or to arbitrate authorship conflicts. If agreement cannot be reached about who qualifies for authorship, the institution(s) where the work was performed, not the journal editor, should be asked to investigate. If authors request removal or addition of an author after manuscript submission or publication, journal editors should seek an explanation and signed statement of agreement for the requested change from all listed authors and from the author to be removed or added.

The corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process, and typically ensures that all the journal's administrative requirements, such as providing details of authorship, ethics committee approval, clinical trial registration documentation, and gathering conflict of interest forms and statements, are properly completed, although these duties may be delegated to one or more coauthors. The corresponding author should be available throughout the submission and peer review process to respond to editorial queries in a timely way, and should be available after publication to respond to critiques of the work and cooperate with any requests from the journal for data or additional information should questions about the paper arise after publication. Although the corresponding author has primary responsibility for correspondence with the journal, the ICMJE recommends that editors send copies of all correspondence to all listed authors.

When a large multi-author group has conducted the work, the group ideally should decide who will be an author before the work is started and confirm who is an author before submitting the manuscript for publication. All members of the group named as authors should meet all four criteria for authorship, including approval of the final manuscript, and they should be able to take public responsibility for the work and should have full confidence in the accuracy and integrity of the work of other group authors. They will also be expected as individuals to complete conflict-of-interest disclosure forms.

Some large multi-author groups designate authorship by a group name, with or without the names of individuals. When submitting a manuscript authored by a group, the corresponding author should specify the group name if one exists, and clearly identify the group members who can take credit and responsibility for the work as authors. The byline of the article identifies who is directly responsible for the manuscript, and MEDLINE lists as authors whichever names appear on the byline. If the byline includes a group name, MEDLINE will list the names of individual group members who are authors or who are collaborators, sometimes called non-author contributors, if there is a note associated with the byline clearly stating that the individual names are elsewhere in the paper and whether those names are authors or collaborators.

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Because acknowledgment may imply endorsement by acknowledged individuals of a study's data and conclusions, editors are advised to require that the corresponding author obtain written permission to be acknowledged from all acknowledged individuals.

ICMJE. Defining the Role of Authors and Contributors. [http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html] Last accessed April 25, 2015.

Invited Articles to Help Build Our Understanding of Research

This year we have the opportunity to learn from chiropractic researchers who have been teaching and sharing research methodologies to help build the chiropractic professions' understanding and ability to utilize the evidence based literature. Many thanks go to Dana Lawrence, DC and Ron LeFebvre for their willingness to share these articles.

Dana Lawrence, MMedEd, MA, DC is currently the Senior Director for the Center for Teaching and Learning and Continuing Education at Parker University, as well as editor for the *Chiropractic Journal of Australia*. He has a long history of editorial accomplishments in the chiropractic profession. He serves on numerous editorial boards. He was a member of the Alternative Medicine Program Advisory Council of NCCAM. Dr. Lawrence has many professional publications. In 2013, Dr. Lawrence is the chair of the Association of Chiropractic and Research Agenda for Chiropractic Conferences. In addition to his DC degree, Dr. Lawrence has earned master's degrees in medical education (MMedEd) and bioethics and health policy (MA).



Ron LeFebvre, MA, DC, is a full professor in the Division of Clinical Education. He serves as the project manager directing the creation of protocols and care pathways for the UWS clinic system. Starting in 2004, he helped to design and implement a National Institutes of Health funded project with the goal of improving students' skills at incorporating research evidence into everyday clinical practice. His major areas of expertise are in the diagnosis and treatment of spinal conditions and physical rehabilitation. His passion is aiding students in that very special transition into thinking and functioning as chiropractic physicians. His goal for graduates is to have excellent hands and excellent minds.



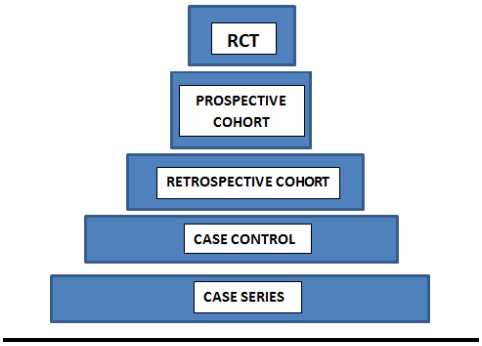
Therapy Study Designs

Ron LeFebvre, DC
University of Western States
4/30/14

Levels of Research Evidence

When searching for primary research papers, one consideration is whether a particular paper that you have found has the best research *design* to answer your question. It is important for the practitioner to understand that different study designs offer different *levels of evidence* to support or refute the benefits of a particular treatment.

This hierarchy of types of primary studies is commonly organized into an Evidence Pyramid. Secondary studies would include systematic reviews (and meta-analysis) which are located even higher on the evidence pyramid (not shown here).



Randomized controlled clinical trials



Randomized controlled clinical trials (RCTs) are carefully planned experiments that introduce a treatment or exposure and measure its effect on patients. RCTs are designed to reduce the potential for bias (e.g., by randomization and blinding) and allow for an even-handed comparison between intervention groups and control groups.

Well done RCTs can provide sound evidence of cause and effect. Their weakness is that because they are so tightly controlled they are not always generalizable to the larger public.

Randomization has two main advantages:

1. It eliminates bias in the selection of which subjects get which treatment (or placebo)--but only if randomization is coupled with *concealed allocation*!
2. It attempts, based on the laws of probability, to evenly distribute potential baseline characteristics (called *confounders*) that might give one group an advantage over the other.

There are a number of ways to achieve randomization.

Simple Randomization

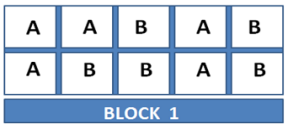
Manchikani (2008) writes:

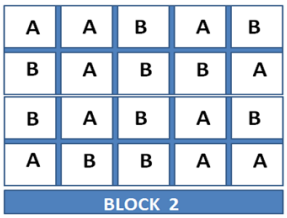
> Randomization based on a single sequence of random assignments is known as simple randomization. The most common and basic method of simple randomization is flipping a coin, as originally described by Fisher in 1926. However, in the modern world, a random number table found in a statistics book or computer-generated random numbers can also be used for simple randomization of participants.
>
> The disadvantages of simple randomization include an unequal distribution in each group. By chance alone, the smaller the sample size, the larger the likelihood of a major imbalance in the number of patients or the baseline characteristics in each group. This disadvantage will happen when flipping a coin or odd and even numbers are utilized in small trials or in larger trials with planned in-term analysis, simple randomization can result in imbalanced group numbers.

Block randomization

Manchikani (2008) goes on to describe blocking:

> Blocking is used to ensure close balance of the numbers in each group at any time during the trial. After a block of every 10 participants was assigned, for example, 5 would be allocated to each arm of the trial and after a block of every 20 participants was assigned, 10 would be allocated to each arm of the trial. However, improved balance comes at the cost of reducing the unpredictability of the sequence. Even though the order of interventions varies randomly within each block, a person running a trial could deduce some of the next treatment allocations if they discovered the block size.





> Even though the balance in sampling may be achieved with this method, groups may be generated that are rarely comparable in terms of certain *covariates*.* It has been observed that one group may have more participants with secondary diseases such as comorbid medical conditions that could confound the data and may negatively influence the results of the clinical trial. The importance of controlling for these covariates due to the serious consequences to the interpretation of the results has been stressed. Hence, in small trials, sample size and covariates must be balanced, since imbalance could introduce bias in the statistical analysis and reduce the power of the study.

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* In this context, a covariate is a factor that, if present, might change the outcome and obscure the true relationship between a treatment and its observed results.

Other methods

Other methods include rolling dice, drawing different colored balls, drawing of ballots with the study group labels from a dark bag, computer-generated stratified blocking (see page 8). Examples of inadequate methods are alternating subjects, birth date, social insurance/security number, date in which they are invited to participate in the study, or hospital registration number. (Furlan 2009)

RCTs: What kind of control?

The control used in an RCT can vary depending on the circumstances of the study and what the goals of the study are.



A treatment invention may be compared to

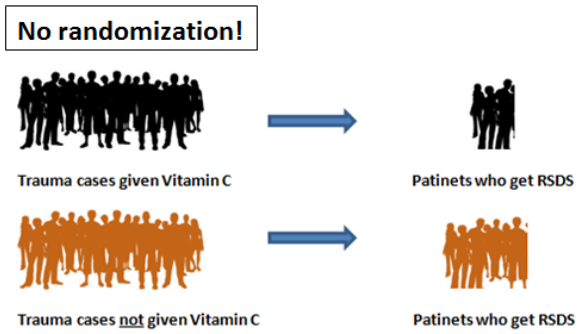
- A placebo or sham treatment that closely mimics the “active “ intervention
- A “watchful waiting” or waiting list group
- An approach identified as “usual care” (sometimes the intervention *plus* usual care is compared to usual care alone)
- Another intervention that is thought to be active/effective (based perhaps on prior research or common use). In pragmatic studies two entire treatment approaches may be compared (e.g., usual medical care for low back pain vs “chiropractic” care).

Teaching Tip: Students (and other beginners) can make the mistake of misinterpreting what can and cannot be concluded from a particular RCT. When two active treatments are compared, for example, one can surmise that one treatment performed better than the other in a particular group of patients (very useful for practitioners and a relatively common research design)—but one *cannot* say the RCT provided evidence that the *treatment is more effective than natural history alone*. Likewise, a study demonstrating that exercise is more effective than a waiting list provides evidence that the *totality* of the intervention was superior to doing nothing, but the study does not identify whether the benefit was due to the specific exercise program itself, increased physical activity (could be *any* activity), the placebo effect, or the *attention* from the providers (called the *Hawthorne effect*). The conclusions one draws from reading a study are limited, in part, by the design and goals of the study itself. ***When reading an RCT (or discussing a study with a student), it is important to find a clear statement of exactly what the goal of the study was!***

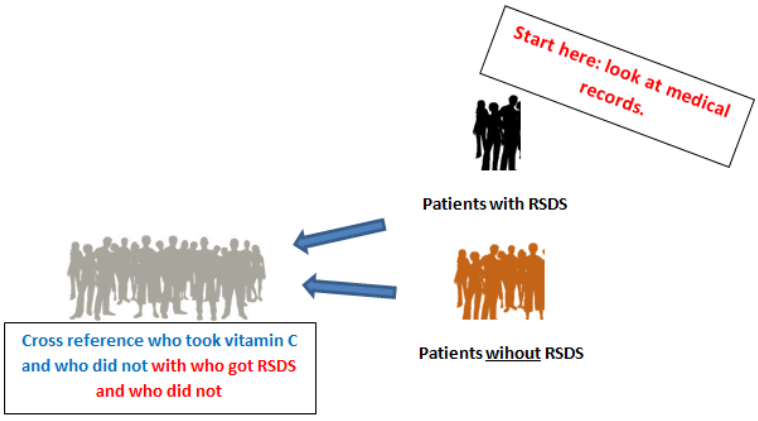
Cohort studies

Cohort studies are *observational* studies which attempt to assess whether there is a potential *association* between a specific health care condition and a specific treatment/exposure. They can be retrospective or prospective. While a cohort study can identify whether a treatment/exposure and an outcome seem to be *associated* with each other, it cannot demonstrate that one *caused* the other.

Prospective Cohort studies follow a pool of selected subjects forward in time to assess the potential association between a specific treatment/exposure and outcomes of interest.



Retrospective cohort studies focus on a pool of subjects identified from *previously* recorded health care records. The records are then analyzed for the presence or absence of an exposure (e.g., to a particular treatment or risk factor) and whether the exposure resulted in the subject getting sick, getting better, or experiencing no change. This design is less robust than prospective studies because it is susceptible to potential recall errors and or incompleteness in original collection of the data. It is not unusual for associations identified in retrospective studies to disappear when repeated in prospective studies so they should be interpreted with caution.



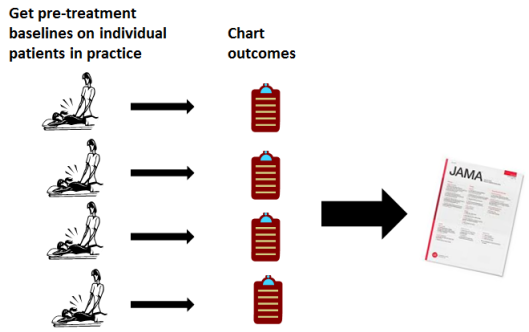
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Case control studies

Case control studies, like cohort studies, are *observational* studies used to ascertain whether there is a potential *association* between a specific health care condition or outcome and a specific exposure. This design is used more commonly in harm studies (e.g., does an exposure to caffeine increase the risk of hypertension?) or a prevention study (e.g., does regular exercise lower the risk of heart disease?). This design is often chosen when studying rare conditions (e.g., vertebral basilar dissection) for which an RCT is not practical (because it would have to be too large) or unethical (because it would mean exposing someone knowingly to a harmful agent). We will discuss Case Control study design in more detail in an upcoming module.

Case series and case reports

Case series and case reports consist of collections of reports on the treatment of individual patients or a report on a single patient. Because they are reports of cases and use no control groups to compare outcomes, they have little statistical validity. They are most useful for postulating research questions and to alert the profession to unusual cases.



Case reports and case series can be of interest to practitioners who wish to see how another "expert" practitioner (or group of practitioners) treats a particular condition. While only providing low level evidence of effectiveness, they can be very informative and can also alert one to potential side effects of an intervention.

Well written case reports can also provide students with "paper' clinical experience by exposing them to how some patients present with certain conditions and how some practitioners handle certain types of patients—especially if the reported diagnostic and management approaches *are similar to the ones that students/interns are trying to learn.*

Why are RCTs such a good design? And why do they fail?

To answer these questions we must first understand the kinds of problems that muddy the waters and may prevent us from seeing the ***truth*** contained in a clinical trial. In other words, did this treatment really cause this beneficial outcome? Two major culprits that can obscure the picture are bias and **confounders**.

Bias

A simple layman's definition of bias is to have a preference for one thing over another, especially an unfair preference. In research methodology, however, the term simply implies an error—whether consciously imposed by someone involved in the study or introduced *inadvertently* into the research design or execution. These errors, when present, can distort the facts of what we see or what we think we see.

Zilberberg (2012) writes

> …any systematic error in the design, conduct, or analysis of a study that results in a mistaken estimate of an exposure's effect on the risk of disease. I think of bias as something that artificially makes the exposure and the outcome occur either together or apart more frequently than they do in reality. For example, the INTERPHONE study, which examined the potential health consequences of cellular phone use, has been criticized for its biased design, in that it defined exposure as at least one cellular phone call every week. Enrolling such light users has two related consequences: (1) They are not representative of the exposure that is trying to be studied, and (2) the exposure may be so small as to be inconsequential, and therefore no health effects can be detected. This is an example of a *selection bias*, by far the most common form that bias takes.

 **Teaching Tip:** When applying the ABCDFIX sniff test to RCTs, we are searching for various forms of errors or bias.

Confounders

Confounders are a little bit different, but they can still end up misleading us.

Again let's turn to Zielberberg (2012):

> A *confounder* is a factor related to both the exposure and the outcome. Take for example the relationship between alcohol and head and neck cancer (H&N CA). While we know that heavy alcohol consumption is associated with a heightened risk of head and neck cancer, we also know that people who consume a lot of alcohol are more likely to be smokers than those who don't, and smoking in turn raises the risk of H&N CA. So, in this case smoking confounds the relationship between alcohol consumption and the development of H&N CA.

Confounders, like bias, can lead us to draw an erroneous conclusion about the results of a study. Sometimes prior research or a plausible "hunch" allows us to identify potential confounders (e.g., age, severity of the condition, sex). Steps can then be taken to try to make

sure that subjects with these characteristics are *evenly distributed* across the research groups. But human biology is so complex and there are so many variables involved that there may be a host of confounders affecting the outcome that *we don't even know about*!

The strength (and *hope*) of the randomization process is that if the cohort is large enough, these seen *and unseen* confounders will be more or less evenly distributed between the intervention group and the control group--thus canceling each other out. This enhances the *internal validity* of the study. For this reason, practitioners should carefully look at the baseline characteristics reported in an RCT to see whether or not randomization did its job.

In the ABCDFIX approach, this is part of the C analysis (C stands for "comparable"). Whether or not known potential confounders were evenly distributed among the research groups is found in the Methods section of a paper, often in Table 1.

The example below (Cleland 2013)* compares two groups of patients with ankle sprains prior to treatment, one that will be getting manual therapy (MTEX) and the other getting home exercise (HEP). Notice the characteristics that they tried to balance.

TABLE 1 DEMOGRAPHICS AND OUTCOME MEASURES AT BASELINE

Variable	HEP (n = 37)*	MTEX (n = 37)*	P Value
Age, y	33.2 ± 9.8	37.1 ± 11.8	.12†
Gender (female), n (%)	19 (51)	17 (46)	.81‡
Duration of symptoms, d	59.9 ± 31.3	72.1 ± 67.7	.32†
Acute (<6 wk), n	11	12	
Subacute (6-12 wk), n	22	17	.37‡
Chronic (>12 wk), n	4	8	
NPRS (0-10)§	3.9 ± 0.9	3.9 ± 0.7	.99†
LEFS (0-80)	53.8 ± 7.2	51.1 ± 8.7	.16†
FAAM ADL (0%-100%)	63.5 ± 12.5	65.8 ± 9.7	.39†
FAAM sports (0%-100%)	49.9 ± 9.4	49.3 ± 8.0	.76†
Taking medications at the start of the study, n (%)	7 (18.9)	5 (13.5)	.75‡

Abbreviations: ADL, activities of daily living; FAAM, Foot and Ankle Ability Measure; HEP, home exercise program; LEFS, Lower Extremity Functional Scale; MTEX, manual therapy and exercise; NPRS, numeric pain rating scale.

Of course, randomization does not always succeed in equally distributing even known or suspected confounders. So then what?

A three part solution

1) Researchers can try to statistically *adjust* the results to compensate for any known potential confounders which were unevenly distributed between the groups.

Zielberberg (2012) writes

> There are multiple ways of dealing with the confounding conundrum…. By far the most commonly used method is regression modeling; this is what was used in the WHI-HRT. This is a rather complex computation that requires much forethought (in other words, "Professional

driver on a closed circuit; don't try this at home"). The frustrating part is that just because the investigators did the regression does not mean that they did it right.

2) Researchers can try to regulate the distribution of <u>known</u> confounders (i.e., *covariates*) in the initial randomization process.

Manchikanti (2008) writes

> Stratified randomization is achieved by performing a separate randomization procedure within each of 2 or more subsets of participants such as age, smoking, or disease severity. Stratification by center is common in multicenter trials and stratification requires blocking within the strata. However, without blocking, it is ineffective.
>
> Stratified randomization, which is a relatively simple and effective technique, specifically for smaller clinical trials, may become too complicated to implement if multiple covariates must be controlled.

3) The methods above can only compensate for <u>known</u> confounders/covariates (and may not always be successful at that).

When available, practitioners should see if the results are reproduced in other RCTs as well. Sometimes larger RCTs and even observational studies ultimately may be needed to give a particular treatment a firm evidentiary footing. Meanwhile practitioners need to make clinical decisions informed by the evidence (with all of its limitations) that is currently available.

 **Teaching Tip:** The introduction and discussion portions of research papers usually place their study results in context by citing other research that has been done that either supports or contradicts their findings. Students/interns should always be encouraged to look at this information as well and take it into consideration.

Is a RCT always the best design?

A randomized controlled trial *is* probably the best design to provide evidence of a cause and effect relationship. In other words, did a particular therapy actually <u>cause</u> the outcome that was measured in the research subjects?

Zilberberg (2012) writes

> To be sure, matters of efficacy ("Does a particular intervention work statistically better than the placebo under very specific circumstances?") are best addressed with a RCT. One of the distinct shortcomings of this design, however, is its narrow focus on very controlled events, frequently accompanied by examining surrogate outcomes (those that matter more in the laboratory, e.g., blood pressure control) rather than meaningful clinical outcomes (those that matter in real life, e.g., death from stroke).

In other words, the RCT design is so tightly regulated by the researchers with such narrow focus and often, by necessity, a relatively small group of subjects that RCTs often fail to be very *generalizable*. That is, the results may apply to one particular group of subjects in one set of

exact conditions, but may not apply to the larger populations of different individuals seen in our practice setting.

For this reason even the evidence from an RCT must be applied with care! In an ideal world, the intervention under review should be demonstrable in multiple RCTs (often combined and described in a systematic review), delivered by different practitioners, in different settings on a broad mix of patients. Even in that case, additional evidence provided by large *cohort studies* can provide even more information about generalizability.

Other study designs

There are other trial designs for therapy that are not as strong as an RCT to demonstrate cause and effect and are hard to find on a traditional evidence pyramid. These are "quasi-experimental" designs which are usually considered the rough equivalent of a cohort study in terms of level of evidence.

Jewell (2014) offers a few useful examples:

Time series design

> Bhambhani et al. used a time series design to evaluate the effectiveness of circuit training in patients with traumatic brain injury. The time line for the study was divided into three phases. During the first phase, the stability of the outcome measures was evaluated through repeated measures 1 week apart (T_1 and T_2). Routine rehabilitation was introduced during the second week. The experimental intervention – circuit training – was introduced to all subjects at week 7 and continued for 14 weeks. Outcome measures were repeated at the conclusion of the rehabilitation (T_3), halfway through the circuit training (T_4), and at the conclusion of circuit training (T_5).

Nonequivalent control group design

> A nonequivalent control group format is similar to the experimental pretest-posttest design [i.e., a RCT] except that random assignment to groups is lacking. Instead, naturally occurring groups are identified with only one receiving the experimental intervention. Unlike the time series design, this format has a control group for the purposes of comparison; however, as the name implies, subject characteristics probably are not distributed equally at the start of the study. Robitaille et al. used a nonequivalent control group design to evaluate the effectiveness of a group exercise program for improving balance in community-dwelling elderly individuals. Two sets of community centers providing services to the elderly recruited potential participants. Subjects in one group of community centers received the experimental treatment, whereas subjects in the other centers had to wait for a period of time until the programs were initiated in their area. Although this study lacked randomized assignment of subjects to groups, it provides an example of a study conducted in typical community settings rather than in research labs or health care facilities.

RCTs not always needed

LaCaze (2012) writes that RCTs are not always necessary (nor sufficient)…

> …not necessary because alternative methods may be appropriate when the effect size is large relative to bias or random error that may possibly obscure it,[11] and not sufficient because there is more to assessing a therapeutic claim than success in a randomized trial (e.g., assessing if the results from a RCT are generalisable). Furthermore, observational studies may be the best available method for particular questions (e.g., assessing rare adverse effects of a medication).

If you are interested in seeing some specific examples of types of research questions that may not require an RCT to establish cause and effect, see Glasziou P, Chalmers I, Rawlins M, et al. When are randomised trials unnecessary? Picking signal from noise. BMJ 2007;334:349-51.

Remember: Even though some study designs are better than others (depending on the question being asked), the quality of the evidence is only good if the study is *properly done*!

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Finding Evidence
Dana Lawrence, DC

The Users' Guide to the Medical Literature states that "assessment of knowledge gaps, question formation, gathering and synthesis of evidence, and application of that evidence to the care of patients are among the foundations of informed care." (1) In our profession we are contextualizing evidence-based practice in terms of patient care; we have used the PICO model to derive meaningful clinical questions that can be effectively searched in order to be answered. Thus, in terms of process, we look initially at a clinical case scenario; a patient presents some sort of challenge to a physician, who then must develop a clinical question to search for evidence, assess the evidence and then apply the evidence and monitor results.

Key in this is finding evidence. We locate evidence through the judicious use of information sources. *The Users' Guides* categorizes information sources into four categories:

1. Systems: These are textbook-like resources that provide regularly updated clinical evidence. This may or may not be integrated with other forms of health care information, and which typically will also provide guidelines for patient care. An example of a system would be UpToDate (www.uptodate.com).

2. Synopses: These are sources which provide preappraised resources of recent journal articles and publications. One classic resource for synoptic evidence is the ACP Journal Club (www.acpjc.org).

3. Summaries: This is where you would locate systematic reviews of health care interventions. The major source that we are familiar with is the Cochrane Collaboration (www.cochrane.org/index.htm). It is also possible to locate systematic reviews using the clinical queries link on PubMed. These reviews examine individual studies, which meet inclusion criteria and then provide recommendations based on analysis of effect sizes and other data.

4. Studies: Of course, we should not forget that another great resource is individual studies themselves, as published in clinical literature. The challenge for us in using individual studies is we need to be able to evaluate the study before use, and this requires a certain skill set to do so most effectively.

In order for you to do the most effective search, you need to know how best to choose the appropriate information resource. Once again, the Users' Guides offer suggestions. They find four important criteria for choosing a resource.

1. Soundness of evidence-based approach: The resource should provide access to a proper sample of high-quality evidence for your question It will address validity and outcomes of interest.

2. Comprehensiveness and specificity: Different resources have different goals and strengths. For example, Cochrane is useful when looking at management, but is not useful if your interest is in diagnostic accuracy. You need to ensure that the tool you choose is best able to answer the question you are interested in.

3. Ease of use: Think about how hard it is to construct an effective search in PubMed. How you need to understand syntax, logic and organization in order to structure a search query that helps cut out dross and unnecessary information. Then, consider how easy it is to go to Cochrane and find topical information related to your needs. Ease of use can be a compelling reason to use one website over another.

4. Availability: Not all sources are free, and some are quite expensive. Within the confines of an academic institution, we might have access to a great deal of information, bur for our students they will lose that access upon their graduation. We should familiarize ourselves with the best free sources of information, of which there are many.

The following is information about search engines beyond those with which most of us are familiar. We are hopefully aware of PubMed, MANTIS, CINAHL, CHIROINDEX, and perhaps and AMED, …

PubMed: https://www.ncbi.nlm.nih.gov/pubmed/

MANTIS : http://www.chiroaccess.com/Search.aspx

CINAHL: https://www.ebscohost.com/nursing/products/cinahl-databases/the-cinahl-database

CHIROINDEX: https://www.chiroindex.org

AMED: https://www.ebsco.com/products/research-databases/amed-the-allied-and-complementary-medicine-database

… but there is a wealth of rigorous search engines we can use to locate information. Here are but some:

Natural Standard Database: http://naturalstandard.com. (Disclaimer: I am a member of their senior editorial board). From their website, they state, “Natural Standard was founded by clinicians and researchers to provide high quality, evidence-based information about complementary and alternative therapies. This international multidisciplinary collaboration now includes contributors from more than 100 eminent academic institutions.” There are actually 8 separate databases on this site, some of which are more consumer oriented while some are clinician and researcher oriented. The “Comparative Effectiveness” and “Medical Conditions” databases are particularly useful.

National Guideline Clearinghouse: http://www.guidelines.gov/ This is a database of evidence-based practice guidelines offered by the Agency for Healthcare Research and Quality (AHRQ). This database hews to evidence-based practice, as all guidelines must be based off of systematic reviews to be included. You can search by disease/condition, treatment/intervention/ measures, or organization. You can also link to healthcare syntheses and expert commentary on this site.

TRIP Database: http://tripdatabase.com/index.html - TRIP stands for Turning Research into Practice, and this database locates the most rigorous possible evidence with which to inform clinical practice decisions, and they do so based on the methods of evidence-based practice. It can link you to evidence-based synopses, systematic reviews and guidelines. It also provides links to evidence-based resources.

ACP Journal Club: http://www.acpjc.org This is a program from the American College of Physicians, and it states its goal as "*ACP Journal Club's* general purpose is to select from the biomedical literature articles that report original studies and systematic reviews that warrant immediate attention by physicians attempting to keep pace with important advances in internal medicine. These articles are summarized in value-added abstracts and commented on by clinical experts." Its search function will allow you to look for condition-specific information or intervention-based information. The material is based on the latest information from top medical journals.

PEDRo: http://www.pedro.org.au/ This is the Physiotherapy Evidence Database, an initiative of the Centre for Evidence-Based Physiotherapy. It contains an excellent tutorial on its use, as well as links to related topic areas. It will allow for basic and advanced searching of the physiotherapy literature.

PsycINFO: http://www.apa.org/psycinfo/ This is from the American Psychological Association and is their database for the psychological literature. It includes journal articles, books, dissertations and other "grey" literature and to date now includes close to 3 million citations.

There are certainly many other databases available for your use, many covering natural therapies. When one has a PICO question (Patient- Intervention- Comparison- Outcome), the use of the most appropriate database can help you resolve a clinical challenge more effectively and efficiently. These are only some of those you can use, but I hope you will consider bookmarking them and using them on a regular basis.

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Who Determines How You Practice Chiropractic?

By Charles L. Blum, DC

If you are like me, you graduated from chiropractic college, passed your licensing examinations, learned different chiropractic techniques to use in practice, and incorporated what you learned in the best way you saw possible to help your patients. As you have practiced, you have learned different assessment and treatment methods that may work better for your patients than what you have utilized previously, and incorporated them into your therapeutic regimen. I foresaw that I could practice this way within the scope of my practice as long as I was helping my patients. However, I have found that things are different from what I had presumed. Practicing chiropractors need to understand how curriculums are developed for our colleges as well as practice guidelines determined by states for scope of practice, insurance agencies for payments, and judicial arenas to determine malpractice.



I recently had the opportunity to participate in a workshop titled, "Toward the Development of a Standardized Chiropractic Technique Program," at this year's Association of Chiropractic Colleges' Research Agenda Joint Conference (ACCRAC) held on March 18–19, 2016 in Orlando, Florida. Part of the process of building a standardized program involves understanding evidence-based practice. Sacket described an "evidence-based practice (EBP) as the conscientious use of current best evidence in making decisions about patient care[1]." One aspect of determining best evidence is studying whether chiropractic's diagnostic and treatment modalities have validity (will what we claim we are finding be supported by the research) and/or reliability (two or more practitioners will have the same finding).

Guiding this workshop was an exhaustive study performed by Triano et al. "designed to evaluate the literature on the validity and reliability of the more common methods used by doctors of chiropractic to inform the choice of the site at which to apply spinal manipulation.[2]" The study concluded, "A considerable range of methods is in use for determining where in the spine to administer spinal manipulation. The currently published evidence falls across a spectrum ranging from strongly favourable to strongly unfavourable in regard to using these methods. In general, the stronger and more favourable evidence is for those procedures, which take a direct measure of the presumptive site of care-methods involving pain provocation upon palpation or localized tissue examination.[2]"

Researchers in this study worked diligently to assess all of the data available and a "total of 2,594 titles were screened, from which 201 articles met all inclusion criteria.[2]" Interestingly some researchers are questioning the role of EBP, particularly if it does not incorporate the clinician[3]. If clinical practitioners are not publishing in the scientific literature, how can these doctors in active practice have an adequate voice in guiding the future of chiropractic education and practice?

There is irony in having the future of chiropractic practice determined by researchers and their published literature because all research has some degree of bias. Research will only be performed if there is an entity to pay for that research or if the researcher has an interest in a particular type of study. This means that what is taking place in a doctor's office may likely not be considered in future practice guidelines or the development of evidence-based practice. If published research will be directing what we teach in the colleges and is used to develop practice guidelines, how can we integrate the wisdom of both the chiropractic researchers and clinic-based factions?

How is it determined what chiropractic clinical diagnostic and treatment methods are taught in our colleges?

Who is developing guidelines for chiropractic care and ultimately the future of chiropractic?

Isaac and Franceschi lament that the gold standard of the EBP "movement, the randomized controlled trial, meets failure in the clinical realm in terms of the value of one patient's life.[3]" In certain cases, even the need for validity/reliability

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arguments that plague qualitative researchers of the generalizability of an "N of 1" become mute.[3] The concept of dualism may be helpful in that it suggests that in order to understand and quantify something we can best do this by separating and comparing. It can be helpful with research when studying "things," however, this may be limiting when studying phenomena such as a healthcare application and a patient's response.

It may be important for EBP to incorporate a nondualistic approach for integrating research and clinical experience when developing chiropractic-based EBP[4]. "Evidence to practice and practice to evidence redefines" EBP "as a circular integration of best research evidence, clinical expertise, and patient values.[3] As Merriam claimed, 'quite a bit can be learned from an N of 1. The impossibility of evidence becomes a matter of practitioner trustworthiness. In this case, a patient's reality becomes the priority, and where application of statistically based generalizations becomes moot. Yet if clinicians are not performing or guiding research or submitting papers to the peer reviewed literature based on their clinical experience, how can they have a voice in this 'circular integration'?"

Is it reasonable to presume that researchers have the extensive clinical experience of those working in the chiropractic therapeutic trenches?

Is it reasonable to presume that chiropractors in clinical practice understand evidence-based practice guidelines and use the research literature to improve the care they render?

There have been a few workshops at previous year's ACC-RAC conferences that attempted to address the relationship between our chiropractic technique systems and the research community. The exchanges during these workshops are usually quite animated and dynamic. One year, I proposed that a good way to study the efficacy or utility of the different chiropractic techniques would be to include a "hands-on" portion along with discussion and review of the literature. It was fascinating how this suggestion was soundly rejected. Emphasis was solely given to the need of reviewing the published research and chiropractic techniques from that perspective, only.

From my experience, I find that no reading or talking can substitute for what I find through the sense of touch. I wonder if one aspect of the difference between researchers and clinicians may be their preferred learning method. The VARK (visual, auditory, read/write, kinesthetic) questionnaire is an assessment tool that has been used to study first-year chiropractic students.[5]

Similar to a study of first-year medical students[6], most students in the chiropractic study preferred a multimodal approach to learning, meaning they preferred a mixture of visual, auditory, read/write, and kinesthetic learning. Yet while the majority preferred multimodal learning, approximately a third of those studied had a particular preference for just visual, auditory, or kinesthetic learning.[7,8]

Is it possible that learning preferences influence a chiropractor's choice to become a clinician, an academician, or a researcher?

And does this learning preference influence the type of research that is performed by the chiropractic research community?

At the 2016 ACC-RAC workshop "Building Chiropractic Research Capacity: 2016 Research Agenda Update," there was a section discussing clinical related research. The predominant theme from those present in this section was that colleges need to create a culture of research, which supports teaching and integrating research concepts into the curriculum. In addition, support should be given to research projects (including those by instructors and students) and the creation of PhD research tracts for chiropractic students and instructors wanting to move in that direction. While I feel all of these suggestions are very important

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for the future of chiropractic research, my concern is where does the doctor in clinical practice[9] fit within this solution?

One answer may be to develop a mentorship between research faculty and doctors in clinical practice[10] that have a desire to share their findings in the research arena but are not skilled or are intimidated to do so. Another possible option could be the development of a free online research certification course that could instruct a doctor in clinical practice in the understanding, performing, and publishing of their research. For example, the National Institute of Health Office of Extramural Research has a free certification service to guide doctors wanting to learn about "Protecting Human Research Participants[11]." This could represent a beginning step toward something created by an international chiropractic college academic and research consortium.

> "From my experience, I find that no reading or talking can substitute for what I find through the sense of touch"

Next year's ACC-RAC conference (March 15–18, 2017) is expected to be a monumental joint conference bringing together the ACC-RAC and the World Federation of Chiropractic's 14th Biennial Congress and National Chiropractic Leadership Conference (NCLC), hosted by the American Chiropractic Association. This will be an important place for all researchers and clinicians to meet and collaborate.

Sacro Occipital Technique Organization (SOTO) – USA is a technique-based research and teaching organization that includes an SOT Research Conference as a part of its annual clinical symposium. This year, May 13–14, 2016, will mark its eighth annual research event. In this arena, doctors in clinical practice have a venue to share their research in a welcoming environment, which follows the guidelines of the ACC-RAC platform presentations. The SOT Research Conference is one avenue for doctors in clinical practice to engage in the research arena and help build a future for the chiropractic profession that integrates both research and clinical practice in a nondualistic manner.

Who determines how you will practice chiropractic? By default, the researchers will determine the guidelines of how to practice and what future students learn, and thus the future of chiropractic.[13] However, it is hoped that doctors in clinical practice can also help direct the future of chiropractic. This can be a reality if programs can be developed to help them step up and become more involved in the chiropractic research process. Also, the college-based research programs should be encouraged to involve and incorporate field doctors' thoughts and experiences in the development and direction of future chiropractic research.

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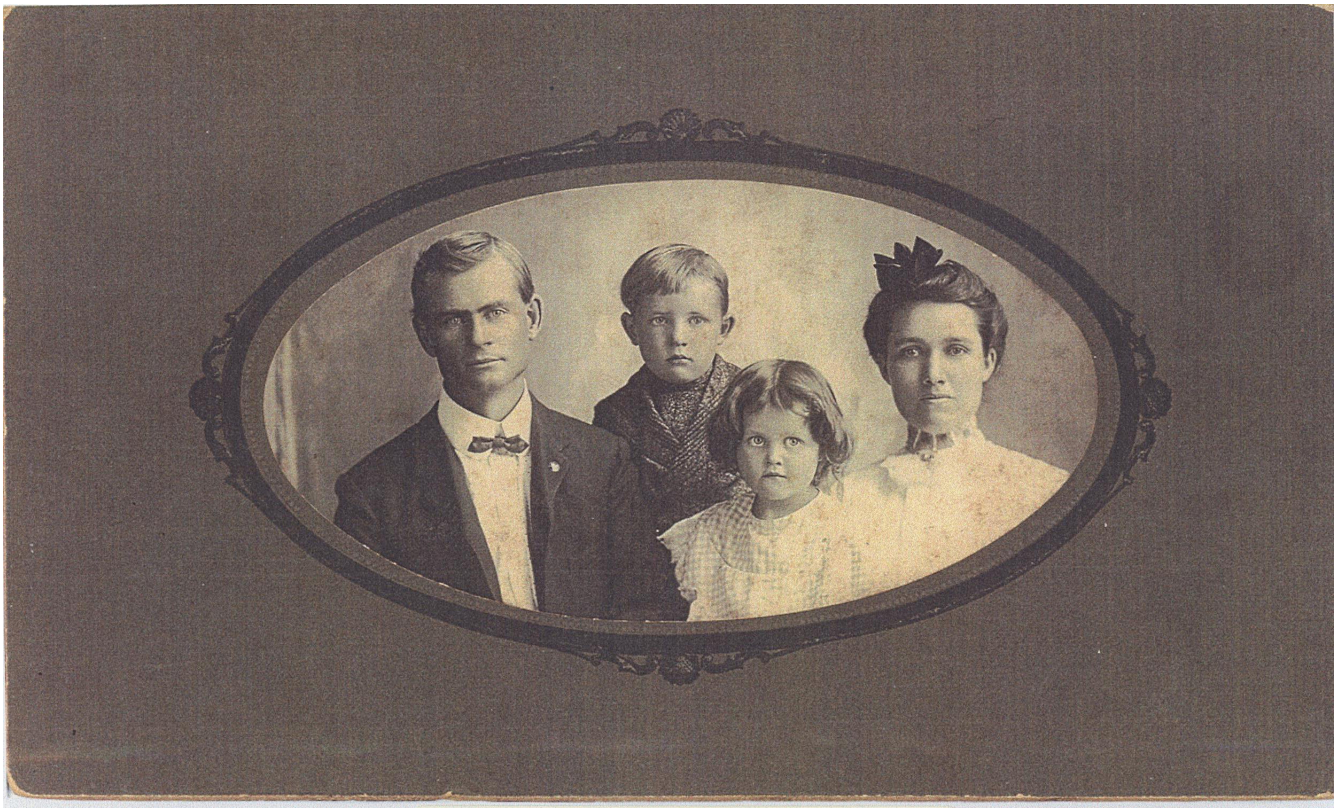
Coming Soon

More than forty years ago, Major Bertram DeJarnette encouraged Nebraska City newspaperman Ivan Beaumont to write a biography of his life. The doctor shared stories and documents with his hometown friend, and a rough draft was written. Each of the busy men added a few notes, but as time and interest slipped away, the stalled project was shelved.

Although information from the unfinished manuscript found its way into articles and time-lines over the decades, this fascinating investigation of Dr. DeJarnette's formative years and early influences has been gathering dust until now.

The title of the biography was and will remain "The Making of a Chiropractor," because its focus is on the people, places and events that put "the Major" onto the road to his destiny. For those elements of the book that were sketched out too vaguely, our editor's thousands of hours of sleuthing has uncovered details that clarify many misunderstandings and fill in details that have been missing in the history of Dr. DeJarnette.

We're sure you'll find "The Making of a Chiropractor" fascinating to read, and that it will provide you with an intimate look at a man whose research and guidance continues to help ease the suffering of millions.



Willis, Major, Fay and Maud DeJarnette in 1904



Complete with sign, Dr. DeJarnette's office at 722 Central Avenue in 1936



Orpheum Theatre Building – 1924 Home of Nebraska Chiropractic College

2018 SOT Research Conference Schedule

February 28 March 2, 2018 · Kauai, Hawaii

February 28, 2018

9:00 – 9:10: AM **Introduction to the SOT Research Conference and Update on SOT Research**
Charles L. Blum, DC

10:00 – 1:00 PM **Conservative chiropractic care for a post-traumatically induced C6/7 intraforaminal disc herniation in a 43-year-old female: A case report.**
Jeffrey A. Mersky, DC

March 1, 2018

9:00 – 11:00 AM **Cranial optokinetic reflex and cervical dystonia: A case report**
Marc Pick, DC

11:00 – 12:00 PM **A 70 year-old female with a 20 year history of reduced cervical range of motion treated with conservative chiropractic care: A case report**
Albert Salem, DC

March 2, 2018

9:00 – 10:00 AM **Temporomandibular joint dysfunction and myogenous influences of the temporalis muscle: A case report**
Robert Monk, DC

10:00 – 12:00 PM **Cranial therapeutic applications to facilitate dentofacial growth and development in a 50-year-old adult female: A case report**
Charles L. Blum, DC

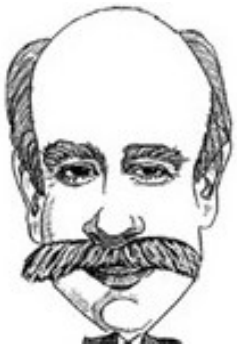
SOT Research Conference Presenter's Biographies



Dr. Charles L. Blum is in private practice Santa Monica, California and past president of SOTO – USA, now their research chair. Adjunct research faculty at Cleveland Chiropractic College, associate faculty at Southern California University of Health Sciences teaching the SOT Elective and TMD Care, as well as at Palmer College of Chiropractic West teaching the SOT Elective. Dr. Blum is a Certified SOT Cranial Practitioner, and on the peer review board of the Journal of Craniomandibular and Sleep Practice (CRANIO), Association of Chiropractic College Conference Peer Review Committee, and Journal of Chiropractic Medicine. He has lectured nationally and internationally, has written various SOT related texts, compiled SOT and cranial related research, and has extensively published in multiple peer reviewed indexed journals and at research conferences from 1984 to the present.



Dr. Jeffrey A. Mersky has been in private practice since 1985 and holds certified status as an advanced S.O.T practitioner and instructor of S.O.T (Sacro Occipital Technique) with a special emphasis on Cranial, TMJ disorders. He is a frequent teacher of S.O.T throughout the United States and has special expertise in Clinical Nutrition. The American Chiropractic Physicians Credentialing Center has awarded Dr. Mersky the designation of APC-M (Advanced Practice of Chiropractic Medicine) and he completed a 300-hour Diplomate certification post graduate program in Internal Disorders for the Chiropractic Physician with the designation of board eligible Internist. In addition he has completed course work in Functional Diagnostic Nutritional Medicine and continues his study in this field.



Dr. Robert Monk was president of SOTO-USA and the primary doctor of the Gentle Chiropractic Office located in Briarcliff, New York from 1987 to the present. His office combines Sacro-Occipital Technique with massage therapy to relax muscles and reduce painful conditions. Dr. Robert Monk, a certified SOT and SOT Cranial instructor as well as a Craniopath, is a founding member of and certified instructor for SOTO-USA. He is the author of the SOT Level 1 & 2 Manuals, the SOT Extremity Manual, and the SOT Cranial Manuals 1, 2, 3, & 4. Dr. Monk has extensive experience in the ability of taking the most complex and making it available for those attempting to learn. This amazing quality is what he uses for the formulation of his SOT and cranial texts and what he shares when teaching.



Dr. Marc G. Pick is a Doctor of Chiropractic with a private practice in Beverly Hills, California since 1973 and has lectured Internationally since 1979. Some of Dr. Pick's accomplishments include a Diplomat and Fellowship status in Craniopathy through the International Craniopathic Society, a Diplomat status in Neurology through the American Chiropractic Neurology Board and in 2015 he was bestowed the International Association of Functional Neurology and Rehabilitation's (IAFNR's), Neurologist of the year award. Since 1996, Dr. Pick has conducted an ongoing annual four-day course in human dissection at the John Burns School of Medicine in Honolulu and a photograph taken by the Internationally acclaimed photographer Pat York of Dr. Pick's central and peripheral nervous system dissection was recently selected by the Smithsonian institute's National Museum as an addition to their collection.



Dr. Albert Salem is a Certified SOT Cranial Practitioner and began studies in SOT and Craniopathy in the 1970s in California, with Dr DeJarnette's Sacro Occipital Teaching Organization and the Craniopathic Instructors Courses in Omaha. With family roots in architecture, medicine and natural healthcare, it became evident that the wholistic interplay is inescapable. SOT became a perfect fit. From practice in Beverly Hills, La Jolla and in Bay Area satellites in the 1980s, Dr Salem decided to begin the '90s with an Australian adventure, as visiting doctor to many SOT practices across the continent. Based in Adelaide, South Australia, Dr. Salem has a general practice clinic with philosophical cores in SOT, Craniopathy and Classical Homeopathy.

Cranial therapeutic applications to facilitate dentofacial growth and development in a 50-year-old adult female: A case report

Charles L. Blum, DC

Introduction:

Procedures treating dental craniofacial growth and development have traditionally been associated with adolescent orthodonture and are performed mostly for aesthetic reasons. In recent years having optimal craniofacial growth and development has transitioned from aesthetics to treatment to improve an adult's airway and possibly obstructive sleep apnea (OSA)[1,2]. There is emerging evidence to support that a restricted or "small" mouth is often associated with restricted or reduced airflow[3-5]. Airway compromise, or OSA, has serious ramifications leading to morbidity and mortality issues[6-10].

There are some very specific factors that contribute to craniofacial growth and development, and dental/chiropractic co-treatment can help to overcome the associated stressors with both children and adults[11,12]. Some of these factors affecting the size of the hard palate and oropharyngeal space can be genetics[13], nutritional[14,15], iatrogenically related to orthodontics (e.g., 4 bicuspid extraction and headgear)[16-23], frenum restrictions[24], tongue-dysfunctional actions[25-27], thumb sucking[28], pacifier overuse[29], breast-feeding versus bottle-feeding in infancy[30], mouth versus nasal breathing[31], poor lip seal[32], and enlarged tonsils[33].

Radical surgery to advance the maxilla to address underdeveloped maxilla, hard palate and oropharyngeal space has some significant risks[34-36]. Therefore, conservative methods to affect craniofacial growth and development would always be preferred in the initial phases of care[37-40]. There are various options for conservative palate expansion that have shown some success[41-43]; however, clinically treating adults often using less force and allowing for more time for changes to occur has been found with some patients to improve outcomes with less secondary discomfort. A specific conservative protocol to assist craniofacial growth and development in adults uses the alternative light wire functional (ALF) appliance[44-47] and, when maxillary advancement is needed, a type of reverse headgear called the Crane[48] can also serve as an important therapeutic consideration.

The purpose of this case report is to present some cranial chiropractic manipulative interventions that can be used with palatal expansion and advancement to aid the adult patient's response to care and minimize any secondary myofascial craniofacial discomfort. Also shared will be a method of affecting the tongue as a means to maximize the optimal effects of palatal expansion and advancement, aid mandibular positioning, and improve airway function outcome.

Case History:

A 50-year-old female patient had been under chiropractic care for 20 years at this office for chronic upper thoracic and cervical spine pain and stiffness, forward head posture, temporomandibular joint (TMJ) pain, joint hypermobility syndrome[49], and fatigue with a suspected related mitochondrial disorder[50]. Chiropractic care for her thoracic and cervical spine

and TMJ pain would help temporarily, but her conditions would tend to reoccur even with following conjoint ergonomic modifications and rehabilitative exercises. Approximately after the initial three years of treatment as she transitioned into supportive chiropractic care[51] the patient was referred to a dentist who addressed her TMJ-related issues with a dental TMJ flat plane mandibular appliance, which gave her some degree of relief on and off for 10 years.

During the years she was co-treated with multiple allopathic physicians, a nutritionist, and an acupuncturist. Within the past five years (after 15 years of care) her condition appeared to worsen and, as the discomfort in her thoracic and cervical spine and TMJ increased, she noticed that her fatigue and forward head posture was worsening. She was diagnosed during this time by her allopathic physician as having a type of mitochondrial syndrome, which contributed to her chronic fatigue and related myofascial syndromes.

An assessment of the patient's stomatognathic system was made to determine if stomatognathic related airway compromise was contributing to her presenting symptomatology over the last three years. Treatment over the years had been sufficient to create stability and the patient only needed intermittent chiropractic care (e.g., 8-10 office visits a year); however, as her quality of life and activities of daily living were becoming more and more compromised, further exploration into possible etiologies of her presentation were studied.

It was clear that she had significantly reduced craniofacial growth and development characterized by reduced hard palate transverse dimension, retruded maxilla, and incisors contacting end to end even with her mandible's condyles resting close to the mastoid processes (class two TM joint position). She was unable to touch her tongue to the roof of her mouth due to lingual frenum restriction, and this was suspected to be related to the reduced craniofacial growth and development. Since she was in her late 40s at this time the possibility of orthodonture to affect growth and development had been not considered due to the costs and time needed to determine any possible health related benefits. Following this assessment she was referred to a functional orthodontist who proposed a conservative, non-surgical approach to improve her stomatognathic system's function with the hopes that improved airway would have positive secondary effects to her health presentation.

Intervention/Methods:

Over the recent past three years the patient received chiropractic care consisting of sacro occipital technique procedures to treat chronic sacroiliac joint instability with pelvic torsion (category two), forward head posture, cervicothoracic myofascial imbalance, and cranial/TMJ imbalance. She received orthodonture/orthopedic dental care using an ALF maxillary appliance to create hard palate expansion and she started using the CRANE at night to facilitate forward advancing of her maxilla. During this time she had a lingual frenectomy, and chiropractic procedures were used to help prepare her for the surgical frenectomy intervention and afterwards to maximize the effects of the lingual frenum release.

During the ALF appliance and CRANE procedures she would sometimes plateau regarding progress (reduced expansion) or have symptoms of increased head and neck tension. A system

of craniofacial and tongue procedures (covered in the discussion section) were utilized to facilitate her progress, reduce head and neck tension, and aid the goal of improving her outcome to the orthodontic/orthopedic dental interventions.

Results:

The patient is still under chiropractic and dental care, which has been reduced to once every 4-6 weeks, particularly when she has a change in her maxillary expansion. Since dental/chiropractic co-treatment began approximately three years ago, the patient's cervicothoracic pain and discomfort went from a chronic 6-8 (on a visual analogue scale of 10 being most painful) to a 3-4 during a flare-up, which occur during increased physical and emotional stress approximately 3-4 times a year. She can now easily touch her tongue to the roof of her mouth and has significantly less TMJ-related pain or discomfort.

She is able to sleep better through the night and uses the CRANE for 1-2 hours at a time, since she prefers to be a side sleeper and to use the CRANE the whole night would require her to be a supine sleeper. Still, she is awakening rested and has less fatigue during the day, which had not occurred regularly prior to the interventions described here. Her improvements have been consistent and relatively stable as she is reaching her expansion and maxillary advancement milestones. The limitations to her maxillary expansion will be once her teeth start to move buccally or if too much space begins to occur between them. As this limit is approached, the chiropractic and cranial treatment will be to support the craniofacial positioning and improvements in head posture and cervicothoracic function.

Discussion:

The cranial procedures used to assist the function of the ALF and CRANE and reduce any secondary myofascial restrictions are focused on facilitating craniofacial growth and development. The direction of pressure and emphasis is based on the craniofacial sutures, whether the sutures were beveled, interdigitated, or if they had tongue and groove-type configurations[51,52].

It is important assess any need for maxillary advancement and utilize this factor in all aspects of the cranial procedures in order to facilitate the actions of the ALF and CRANE. Some patients require more lateral expansion while anterior advancement is not as much an issue. Often the position of the mandible can guide this diagnostic criterion. If the mandible can be advanced sufficiently to draw the tongue forward to open the airway and the incisors can maintain a class one occlusion, then anterior advancement of the maxilla (e.g., utilizing the CRANE) may not be needed. The following is a typical procedure utilized with this patient:

> Step 1. **Maxillary Lateral Expansion**: When maxillary advancement is preferred, the procedure starts with the doctor's two index fingers inside the patient's mouth contacting the anterior aspect of both maxillae. Initial force is directed to draw the maxilla anterior-ward until a relaxation of the tissues is felt and is usually associated with a feeling of a

slight “unwinding” of stress. While still maintaining this anterior-ward pressure, the next step is to attempt to create width along the intermaxillary and interpalatine sutures, which are interdigitated. This lateral expansive pressure is similarly held until the osseous tissues relax, with the initial contact starting at the anterior premaxillary area. Once the premaxillary area relaxes, the doctor moves the index fingers to the mid-maxilla and then to the palatine maintaining the anterior and lateral pressure and feeling for relaxation of the tissues.

Step 2. **Expand Maxillopalatine Sutures**: From the perspective of inside of the mouth looking upward, the maxilla has an overlapping bevel of bone relative to the related palatine. The goal is to attempt to facilitate advancing of the maxilla. This can be helped by using two fingers to simultaneously gently lift the palatine while drawing the ipsilateral maxilla anteriorward. This contact is held until a relaxation is felt in the tissues and then repeated on the opposite side.

Step 3. **Pre-Maxilla and Maxilla Encouraged into Cranial External Rotation**: Usually the doctor’s index and middle finger are moved to contact intraorally on one side the anterior (pre-maxilla) and posterior aspect of the maxilla with the thumb outside the teeth but inside the mouth contacting the superior aspect of the maxilla. The goal is to influence the maxilla, with the fingers inside the mouth, into external rotation (increasing the lateral hard palate dimension) using the thumb as a pivot point. While this external rotation is encouraged, a consistent anterior translation of the maxilla is also influenced until relaxation of the tissues occurred. Once one side is relaxed, move to Step Four and then repeat Step Three and Step Four on the contralateral side.

Step 4. **Maxilla and Zygoma Simultaneously Encouraged into External Rotation**: Once movement or relaxation into external rotation of the maxilla is felt, the doctor’s middle finger moves from inside the teeth to outside the teeth under the mid-zygoma. The doctor’s thumb moves to outside the mouth to externally contact the zygoma just lateral to the maxilla and this is used as a pivot point as\ simultaneously the maxilla and zygoma are both rotated into external rotation. This contact is gently maintained, since the intraoral zygomatic contact is commonly very sensitive. The pressure is continued until relaxation is felt at the ipsilateral maxilla and zygoma intraoral contacts. When both sides are completed, if the patient’s mouth will allow, both maxilla and zygoma are contacted intraorally as before with fingers from both doctor’s hands. However.this time using both hands attempt to encourage both maxilla and zygoma bilaterally to release into external rotation encouraging lateral expansion. If advancing the maxilla is a consideration, then while both the maxilla and zygoma are contacted bilaterally and encouraged into external rotation, the maxilla is also attempted to be advanced forward.

Step 5. **Maxillary Rotation Encouraging Anterior Maxillary Positioning**: The next step is to assess maxillary rotation with an intraoral contact using the doctor’s thumb and fingers to grasp the maxillopalatine bones above the teeth. The doctor’s external contact will span to contact the patient’s frontal bone and greater wings of the sphenoid. The external contact will serve to stabilize as the hard palate is rotated forward on one side with the doctor assessing adequate anterior translation. This is generally repeated until

symmetry in rotation to both sides is determined. With this patient she tended to have reduced anterior hard palate rotational translation on the left side, so while maintaining the frontal/sphenoid contact her left hard palate was contacted behind the last molar and whole palate rotated forward towards the right.

Step 6. **Mandible Release**: With a patient that needs to have the maxilla advanced it is common that their incisors can be end to end and the mandible's condyles are retro-positioned (Class Two condyle position) releasing the mandible into a preferred anterior position is not performed initially. At the initial stages of care with a patient that cannot adequately have the mandible advanced, contact is made by the doctor's thumbs to the bilateral molars of the patient's mandible with resting of the fingers under the mandible as a figure 8 distraction type motion of the mandible is performed. The initial attempt will be to increase the vertical dimension of the temporomandibular joint. After treatment with the ALF and CRANE and the maxilla has been sufficiently advanced then the mandible can also be distracted not just to create vertical change, but also to draw it slightly anteriorward.

Step 7. **Tongue Traction Release**: If the patient has significant tongue and suprahyoidal muscle tension, a goal of care may be to support a lingual frenectomy and aid the progress of the ALF by having the patient be able to easily rest the tongue at the incisal papillae[54]. Using a sanitary paper towel, the patient's tongue is contacted by the doctor and gently tractioned forward in various positions, determining if any direction is restricted. This can be very sensitive, so the doctor will have to be gentle. When restriction is felt in one direction the tongue is held in that direction with gentle traction while the doctors other hand contacts under the chin to gently massage the related suprahyoidal muscles until relaxation occurs and the tongue moves without restriction.

This procedure has been used clinically with many patients over the past few years successfully with remarks that it gives them mouth "space" or "relaxes tension" from any type of maxillary expander ALF or a different palatal expander. It has been utilized to prepare the patient for dental palate expansion and to aid the process reducing secondary patient reactions to the intraoral internal pressures.

As with all case studies caution must be used when generalizing a single subject's presentation and response to treatment. This is because confounders such as placebo or ideomotor effects, regression to the mean, and other factors cannot be ruled out. However, what is compelling is that the patient had been having similar symptoms for two decades or more before starting a new treatment program that incorporated the ALF, CRANE, sacro occipital technique procedures, and specific chiropractic craniofacial therapy to aid the maxillary expansion and advancement. Her prior unresponsiveness to care and positive outcome following instituting a new treatment protocol suggests a temporal relationship between the care rendered and the patient's symptomatology.

Conclusion:

This case report discusses a 50-year-old female who was chronically suffering from upper thoracic and cervical spine pain and stiffness, forward head posture, and temporomandibular joint (TMJ) pain. Consistent and maintained improvement began to occur when dental care with an ALF appliance to expand her hard palate and the CRANE devise to advance her maxilla along with a specific chiropractic craniofacial therapy. Greater study is needed to determine if this conservative procedure can be helpful to pediatric and adult patients receiving maxillary expansion and advancement.

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Conservative chiropractic care for a post-traumatically induced C6/7 intraforaminal disc herniation in a 43-year-old female: A case report.

Jeffrey A. Mersky, DC

Introduction:

Cervical spine pain "is the fourth leading cause of disability, with an annual prevalence rate exceeding 30%. Most episodes of acute neck pain will resolve with or without treatment, but nearly 50% of individuals will continue to experience some degree of pain or frequent occurrences[1]." It is not unusual for a patient in an automobile accident[2] sustaining post-traumatic insults to develop secondary cervical herniated discopathy[3].

There are three main types of cervical disc herniation that lead to nerve root impingement. "The most common is intraforaminal, which results in predominantly sensory radicular symptoms. The next most common is posterolateral, which results in weakness and potentially muscle atrophy. Rarer midline herniations directly compress the spinal cord and result in symptoms of myelopathy, such as upper extremity numbness, weakness, gait disturbance, ataxia, and urinary incontinence[4]."

When neck or cervical spine pain, associated with disc herniation and nerve root irritation, persists it can lead to cervical spine radiculopathy syndromes. Cervical spine radiculopathy syndromes commonly relate to vertebral joint imbalance or stress affecting the intervertebral foramina leading to compression or irritation of cervical nerve roots and subsequent radiating pain in one or both upper extremities. "The cervical radiculopathy can be accompanied by motor, sensory, or reflex deficits[5]." "The annual incidence is 107 per 100,000 men, and 64 per 100,000 women. It is most prevalent in persons 50 to 54 years of age[6]." Most patients with cervical radiculopathy will improve regardless of treatment modality[6]. In fact, roughly 88% will improve within four weeks of nonoperative management[7]. In a retrospective case series, 80% of those with objective weakness or reflex deficit improved within three weeks of conservative management[8].

The treatment of neck or cervical spine pain is still in its formative state with some evidence suggesting that exercise or muscle relaxants may be helpful along with "conflicting evidence for epidural corticosteroid injections for radiculopathy, and weak positive evidence for cervical facet joint radiofrequency denervation. In patients with radiculopathy or myelopathy, surgery appears to be more effective than nonsurgical therapy in the short term but not in the long term for most people[1]." Most conservative treatments for cervical radiculopathy "consist of immobilization, anti-inflammatory medications, physical therapy, cervical traction, and epidural steroid injections. Cervical radiculopathy typically is self-limiting with 75%-90% of patients achieving symptomatic improvement with nonoperative care[9]."

When the patient's condition is refractory to conservative interventions then the most common next step is epidural injections and then, if necessary, surgery. However cervical spine epidural injections are not without their risks. Childress et al note that, "patients should be counseled about the risk of potential complications, including dural puncture, meningitis, epidural abscess, and nerve root injury[10]." In a study by Park and Lee they found that the "causes of upper

extremity radicular pain or neck pain are varied, often involving disc herniation, spinal stenosis, or spondylosis. Cervical transformaminal epidural steroid injection (C-TFESI) is a common treatment for such pain. Of the 50 procedures where dispersion of contrast was intraforaminal, 44% (22/50) were scored as unfavorable outcomes[11]." Essentially Lee et al., concluded that though "spinal pain blocks are a good option for relieving pain, clinicians should always keep in mind the potential for development of inevitable complications[12]."

There are studies that investigated surgical care for cervical radicular syndromes and found that surgery can be a viable option when conservative care and injections are not successful[13,14]. However Edwards et al., cautioned in a study investigating the accuracy of surgeon records documenting the prevalence of patient adverse outcomes to cervical spine surgery, that their documentation was consistently poor[15], suggesting an underreporting of adverse outcomes[16-19].

This case report presents a female patient suffering from a post-traumatic intraforaminal cervical disc herniation with radicular syndrome presenting for conservative chiropractic care.

Case History:

A 43 year old female, concert bassist in symphony orchestra, was the driver of a vehicle that was rear-ended. Prior to impact her head was turned to the left and from the impact of the collision had a resultant left sided intraforaminal C6/7 disc herniation. Immediately following the accident she noted that she had radicular symptoms to the whole left upper extremity all the way to the hand with associated numbness, tingling, lack of sensation, and muscle weakness. Due to the pain, discomfort, and weakness she was placed on temporary total disability from January 18, 2017 through May 16, 2017.

Treatment at this office began on March 7, 2017.She was referred by another chiropractor as her improvement had not reached a level where she could return to work. There was concern that she would not be able to return to her prior occupation. She had also seen an acupuncturist, physical therapist, and medical doctor with no change in symptoms. There was motivation to receive care at this office since the only alternative was steroidal injections into the cervical spine and she was hoping for an alternative treatment option offering less risk.

Methods/Intervention:

The patient was assessed with sacro occipital technique category and cranial system of analysis[20]. It was determined that she had a category two presentation[21=23] with category three presentation[24-26] interrelationships. This meant that while she presented with pelvic torsion and sacroiliac joint hypermobility syndrome, she also had some spinal related discopathy. This would require care offered by both category systems of analysis.
Treatment also focused to her cervical spine and cranial related imbalance, which noted a relationship between her piriformis/hip range of motion[27,28], pelvis[29], and concomitant cranial imbalance (sphenobasilar sidebending lesion) [30,31]. She was also assessed and treated with

cranial manipulative care[32-34] to create symmetry for an asymmetrical hard palate[35] with one maxilla in internal rotation and the other in external rotation.

Results:

Treatment began on March 7, 2017at a frequency of 2 times a week for 3-4 weeks, and then 1 time a week for 6 weeks. She was able to return to work without any limitations on May 17, 2017. Treatment was continued for 6 months to sustain improvements and she was seen approximately 1-2 times a month during that time. As of January 2018 the patient has been a stable category two with equal leg lengths and no related indicators for pelvic torsion or sacroiliac joint hypermobility. She reports no upper extremity discomfort except when she over exerts herself, such as playing a particular stressful piece of music. However the discomfort, however, will resolve quickly and she can return to activities without any radicular syndrome.

Discussion:

After attempting various conservative methods of care, including standard chiropractic, for her cervical spine disability a main motivating factor for the patient seeking care at this office was the desire to not have a procedure, such as an epidural injection which had been recommend to her, for fear of an adverse reaction. She was already in significant pain with functional limitations and the thought of her condition worsening deeply concerned her. Since there have been studies finding adverse reactions to cervical steroidal epidural injections, all conservative options were sought.

While a search of Pub Med could not find any research studies on chiropractic care of cervical intraforaminal disc herniations, one study found that "a large percentage of acute and importantly chronic lumbar disc [intraforaminal] herniation patients treated with chiropractic spinal manipulation reported clinically relevant improvement[36]." There were some studies, not specifically mentioning "intraforaminal herniation" that described the successful use of chiropractic care of cervical discopathies[37-41]. Of interest in a study by Peterson et al., subacute/chronic patients with cervical disc herniation treated with spinal manipulative therapy (77%) were significantly more likely to report relevant "improvement" compared with those patients receiving imaging-guided cervical nerve root injection blocks (46%)[42].

As it is presumed that chiropractic care would offer less risk than a nerve root related injection[43], what biological plausibility is there that sacro occipital and cranial techniques appeared to lead to a positive therapeutic outcome when other prior interventions did not? One theory can be that the sacro occipital technique and cranial care helped to reduce stressors and pressure[44] to the intraforaminal ligaments, "which may act in conjunction with the dura and periosteum to protect the nerve roots mechanically[45]." This reduction or balancing of meningeal axial tensions[26] could also be related to the patient's concurrent reduction in cervical radicular syndrome[46].

The search for optimal conservative care for patients with cervical spine disorders such as disc herniations and radicular syndrome is complex for practitioners to determine. "The Task Force

on Neck Pain and Its Associated Disorders (TFNPAD) extensively reviewed the literature to make best-evidence recommendations on the management of neck pain disorders. The review found insufficient evidence to draw firm conclusions or make appropriate treatment recommendations for cervical spine radiculopathy, or identify contraindicated therapies.[47]

The challenge of determining how chiropractic care fits in the field of conservative care is complicated by the lack of awareness in both the chiropractic and allopathic research communities of the different types of low force spinal manipulative therapies (e.g., sacro occipital technique) other than the high velocity low amplitude methods, commonly considered spinal manipulative therapy. In a study by Saal et al., they stated that "forceful joint manipulation was not used" in their protocol for cervical spine radiculopathy[48], while Haas et al stated that intervertebral disc herniation and cervical spine radiculopathy are contraindications to manipulation[49]. Rodine and Vernon determined that statements such as those by Saal and Haas "are unsupported by both basic science evidence which justifies a plausible risk, and epidemiological evidence suggesting hazard or ineffectiveness[50]."

As with all case studies caution must be used when generalizing a single subject's presentation and response to treatment. This is because confounders such as placebo or ideomotor effects, regression to the mean, and other factors cannot be ruled out. However what is compelling is that the patient was diagnosed by MRI of a post-traumatic intraforaminal cervical disc herniation, and her condition was unresolving even with receiving standard chiropractic, acupuncture, physical therapy, and allopathic care. Prior to care at this office her condition was unchanging and she did not have use of her left upper extremity due to muscle weakness and pain. The condition was severe enough that she could not work. Following her first office visit at this office utilizing SOT methods of analysis and treatment, she immediately noted improvement in strength and reduction of pain, which continued during the course of care. Her prior unresponsiveness to care and positive outcome following treatment at this office suggests a temporal relationship between the care rendered and the patient's symptomatology.

Conclusion:

This case report discusses a 43-year-old musician who suffered an intraforaminal cervical disc herniation that was un-resolving with chiropractic, acupuncture, physical therapy, and allopathic care. Her response to care prior to being seen at this office utilizing sacro occipital technique and cranial was limited, and she was not able to perform her occupation. Within a relatively short time of receiving this specific form of chiropractic care she was able to return to work and became virtually symptom free. Further study is warranted to determine what subsets of patients with intraforaminal disc herniations may benefit from this conservative chiropractic method of care and why this type of treatment may produce better outcomes.

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Temporomandibular joint dysfunction and myogenous influences of the temporalis muscle: A case report.

Robert Monk, DC

Introduction:

The temporomandibular joint (TMJ) is a complex joint affected by occlusion (how the teeth touch), TMJ condylar joint position, the function of the TMJ disc, the related stomatognathic muscles, ligaments, and joint capsule, and has an effect on airway[1]. A disorder of the temporomandibular joint (TMD) is considered a "multifactorial disease process caused by muscle hyperfunction or parafunction, traumatic injuries, hormonal influences, and articular changes. Symptoms of TMD include decreased mandibular range of motion, muscle and joint pain, joint crepitus, and functional limitation or deviation of jaw opening. Only after failure of noninvasive options should more invasive and nonreversible treatments be initiated. Treatment can be divided into noninvasive, minimally invasive, and invasive options[2]."

The prevalence of patients reporting TMD symptomatology is highly variable across studies. Manfredini et all found that "myofascial pain with or without mouth opening limitation was the commonest diagnosis in TMD patient populations, and disc displacement with reduction was the commonest diagnosis in community samples[3]." In a 5-year epidemiological study by Rammelsberg et al, they determined that muscle disorders classified by the Research Diagnostic Criteria for Temporomandibular Disorders "are predominantly chronic or fluctuating pain conditions, with a modest probability (31%) of remission[4]."

Magnusson et all performed a longitudinal epidemiological study of TMD of patients from 15 to 35 years of age. They found that "women reported TMD symptoms and headache and had muscle tenderness and joint sounds more often than men." "Among the highest correlations found (rs = 0.4) were those between reported clenching and bruxing habits and TMJ sounds and jaw fatigue[5]." While most TMD related symptoms would subside over time, many times patients will not be willing to watch and wait as they are in increasing pain and have limited ability to eat and chew their food. For those patients with TMD that have their quality of life and activities of daily living adversely affected they are seeking conservative options. The purpose of this case report is to share a minimally invasive, low risk option for care of a patient presenting with TMD

Case Study:

A 32-year-old female presented for care, having experienced right-sided jaw pain for several weeks, with the pain gradually increasing in intensity, without any sign of possible reduction in pain or disability. The pain was experienced during the final degrees of opening. This was especially evident on yawning and attempts to eat foods requiring her to open her jaw wide (e.g., apples, sandwiches, etc.). Crepitus and clicking sounds were absent and the patient denied feelings of joint locking. Active and passive ranges of motion were essentially normal however apprehension signs and guarding were noted on advanced opening.

Intervention/Methods:

Palpation of the soft tissues and muscles around the area of the proximal head of the mandible extra and intra-orally revealed only slight discomfort. However palpation along the anterior ramus, especially the medial (lingual) surface, created audibilized pain and flinching. More isolated and specific palpation elicited extreme sensitivity in the tendinous attachments of both lower temporalis muscles along the ramus of the mandible.
These muscles were treated with gentle pressure and compression of the affected tissues creating gradual de-sensitivity and pain relief. The patient was instructed to adopt a softer diet for three weeks and avoid foods and activities requiring advanced jaw opening. Special instructions were issued to reduce exacerbations due to yawning by placing her tongue at the roof of her mouth with pressure anytime she felt a yawn coming on. She was also given relaxation exercises and temporalis muscle self-massage instructions.

Results:

Following one treatment the patient reported significantly decreased pain and the ability to open her mouth with less discomfort. The patient was treated in this manner 3 times over a two-week period, then a single follow-up visit 4 weeks later. Patient reported 95% reduction in symptoms, no longer experiencing pain on full opening and able to eat whatever foods she wanted. It was anticipated that as time would pass her condition would continue to progress until there was no further symptomatology.

Discussion:

The temporalis muscle inserts onto the coracoid process as well as the lingual and anterior surfaces of the ramus. These areas are often neglected as sources of trigger point activity. The temporalis muscle is the principal elevator (closer) of the mandible and is more sensitive to occlusal interferences than any other masticatory muscle. It has three independent functional components that correspond to the direction of its fibers. The anterior fibers, which run almost vertical, contract shortly before the rest of the fibers at the onset of elevation. The most posterior fibers, which run almost horizontal, are active in retrusion of the mandible and lateral deviation to the ipsilateral side. The anterior part acts as a synergist with the masseter in clenching, whereas the posterior part acts as an antagonist to the masseter in retruding the mandible.

Ardizone et al[6], determined in a case controlled TMD study that there were significant differences among patients with a different degree of clinical dysfunction, as well as between patients with TMD and the control group. “These differences were more important during maximum effort clenching and mastication[6].” In their study differences in temporalis muscle activity were found to be significant within some of groups[6]. In another study, Scopel et al[7] attempted to evaluate the effectiveness of a therapeutic intervention utilizing a “centric relation stabilization appliance (CRSA) in patients with temporomandibular disorders of myogenous origin by electromyography and compare the results with two asymptomatic control groups[7].” “Electromyography (EMG) of masseter and anterior temporalis muscles was performed during

mandibular rest position. In the treated group, the occlusal appliance reduced the electrical activity of the analyzed muscles at right and left sides ($p<0.0001$), and equilibrated muscular activity between right and left sides ($p<0.0001$), reaching values close to the control groups[7].” Of interest is determining whether affecting temporalis muscle function can help with creating an improved centric relationship independent of a dental appliance.

While one study found that myofascial techniques to the temporalis and masseter muscles created no change in asymptomatic patients[8] another study did find correlations “between the presence of masseter and temporalis muscle trigger points (TrPs) and jaw opening between individuals with mechanical neck pain and healthy controls[9].” It has generally been accepted that assessing for myogenous TMD presentations that “the tests include pain with opening jaw movements and palpation of the temporalis and masseter muscles[10].” In fact for TMD related “myalgia and the three types of [myalgic] diagnoses, palpation of only the temporalis and masseter muscles is required…[10]”

As with all case reports caution must be exercised in generalizing the outcome with the whole patient population. With single subject studies we cannot rule out placebo or ideomotor effects, regression to the mean, and other confounders. What is compelling, however, is that the patient’s condition was stable and gradually worsening until the treatment was rendered and there was a temporal relationship between her relief occurring immediately following the intervention.

Conclusion:

This case report shared a patient presenting with TMD pain and limited opening that was unresponsive to “watching and waiting.” As her condition was continually worsening she sought care at this office and assessment determined that she had extreme sensitivity at her temporalis muscle insertion, which was relieved by pressure and subsequently led to improved TMJ function. She was given home exercises and after 4 office visits over 4 months was 95% improved. This low risk treatment for a TMD acute patient is worthy of further investigation to determine what subset of patients might respond to this type of intervention.

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Cranial optokinetic reflex and cervical dystonia: A case report
Marc Pick, DC

Introduction:

Cervical dystonia (CD), also known as spasmodic torticollis (ST), is a focal dystonia characterized by neck muscles contracting involuntarily causing abnormal movements and awkward posture of the head and neck. CD is "the most common form of adult-onset focal dystonia, has a heterogeneous clinical presentation with variable clinical features that often can lead to difficulties and delays in diagnosis. The prevalence of CD in the population is estimatesd ranged from 20–4,100 cases/million[1]. Defazio et al found that with CD generally, "studies that relied on service-based and record-linkage system data likely underestimated the prevalence of CD, whereas population-based studies suffered from over-ascertainment. The more methodologically robust studies yielded a range of estimates of 28–183 cases/million. Despite the varying prevalence estimates, an approximate 2:1 female:male ratio was consistent among many studies[1]." Of the three studies reviewed in the DeFazio et al systematic review they found an estimated incidence of CD, ranging from 8–12 cases/million person-years[1].

CD is most often primary (sometimes called idiopathic cervical dystonia (ICD)), though it can also be secondary to other neurological disease. Dystonic movements are typically involuntary, spasmodic, and repeated in a stereotype pattern. "From onset they are often mild and intermittent, but become constant with progression. Turning of the head (torticollis) is most frequent, but lateroflexion (latero-), extension (retro-) and flexion (anterocollis) of the neck are also seen. The range of voluntary neck movement is often reduced[2]."

If the CD contractions are sustained, they may cause abnormal posture of the head and neck. If the spasms are periodic or patterned, they may produce jerky head movements. The severity of cervical dystonia varies from mild to severe. Movements are often partially relieved by a sensory trick (also known as geste antagoniste) such as gently touching the chin, other areas of the face, or back of the head. Cervical dystonia may begin in the neck and spread into the shoulders, but the symptoms usually plateau and remain stable within five years of onset.

The pathogenesis of CD remains obscure. However, genetic factors, trauma, the sensory system, and impaired basal ganglia function may all play a role in the development of this disease[3]. Le Doux et al[4] performed a review of the literature studying secondary CD and determined that "structural lesions associated with cervical dystonia were most commonly localized to the brainstem and cerebellums with the remaining cases were equally divided between the cervical spinal cord and basal ganglia. Although inconsistent, head rotation tended to be contralateral to lesion localization[4]." Of importance, they found that the "relative paucity of basal ganglia pathology and concentration of lesions in the brainstem, cerebellum, and cervical spinal cord in patients with secondary cervical dystonia suggests that dysfunction of cerebellar afferent pathways may be important to the pathophysiology of primary cervical dystonia[4]."

Aside from primary or secondary types of CD there are also discriminations between whether the CD appeared post-traumatically and if the onset was acute or delayed. In a study by Tarsy[5], "patients with cervical dystonia attending a movement disorder clinic were reviewed for history

of trauma before onset of symptoms. Patients with symptom onset within 4 weeks of trauma were compared with patients who developed symptoms between 3 months and 1 year after trauma. Acute-onset cervical dystonia was characterized by markedly reduced cervical mobility; prominent shoulder elevation with trapezius hypertrophy in most patients, absence of involuntary movements, sensory tricks, or activation maneuvers; and poor response to botulinum toxin injection. By contrast, delayed-onset cervical dystonia was clinically indistinguishable from non-traumatic idiopathic cervical dystonia[5]."

The most common therapeutic option for CD is botulism toxin[6,7], but this is not without risks[8-10], and if it is not adequate to control the patient's CD, anticholinergics, benzodiazepines, baclofen and other medications can be used as adjunctive therapy[11]. Low-risk physical modalities that have shown some promise include "EMG biofeedback training, muscular elongation, postural exercises and electrotherapy[12]." Two chiropractic studies found some improvement in CD with one utilizing chiropractic manipulative care[13] and the other using a form of Optokinetic reflex therapy[14], similar to what was used in this current case study. CD patients who are refractory to conservative methods, botulism toxin injections, and medications may respond higher risk procedures such as deep brain stimulation[15] and surgical interventions[11].

While conservative methods offer low-risk options to a patient presenting with CD and pharmaceutical and surgical options offer greater risk, there is a risk to no treatment at all. A review of the literature by Konrad et al[16] found that there are orthopedic and neurological complications that can arise from untreated CD: "cervical spine degeneration, spondylosis, disk herniation, vertebral subluxations and fractures, radiculopathies and myelopathies[16]." They cautioned that awareness "of the frequent occurrence of complications and screening for symptoms of radiculomyelopathy in patients with dystonia is essential to avoid irreversible spinal cord damage. Complications of cervical dystonia need to be taken into consideration when weighting risks and calculating costs of the disease and its treatment[16]."

Case Study:

A 45-year-old female presented with acute cervical dystonic myotonic spasms and pain of two-day duration, unresponsive to acupuncture and physical therapeutic interventions.

Methods/Intervention:

The patient's complaint was acute pain and stiffness in her right posterior cervical musculature. Through preliminary examination, her right-sided pain was determined to be registered in her left parietal sensory cortex within the postcentral gyrus. From this examination it was considered that her right cervical dystonic spasms were associated with a mismatch between either her left motor-basal ganglionic association or pathways pre- or post- to this system. The left motor-basal ganglionic association or pathways was chosen because the Parietal lobe is the sensory cortex of the brain and all sensations that are brought to a conscious level can only occur if the parietal lobe is activated. Somatosensory pain or activity in the right side of the body can only be brought to a conscious awareness by the subject if their left parietal Somatosensory region (postcentral

gyrus) is activated.

Initially her optokinetic reflex system was stimulated to increase dopamine activity related to specific left mesencephalic ocular stimulation. This required an optokinetic strip motion from the subject's right upper visual field diagonally directed toward their left lower visual field. Directing the optokinetic strip on the diagonal was selected by the extraocular muscles innervation pathways. The selection of diagonal right upper to left lower optokinetic activation was specifically chosen to increase the activation and collateral stimulation of the ascending left mesencephalic reticular system and dopaminergic generating centers. This action was intended to regulate and modulate control through the left cerebral cortical-striatal pathways and through the descending medial longitudinal fasciculus to regain inhibitory balance to the output of her right cervical ventral horn cells.

In general the amount of time and intervals of the optokinetic strip stimulus was based on the patient's metabolic capacity to receive the stimulus. This is commonly determined by pulse rate, blood pressure readings, ability to concentrate on optokinetic stimulation acceptance, activation of blithrospasm manifestations around the eyelids or increased sweating. In this patient's case, the application was administered until sweating was induced and each application was administered one second less than the time it took to induce perspiration. Completion of the intervention was determined when her symptoms were reduced by approximately 75%.

Home exercises consisted of a download application of optokinetic strips into her iPhone with instructions to direct the optokinetic Stimulus diagonally down and away from the side of cervical tension. She was instructed to apply the stimulation for approximately 10-12 cycles and then recheck her neck tension. This procedure was to be reapplied 4-5 times per day.

Results:

The patient was treated with cranial optokinetic reflex procedure and had 75% improvement within 2-minutes. She was given the procedure to perform at home and within two-days her CD had completely resolved and has not returned in the past 12-months, as determined at a follow-up assessment.

Discussion:

Conservative treatment for primary and secondary CD that offers low risk would be preferred to more high-risk procedures such as surgery, deep brain stimulation, and medications. Generally options for care are weighted toward low-risk and incrementally adding therapy with greater risk as the patient appears refractory to lower-risk options. It is clear that untreated CD also has its risk[16] so extended "watching and waiting" may be problematic.

In this study optokinetic stimulation therapy was used to treat acute onset idiopathic cervical dystonia in a 45-year-old female. The hypothesis suggests that the improvement of the patient's CD was related to a re-circuiting of the neural pathways in the basal ganglia, substantia nigra,

pontine brainstem, and cerebellum[17,18]. In Bova and Sergent's therapeutic approach[14], they also similarly employed optokinetic stimulation to achieve a reduction in a patient's cervical dystonic condition.

The rational for the specific care utilized in this specific patient's case involves reviewing some specific neurological pathways[19] to help explore why the optokinetic stimulation appeared to have a positive effect on this patient's CD. Left optokinetic stimulation is believed to be a combined action of left pursuits and right refixation saccades. Left pursuits are known to activate the left parietal cortex (sensory cortex). Right refixation saccades utilize the left frontal cortex, which initiates from the frontal eye field and feeds into the basal ganglia as well as the left supplementary and primary motor cortical regions. The right-to-left optokinetic reflex also feeds from olivary climbing fibers directly into the right cerebellum and projects through the efferent copy feedback pathways to the left midbrain dopaminergic generator cells of the Substantia nigra and ventral tegmentum while in route back to the left cerebral cortex. Therefore, in this patient, the direction of right-to-left optokinetic stimulation was initially selected.

A neurological association has been found between the extraocular muscles of the eyes as they relate with nuclei embedded within the brainstem[20] and cerebellar-striatal-cortical regions. Optokinetic stimulation can also affect head position and spatial neglect[21] possibly associated with CD. Utilizing these various pathways involved in the optokinetic reflex offers a possible explanation how, in a subset of patients with CD, optokinetic stimulation may help effectively modulate muscular tone[22,23].

As with any case report, caution must be used when considering the results of the clinical encounter since with single subject studies we cannot rule out placebo or ideomotor effects, regression to the mean, and other confounders. What is compelling, however, is that the patient was unresponsive to prior interventions (acupuncture and physical modalities) and responded within minutes to the optokinetic reflex therapy.

Conclusion:

CD is a life-altering traumatizing condition lasting 24 hours a day without relents. Patients with CD are seeking low-risk options that may offer therapeutic value. In this case a patient with early-onset CD unresponsive to acupuncture and physical modalities was treated with cranial optokinetic therapy and had an immediate positive response without any relapse during the ensuing 12 months. While this intervention is not considered an option for CD caused by genetic or diseased atrophy of the basal ganglia, it is hoped that future study will find specific subsets of CD patients who present with spastic conditions caused by diminished or aberrant pathway connectivity that can be helped with optokinetic therapy.

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A 70 year-old female with a 20 year history of reduced cervical range of motion treated with conservative chiropractic care: A case report

Albert Salem, DC

Introduction:

The assessment of cervical ranges of motion in chiropractic office encounters are common.[1,2] Reduced motion is often associated with increased patient discomfort as well as limited function (e.g., turning head when driving an automobile). Stenneberg et al found that patients with neck pain have a significantly decreased active cervical range of motion compared with persons without neck pain, and patients with whiplash-associated disorders have less active cervical range of motion than those with nontraumatic neck pain[3].

Unsurprisingly age-related degenerative changes in the cervical spine, including issues of cervical alignment and cervical ranges of motion, tend to worsen with each decade of life[4,5]. This was established in a comparative study evaluating those with cervical spondylotic myelopathy and asymptomatic subjects[6]. An important affect of this age-related loss of range of motion is its associated affect on automobile safety, both for the driver and others on the road[7,8]. Shugg et al noted "there is a large degree of variability in cervical axial rotation during driving and that most of the driving tasks related to stopping had increased proportion of time out of neutral rotation[9]." This often makes it challenging for drivers of an automobile to safely make quick turns or look behind them when backing up. For instance in a study by Chen et al, they found that cervical range of motion contributes to functional ranges of motion during driving and "target detection success and time to detection may also be part of the aging process[10]" needed to be considered when driving safety is a concern in the older driver.

Since one cause of neck pain can be decreased cervical range of motion, it goes to follow that a portion of these patients are finding their way into a chiropractor's office. Our degree of success in getting increases in cervical ranges of motion, particular in the aging population, can have a large impact on society as whole as this could potentially lead to a safer driving experience. Therefore, considerations for effective and safe care in the senior population, in this case for neck pain and decreased cervical motion, are important subjects to be assessing [11,12].

Case History:

A 70-year-old female presented for care at this office with a variety of ailments, the most obvious being pain and reduced cervical range of motion in all directions, unresponsive to care for the past 20 years. Additionally she presented with left shoulder pain of 8 years duration as well as more recent onset of pain in her low back, hips, and temporomandibular joint (TMJ).

Methods/Intervention:

Initial assessment of the patient revealed marked restriction in her cervical ranges of motion, with forward head posture and hypolordosis. The patient was guarded and apprehensive when

needing to move her head and was reactive with tension, pain and restriction to palpation. A February10, 2017 x-ray revealed C5-6 spondylosis, C5-7 marked foraminal stenosis, and a reduced cervical lordosis.

Sacro occipital technique[13] care was rendered with an initial focus on category three[14-16] and chiropractic manipulative reflex technique[17-22]. As her condition was improving care shifted to category two[23-26] therapeutic interventions along with atlas dural, sutural techniques, craniofacial myofascia release, and TMJ balancing[27] from March to May 2017. The patient was gradually improving but from September to December 2017 she was not treated due to her need to have podiatric surgery and deal with the recovery from that procedure.

On December 22, 2017 she returned for care and was treated with the "Cervical Wedge Technique," and her response to this intervention (described in the discussion section) was dramatic. On December 27, 2017 she was treated with the following techniques: category two block placement, cervical stairstep[28] and cervical wedge technique (CWT), upper cervical dural release[27], sphenobasilar symphysis technique[29,30], and ventricular bulb technique[31].

Results:

Following the December 22, 2017 treatment her head position relative to her shoulders changed and was no longer in a forward head posture. Palpation of her cervical spine no longer elicited a visible pain response, and passive mobility of her cervical spine greatly improved along with decreased TMJ tension and improved joint translation. Her gait was more secure and balanced without any sway, and she had significantly less hip pain.

After the December 27, 2017 office visit her cervical spine sensitivity and ranges of motion continued to improve along with decreased sensitivity to her TMJ. An occlusal TMJ splint was utilized, which eliminated any low back or hip pain. Prior to balancing of the cervical spine the occlusal TMJ splint did not have an effect on the lower pelvis and hips.

At her January 3, 2018 follow up visit the patient reported no imbalance when standing or during gait, no cervical spine pain with significantly improved ranges of motion, reduced TMJ pain with improved joint translation, and no low back or hip joint pains. She has continued to stabilized over the past month and we are currently determining whether ongoing supportive care will be necessary.

Discussion:

The "Cervical Wedge Technique" (CWT) is a method of care following a similar trend as an osteopathic approached called, "progressive inhibition of neuromuscular structures (PINS) technique[32]." For assessment and treatment the CWT incorporates the cervical stairstep[28] along with the Cranial Mandibular Motion Techinque (CMMT) [33], both developed by DeJarnette. The cervical stairstep[28] procedure is a method of assessment and treatment that is an important part of the low force cervical spine treatment utilized in sacro occipital technique method of care. The

cervical stairstep procedure is taught in most chiropractic colleges as a means of offering another manner of treating the cervical spine besides the typical high velocity low amplitude (HVLA) adjusting commonly associated with chiropractic (spinal) manipulative therapy[34]. The CMMT procedure[33] is a method of assessing cranial bone compliance and mobility by palpating a cranial bone's motion as the patient's mandible moves (most commonly) from side-to-side.

The following presents the CWT phases of assessment and treatment:

1. Initial assessment is performed with the patient supine and head in a neutral position. CMMT is performed on the various cranial bones (e.g., frontal, parietal, temporal, occipital, and sphenoid) attempting to determine bone and side of relative restrained movement or motion as it reacts to mandibular motion.

2. The next part of the assessment involves performing the cervical stairstep and test each cervical level (e.g. T1/C7, C6/C5, C4/C3, C2/C1) for normal cervical articular joint translation, bringing head to the step of the most decreased joint translation and laterally flex the cervical spine towards the side of the cranial bone restricted motion, holding this position.

3. The treatment begins with the doctor's fingers contacting the superior aspect of the transverse process of the selected cervical articular facet level, as the doctor's thumbs rest onto the target cranial bones (bilaterally). Then the doctor lightly presses his cervical contact inferiorly and asks the patient to move their mandible from side-to-side. At this point the doctor reassess if the prior restricted movement of cranial bone side has now increased. (This usually takes one or two side-to-side mandibular movement cycles to determine.)

4. Once the restricted movement of a cranial bone has increased, then the doctor will continue to press the cervical transverse process with more pressure inferiorly for one or two more mandibular movement cycles, essentially until there is balance of bilateral cranial bone movement.

5. If following the second cycle the bilateral cranial bone movement has not equilibrated, then the patient's head is returned to the table and to a neutral position. With the contralateral "Stabilizing Hand," then curl the head with cervical spine into lateral flexion (without either the stairstep lift or cranial contact) as if a contiguous "C" curve is formed onto the restricted cervical articular facet and transverse process. Then the doctor's thumb tip again contacts the superior aspect of transverse process firmly pressing it inferiorly, with the "Stabilizing Hand" securely supporting contralateral neck, maintaining lateral flexion.

6. The doctor is likely to notice that once the patient has relaxed in this laterally flexed cervical spine position, a lateral vertebral translation will take place and there will be no need to press medially or to hold contact any longer once this shift has taken place.

7. Once cervical and cranial motion appear balanced then retest the cervical stairstep and CMMT to assess for improved symmetry in motion and response of the cranial bones to side-to-side mandibular motion. In general this procedure will help with improving both cervical spine dynamics and the response of the cranial bones to mandibular motion.

There are some possible contraindications to the CWT, some of which may include but are not limited to: known/suspected local pathology or severe osteoporosis, and caution with various positive tests such as George's Test, Valsalva Maneuver (e.g., Cervical or Cervicothoracic), Maigne's Test, Backward Bending Test, Hautant's Test, Spurling's Test, and the Maximum Cervical Compression Test.

While the HVLA type adjustment can be an effective tool for treating reduced cervical ranges of motion[35] some patients do not prefer this type of "forceful" manipulation and may also respond well to myofascial type interventions[36]. Following the premise of PINS technique, CWT "offers an alternative to a HVLA manipulation and relies on the doctor's knowledge of anatomy and neuromuscular physiologic features[32]" Like PINS technique the CWT has an emphasis on the determination of the "alteration of the tissues due to dysfunction, delivering treatment based on palpatory evaluation and patient feedback[32]. "

As with all case studies caution must be used when generalizing a single subject's presentation and response to treatment. Confounders such as placebo or ideomotor effects, regression to the mean, and other factors cannot be ruled out. However what is compelling is that the patient had persistent pain and dysfunction of 20 years duration, in numerous areas of her body, and had positive affects as a result of her treatment. Within moments of her receiving the CWT her cervical spine musculature relaxed, she had significant greater range of motion without discomfort during active and passive movement, and her forward head posture decreased. The temporal relationship between the length of time of her presenting condition and response to care is compelling, also it is noted that weeks later she had not lost this improved range of motion, reduced discomfort on motion, and reduced forward head posture.

Conclusion:

This case report presents the assessment and care of a 70-year-old female with reduced cervical ranges of motion of 20 years duration, unresponsive to prior interventions and treated with the CWT. CWT utilizes the principles of PINS technique utilized in osteopathy along with sacro occipital technique's cervical stairstep and CMMT assessment and treatment procedures. Greater research is needed to determine if this novel method of care (CWT) may offer the chiropractor a way to treat refractory reduced cervical spine ranges of motion as an alternative to the typical HVLA type manipulative intervention. Since patient preference in care is an important aspect in healthcare, offering a low force and effective treatment option to patients would likely be the preferred option in many cases.

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Selected Cranial Therapeutic Related Articles from Past SOT Research Conferences (2009-2017)

SOT Cranial and TMJ therapy for unresolved BPPV: A case report.
Thomas Bloink, DC

Introduction:

Vertigo, also called dizziness, accounts for about 6 million clinic visits in the U.S. every year, and 17–42% of these patients eventually are diagnosed with benign paroxysmal positional vertigo (BPPV). [1] In a 2007 study they found that BPPV accounted for 8% of individuals with moderate or severe dizziness/vertigo. The lifetime prevalence of BPPV was 2.4%, the 1-year prevalence was 1.6%, and the 1-year incidence was 0.6%. The median duration of an episode was 2 weeks [2]. BPPV is a disorder caused by problems in the inner ear. Its symptoms are repeated episodes of positional vertigo, that is, of a spinning sensation caused by changes in the position of the head. [1]

Within the labyrinth of the inner ear lie collections of calcium crystals known as otoconia. In patients with BPPV, the otoconia are dislodged from their usual position within the utricle and they migrate over time into one of the semicircular canals (the posterior canal is most commonly affected due to its anatomical position). When the head is reoriented relative to gravity, the gravity-dependent movement of the heavier otoconial debris (colloquially "ear rocks") within the affected semicircular canal causes abnormal (pathological) fluid endolymph displacement and a resultant sensation of vertigo.

A typical sign associated with BPPV is rotatory (torsional) nystagmus, where the top of the eye rotates towards the affected ear to a beating or twitching fashion. Patients should not experience other neurological deficits such as numbness or weakness, and if these symptoms are present, a more serious etiology must be considered. Two treatments have been found effective for relieving symptoms of posterior canal BPPV: the canalith repositioning procedure (CRP) or Epley maneuver, and the liberatory or Semont maneuver. [1]

Case Report

A 37-year-old female was seen for acute benign vertigo that was referred by her allopathic physician for an evaluation and determination of the need for chiropractic care. The patient had 2-3 months of constant vertigo which was diagnosed as BPPV. She had been treated with the Epley Maneuver and various medications, however they did not resolve her symptoms. Her vertigo would last the whole day with peaks and valleys related to intensity. This affected her ability to function at home, drive her car and even walk “out of the door” of her home.

Assessment

Patient presented with a category two, right temporal bone with external rotation, and significant malocclusion with clenching and anterior interferences. In evaluating the dental signs of malocclusion it was determined that due to the stress of the anterior interferences, particularly on

the right side, that the repetitive stress on occlusion created right temporomandibular (TM) condylar compression stress summating at right temporal fossa.

Treatment

Category two protocols for the pelvis were applied and an intraoral cranial adjustment to the temporal bone, maxilla, sphenoid, and zygoma were performed directed by palpatory pain indicators. Palpatory pain in and around the TM joint (TMJ) was used to help guide treatment as well as ability of patient to achieve sufficient vertical opening. Cotreatment with a dentist was used to help stabilize and maintain the chiropractic cranial and TMJ corrections.

Results

By the 7th office visit (3-4 weeks of care) the patient's vertigo had resolved. In addition her TM joint translation and opening had improved significantly and pain around the right TM joint and related tissues had been eliminated. The anterior interferences were treated with a nighttime dental appliance that allowed the patient to have bilateral posterior teeth contact and reduced contact to the front teeth.

Discussion

Occlusion and condylar position is purported to be affected by or affects cranial bone distortion patterns. In instances where the TMJ/dental dysfunction or malocclusion, associated with vertigo [3], is affecting cranial bone distortion the region of cranial distortion overlying specific regions of the cerebral cortex may have a relationship with the underlying cortical functions [4].

Similarly to Hilton's Law where the innervation of the overlying skin of a joint relates to the bone, ligament and muscles it is theorized that regions of cranial bone distortion may have a relationship underlying meningeal, CSF function, and ultimately cortical activities.

Therefore when there is malocclusion affecting the cranial suture and local periosteal tissue, it is theorized that with some patients possibly the internal periosteal dura, CSF circulation, and related cortical region might be affected. On the other hand reliving the stressors of restricted cranial motion and malocclusion could lead to improved cortical function just by reducing global stress to the CNS due to reduce pain and related myofascial tension. Since it is not uncommon for cranial trauma or stress to affect cranial nerve function, it is possible that low level sustained cranial stress or trauma could effect of be contributory to low-level clinical presentations of conditions such as BPPV [5].

Conclusion

In this case report the patient's response to care was quite dramatic. She was unresponsive to prior care and her quality of life was profoundly affected. It is difficult to extrapolate from this one case and apply this to the general population however the patient's rapid response to care suggests that further investigation into this method of care for patients presenting with vertigo be considered. *(This is an abstract from a research conference presentation only and does not represent a full work that has been peer reviewed and accepted for publication.)*

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Effects of pregnancy on cranial structures.
Frank O. Pederick, DC

Introduction

A relationship between women's brain volume and pregnancy has been found in the literature. Responses to this change in brain volume have also been associated with neurohormonal reactions before and after pregnancy. "The brain decreases in size during pregnancy and increases in size after delivery. The changes follow a consistent time course in each woman. The mechanism and physiologic importance of these findings are speculative at the present time [1]." From a clinical perspective the cranium purportedly relates to this change in brain volume and these effects on cranial bones and dura persist long after giving birth.

Therefore observations made and recorded in the literature, (Chiropr J Aust 1993;23: 106-112 and Chiropr Technique 1994; 6:112-3), over 15 years ago on the effects of pregnancy on women's cranial structures during chiropractic care have received a degree of confirmation from more recent medical studies of 3-D MRI images of the effects of pregnancy on the volume of women's brains [1-3]. These changes have the potential to affect women's physical and mental health and attention to them could be included in the care provided by chiropractor's working in the cranial field.

Diagnostic Intervention

The Malcolm Test described by Denslow et al notes that "..low threshold segments are those in which a relatively large portion of the motoneurons are maintained in a state of facilitation, due to chronic bombardment from some unknown source. Presumptive evidence indicates that the facilitating impulses arise from segmentally related structures [4]." A modified Malcolm Test has been proposed by Kotheimer for assessing spinal and cranial distortions. This test relies on observation of changes in leg length when a subluxated spinal segment or cranial bone has pressure applied in a specific direction [5].

Kotheimer determined the most desirable direction of cranial adjustment by using the challenge test. The optimal direction for the manipulation is considered to be opposite to the positive challenge direction [5]. Clinically evaluating pregnant women for cranial imbalance, most especially after pregnancy, apply light two handed pressure first in evaluating cranial bone extension patterns; then check leg length effect; and then evaluating cranial flexion patterns and recheck leg length. This test is particularly directed to the midline structures of the cranium. Before making this test on the cranium, the recommended procedure is to make every effort to reduce structural distortions and restrictions in the rest of the body to minimize somato-somatic reflex effects

Treatment Rational

Due to its low pressure venous return pressure is affected by any restriction in the spinal articulations and ribs, and striated muscles and fascia affecting the thoracic outlet, the respiratory diaphragm and the uro-genital diaphragm. The effect of restrictions in and between these structures, (which combined have been called the 'sternal pump'), is to increase venous back pressure. Any increase in venous back pressure is reflected in the internal jugular vein which is the main drainage point for the venous sinuses of the skull and spine. As the venous back pressure rises the CSF pressure and cranial interstitial pressures will also increase

The increased pressure in the jugular foramen may result increased pressure on the spinal accessory nerve which could increase the tension in the trapezius and sternocleidomastoid muscles increasing restrictions to the movement of the sternal pump, further increasing venous back pressure in a self-locking fashion.

The effect of the pressure changes outlined seems to be a primary restriction in the motion of the skull in the sagittal plane. At the cranial midline, the falx cerebri and the spheno-basilar synchrondrosis (SBS) are two of the major structures likely to be affected. As the sagittal sinus is intimately associated with the falx, prolonged venous pressure changes in the sinus are likely to result in changes in tension in the falx with resulting SBS restrictions also. The other cranial sinuses are also associated with the major membranes in the cranial cavity. Increased tension in these membranes may be the cause of restricted motion of related cranial bones which is palpable by and may be released by a trained practitioner.

A major emphasis is placed on the cranial midline structures because they also involve the hypothalamus and pituitary. The hypothalamus synthesizes and secretes neurohormones, often called hypothalamic-releasing hormones controlling body temperature, hunger, thirst, fatigue, and circadian cycles. These in turn stimulate or inhibit the secretion of pituitary hormones that control blood pressure, water and osmolarity regulation, secretion of anti-diuretic hormone, and directly affect reproductive functions such as, uterine contraction in childbirth, breast milk production and sexual organ functions.

Discussion

A reduction in women's brain volume during pregnancy was found by Holdcroft's team while investigating causes of pre-eclampsia and reported in New Scientist magazine in 1997 [1]. The study developed three sets of 3-D magnetic resonance images of 10 healthy women: (1) the first set were taken towards the end of pregnancy, (2) the second 6-8 weeks after delivery and (3) the third about 6 months later. It was concluded that when the women's physiology returned to normal after pregnancy, their brain volume increased [1]. Holdcroft concluded that the changes noted were normal and unrelated to pre-eclampsia [1]. (Pre-eclampsia relates to findings of high blood pressure and proteinuria inpregnant women. There is no established cause.)

While the brain volume decreased, the pituitary - the main hormone regulator for the body, including some hormones involved in reproduction - showed an opposite effect by increasing in

volume during pregnancy. Holdcroft believed that the change in brain volume could be attributed to reduction in individual cell size rather than any reduction in the number of cells [1].

This work was later repeated and reported in a 2002 by Oatridge, Holdcroft, et al [2]. Images were obtained of nine healthy women before and after birthing and in two cases before, during and after pregnancy. Images of five women with pre-eclampsia were obtained before delivery and 6 weeks after delivery , and for three of these further images were obtained within 52 weeks of delivery. Both the pre-eclampsic and healthy groups showed a reduction in brain volume that was greatest at full-term and regained normal dimensions within six months of delivery. Ventricular size increased during pregnancy and decreased afterwards. In pre-eclamptic women the brain volume was significantly less than in the healthy group before and after birthing. The changes in all of the women followed a consistent course with time. The changes in volume are large, with the two subjects examined before conception, the reductions in brain volume were 4.1%, (or 46.7 cubic cm) and 6.6%, (or 80.2 cubic cm) [2].

Johnson [3] corroborating the work of Oatridge and Holdcroft et al [2] and Holdcroft [1] suggested that pregnancy related depression may be associated with volumetric changes in the brain, such as alterations in discrete neural regions. "For example, preliminary evidence suggests depressive symptoms may be associated with decreased size of the hippocampus, a region critical for memory and other cognitive functions [3]."

Although only speculation at this point, Johnson [3] presents a theory that the longer someone is depressed, the more changes will occur in their brain. "Maybe early on you can reverse it, but later you can't [3]". 50% of patients can expect a full remission in the first 6 months of treatment -- if they are diagnosed and treated appropriately, whereas this number drops dramatically with inappropriate therapy [3]. Commonly the treatment involves mood stabilizers and antidepressants [3].

A suggestion to explain these observations is based on what is known of pressure gradients governing the pressures within the brain. These vary from the highest, mean arterial pressure, (approximating cranial perfusion pressure), to cranial interstitial fluid pressure, to cerebrospinal fluid pressure, to sagittal venous sinus pressure and finally bodily interstitial fluid pressure which is negative and helps to hold us together. Perhaps, on the basis of some evidence in the literature, while the auto-regulatory systems of the body generally cope well with fairly rapid changes in fluid pressures, (such as when lifting a heavy object, or straining at stool), this may not be so when the changes are slow and prolonged such as during the development of a fetus.

Therefore the work of Oatridge and Holdcroft [2] on changes in women's brain volume during pregnancy and the cranial effects noted; may both stem from the limitations of the auto-regulatory system when governing prolonged slow changes in venous back pressures. Perhaps pre-eclampsia is an inappropriate late response to such changes in women with a smaller brain volume. Clinically it has been found that cranial work is ineffective if the patient is taking psychoactive drugs for postnatal depression.

Conclusion

The effect of cranial work on women during and after pregnancy is a matter which could be the subject of many case reports. Subsequently, perhaps more intensive trials to test the effectiveness of cranial adjusting for postnatal depression could be arranged. There could be a prophylactic role for cranial work in controlling pre-eclampsia. Such reports and trials could make a major contribution towards the health of childbearing women. *(This is an abstract from a research conference presentation only and does not represent a full work that has been peer reviewed and accepted for publication.)*

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Chiropractic cranial treatment protocol increases successful outcome of the multidisciplinary care model for traumatic brain injury (TBI) patients: A case series.

Esther M. Remeta, DC, Charles L. Blum, DC

Introduction

Notoriously, all traumatic brain injury creates challenges that have various levels of negative impact on the patient's life and family. The goal of all TBI treatment plans is to try to achieve the highest state of wellness possible to increase the quality of life for the patient. Since often the prognosis of patients with TBI is dismal, offering a method of care that has low risk, reasonable benefit, and some biological plausibility is preferred. The goal of care should be to relieve patients of disability and pain while facilitating their ability to have normal activities of daily living. This article seeks to share a novel manner of multidisciplinary care which incorporates the fields of allopathy, chiropractic, psychology, acupuncture, neurorehabilitation, and nutrition.

Case Report

Case # 1: A 28 year old female suffered TBI from a violent attack resulting with severe debilitating headaches requiring daily bed rest for two years with her condition consistently devolving prior to initial office visit at this clinic. She was diagnosed with chronic migraines and informed that she would need prescription medication the rest of her life.

Case # 2: A 30 year old female sustained a TBI from a motor vehicle accident. PETscans noted decreased bilateral occipital lobe metabolic activity. She had chronic headaches of 2 year duration with transient paralysis of her left extremities and short term memory loss. She was informed by her neurologist that due to the duration of her post concussion syndrome that no recovery could be expected.

Case # 3: A 70 year old male suffered a TBI from a stroke causing complete paralysis of the right upper and lower extremity. He also suffered from swallowing difficulty and speech problems. His neurologist had informed him that he would never work again, would need to walk with assistance, and have compromised use of his right hand.

Treatment/Intervention

A focal point of this multidisciplinary care at this clinic is Sacro Occipital Technique (SOT) cranial manipulation protocols [1,2] along with specific neurological rehabilitation training and home exercises. Home therapy focuses on physical, mental and emotional balance which increases efficacy of treatment. The care model is implemented for a minimum of 1 year with most patients remaining in the model for 5 years.

Results

Case # 1: When treatment began there was a significant initial improvement along with a gradual increase in function so that now at 2 years later (1 treatment per week) headaches occur only once every 2 weeks lasting 12 hours. She is off all 10 of her prescription medications except for 1 and is currently tapering off of it under medical supervision. She now is able to live a more normal life with her young 8 year old daughter taking part in her life activities as well.

Case # 2: After 5 years of treatment (1 time per week) she is headache free, has neither short term memory loss nor any paralysis episodes.

Case # 3: After 9 months of care he was back at work full time and without paralysis, speech or swallow problems. After 5 years of care (1 treatment per week) there were no obvious symptoms associated with the left parietal lobe infarct despite brain MRI scans showing damage was still present.

Discussion

Rehabilitation has been found effective using an interdisciplinary approach and "recovery from TBI can continue for at least 5 years after injury [3]." In another study they found, "that traumatic brain injury may cause decades-lasting vulnerability to psychiatric illness in some individuals [4]" and for a "subset of persons with moderate to severe TBI, neuropsychological recovery may continue several years after injury with substantial recovery [5]."

Conclusion

Success was measured based on improved quality of life and return to activities of daily living along with decreased subjective and objective symptomatology. Barriers to successful outcome included patient non compliance to treatment plan and patient financial challenges. Highest success was achieved with the 5 year model and with the inclusion of SOT cranial manipulation protocols. The temporal nature of the patient's response to care and their gradual worsening of symptoms prior to treatment at this clinic suggest the patient's conditions would have worsened. This care model gives greater hope for those suffering from TBI as well as gives the health care profession at large more options to create treatment plans resulting in better prognoses. *(This is an abstract from a research conference presentation only and does not represent a full work that has been peer reviewed and accepted for publication.)*

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Sacro occipital technique treatment of patient with pervasive craniofacial and body pains secondary to chronic TMD: A case report.

Albert R. Salem, DC

Introduction

Chronic low back, neck, head and temporomandibular joint (TMJ) pain and dysfunction can be profound conditions affecting a patient's quality of life and activities of daily living. "Chronic back pain is sometimes defined as back pain that lasts for longer than 7-12 weeks. In fact, some people argue that chronic disability in back pain is primarily related to a psychosocial dysfunction [1]." "The literature suggests that the prevalence of neck pain increases with age and that it is more common in women [2]." It is also interesting to note that there is a significant finding of TMJ disorders (TMD) in women than men and there is a controversy in the dental field, which refutes that TMD is related to dental factors of occlusion or condylar position [3] but that is solely a biopsychosocial condition.

For chronic low back, neck, head and TMD there are various types of treatments from conservative care involving exercises or rest, to other methods of treatment such as chiropractic care or dental appliances. Allopathic alternatives often involve medication, injections, and surgical interventions. Developing a treatment regime that is effective and offers low risk is preferred and it is incumbent upon healthcare practitioners in clinical practice to share situations where significant results are obtained in particularly challenging cases.

Case Report

A 54-year-old female, housewife, mother of 3, was seen in my clinic for chronic low back, neck, head and jaw pain which had begun in 1990 and persisted. Due to the pain and discomfort she indicated that she was unable to focus, read, perform housework, sit for long periods, bend over, and walk intermittently. The jaw pain affected her ability to chew and may have been associated with an airway compromise which led to her difficulty to breathe at times and symptoms of claustrophobia. She noted that she had been consistently on pain medication and intermittently on anti-depressant drugs. For the past 18 years she regularly used prescribed dental appliances for day and nighttime use, described by the patient that they were used to keep her "bite" open and reduce any bruxism. The patient was referred to my clinic by the dentist who is currently treating the patient by fitting a crown onto a left lower molar.

Treatment/Intervention

During the month of care following the patient's initial presentation she was treated with sacro occipital technique (SOT) and cranial techniques. In the first two consults, due to her chronic low back pain the patient was treated for lumbosacral pain control utilizing Category 3 procedures. Cervical stairstep techniques were used to treat her cervical spine and surprisingly it was found that by balancing the cervical spine this completely relieved her TMJ and associated musculature pain and discomfort. Therefore cranial and TMJ therapy was not employed in the

first two clinical encounters. For the next few weeks she was treated for category two (sacroiliac joint hypermobility) symptomatology with cranial balancing techniques as needed.

As part of the evaluation and treatment process to relieve discomfort and increase TM function, the patient was instructed to insert a simple "gapping device," a tongue depressor placed between her front upper and lower incisors, and use this "device" for a few periods each day.

Results

Following the 2nd consult the patient reported that since receiving treatment, "the pain around my head and face stopped. My shoulders and neck were more relaxed and jaw didn't ache… my back pain is gone. I haven't had any ear noises." This progress resulted in her improved physical strength and ability to then perform housework, read, to concentrate and sit for longer periods.

During the initial month of care, she was seen 2 times per week, totaling 8 consults. When asked to give updates on her condition she consistently indicated that she did not have any pain or complaints. At 7 weeks, a full cranial sutural treatment resulted in the patient's jaw translating with greater range through open and closing without crepitus, deviation, deflection or locking, as had chronically been the case.

Discussion

There are various possible theories as to why prone pelvic block placement to reduce pelvic torsion and block angulations based on pain reduction could have assisted the patient's symptoms [4]. One theory could be that the "unwinding" of the chronic discal low back could kinematically ascend in myofascial influence to reduce neck and jaw dysfunction [5]. It is possible also that the visual and vestibular righting mechanisms cause cervical and TMJ accommodations to imbalance originating from the lumbopelvic region. DeJarnette, the developer of SOT, discussed how the category 3 syndrome could include the whole cartilaginous system of the body and this might relate to the temporomandibular discs [4].

Conclusion

Chronic generalized body complaints necessitating medication, TMD, and related limitations to focus, read, and perform activities of daily living can be devastating. When patients do not see a hopeful future this can further complicate their recovery and explain how physical conditions and psychosocial issues can become intertwined. Ideally therapeutic interventions that offer low risk or costs and offer effective outcomes would be preferred. While this paper only reports on the outcome of one such particular case, it is reasonable to assume that a subset of patients with similar presenting symptoms may well respond to SOT and cranial care. Further research is indicated to determine what subset of patients with generalized body pain and TMD might best respond to chiropractic care. It is also reasonable that a trial period of treatment could function as an evaluative tool to determine if SOT and cranial care could facilitate recovery. *(This is an*

abstract from a research conference presentation only and does not represent a full work that has been peer reviewed and accepted for publication.)

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Integration of SOT cranial therapy with an occlusal splint for the treatment of obstructive sleep apnea: A case report.

Thomas Bloink, DC, Mamal Rahimi, DDS, Charles L. Blum, DC

Introduction

Obstructive sleep apnea (OSA) relates to an obstruction to the continuum of airway expressed as sleep-disordered breathing. This spectrum ranges from slight vibration of tissues at its mildest to death from asphyxiation at its severe extreme. Between lies pathologic snoring and periods of complete airway closure and breathing cessation called "apnea". Some of the most serious chronic diseases of man have been associated with snoring and sleep apnea, including: stroke, hypertension (high blood pressure), myocardial infarction (heart attack), arteriosclerosis (hardening of the arteries), cardiac arrhythmias (irregular pulse), diabetes, gastro-esophageal reflux disorder (GERD), polycythemia vera (thickening of the blood) and others.

Sleep disordered breathing also disrupts the normal patterns of brain activity and relaxation, precluding restorative sleep. Overwhelming daytime sleepiness contributes to the risk of accident and injury from decreased attention span, judgment and reflex. The risk of automobile accident in the untreated sleep apnea patient is about 8 times as compared to that of a normal sleeper. Therefore as might be expected work productivity and safety suffer.

Common treatments for OSA usually start with a continuous positive airway pressure (CPAP) machine and can progress to surgery to facilitate airway expansion and/or increase function. Surgery is costly and invasive yet patient compliance with CPAP machines is estimated at only 40%. From a dental perspective oral apnea appliances (e.g., TAP, SOMNIMED, OAYSIS), which are based on the concept of mandibular advancement, have shown promise but are also expensive and may adversely affect occlusion or condylar position. The following is a case report of a patient presenting with symptomatology of sleep apnea and relates the treatment rendered to facilitate her recovery.

Case History

A 56 year old female patient presented for chiropractic and dental care with symptoms of short term memory loss, foggy-headedness, temporomandibular joint (TMJ) pain, chronic myofascial neck and shoulder pain and fatigue. She also had a history of vertigo along with poor quality of sleep and significant excessive daytime sleepiness.

Methods/Intervention:

Cranial-dental exam revealed a dental class II with narrow arches and premature anterior contacts. Decreased translation of the right TMJ with crepiits and clicking upon opening and lateral movements of the left TMJ. Pain was reported upon palpation to the medial ptyergoids, masseters, and temporalis muscles. Examination of the teeth showed evidence of clenching and bruxism. Cervical spine range of motion was limited and painful. The right temporal bone was

subluxated in extension (internal rotation) and spheno-maxillary distortion pattern as described by Buddingh [1] was noted.

Following this evaluation a sleep study was advised to rule out sleep apnea, however her history and presenting symptoms were consistent with sleep apnea and the sleep study could help differentiate between OSA or if related to central nervous system dysfunction. The sleep study did reveal a Respiratory Disturbance (RDI) Index of 17.1 and an Apnea Hypopnea Index (AHI) of 16.3. Also it was noted that there was lowest oxyhemoglobin saturation (Sa02) of 89% during sleep.

Treatment consisted of six SOT chiropractic cranial-dental treatments incorporating SOT intra-oral cranial adjustments [2] and spheno-maxillary craniopathy [1] in conjunction with occlusal balancing by a lower flat plane splint [3] by Dr. Rahimi. The treatment was performed over a 3-4 week period of time.

Results

Following treatment the patient reported significant reduction of all symptoms. Follow-up polysomnogram was performed one month following prior study and with the dental appliance in her mouth she showed improvement as RDI and AHI were both reduced to 2.9 and lowest Sa02 was 92% during sleep. The patient had significantly reduced TMJ pain and the chronic myofascial neck and shoulder pain had gradually resolved over the 3-4 weeks of care. Due to her increased ability to sleep and increased oxygenation, she was also less fatigued and functional during the daytime.

Discussion

The combination of SOT cranial therapy with a flat plane lower GELB type occlusal splint not only resolved this patient's apnea and accompanied symptoms but was also minimally invasive, less costly, and only required a 3 to 4 week treatment program. Splint type therapy has been found to be helpful for OSA patients and one prospective randomized study found "that a dental appliance could be an alternative treatment for some patients with severe OSA [3]." In addition to the standard SOT cranial therapy a portion of the cranial therapy rendered was based on a method of adjusting the sphenomaxillary suture as developed by Buddingh, which essentially attempts to balance tensions of the pterygoid muscle and related cranial bones.

Buddingh has determined that "The sphenoid bone is influenced to the anterior by the pterygoid process at the maxilla suture, the occiput to the posterior at the sphenobasilar articulation. Hypertonicity of the pterygoid muscles occurs when the patient's body requires the pterygoid muscle to balance the reciprocation of the anterior falx to the general dural tensions. The hypertonic pterygoid and the concomitant tension into the TMJ will purportedly be reduced via the spheno-maxillary adjustment. Clinical studies have noted that balancing the spheno-maxillary suture causes a reduction of the hypertonicity of the related muscles affecting occlusal

relationships. This change appears to have an affect also on the dental cone, the curve of Wilson and the curve of Spee [1]."

Working together the dental and chiropractic profession can help determine if dysfunctional postural patterns or OSA have predominant descending or ascending influences. In an important study investigating this ascending and descending contribution of posture and TMD imbalance, Sakaguchi et. al., while evaluating 45 asymptomatic subjects, found that "Body posture was more stable when subjects bit down in centric occlusion. Changes in body posture affected occlusal force distribution. Altering body posture by changing leg length shifted the occlusal force distribution to the same side that had a heel lift [4]."

While for the sake of clarity and ease in clinical assessment we would prefer patients to have either an ascending or descending contribution to postural influence, more commonly, they present with a mixture of both patterns. It is in these "mixed" presentation patients that chiropractics and dentistry can offer improved patient outcomes. The typical patient, such as the patient in this case report, that may likely need chiropractic dental co-treatment will usually present with a low pain threshold, low physiological adaptive range, and a history of musculoskeletal pain or injuries. Patients with OSA will also tend to have general poor health due to the lack of rest and oxygenation, which will predispose them to various chronic presentations.

Future research may need to determine whether the patient could achieve improved function with only chiropractic care or dental care and whether the optimal care would be a co-treatment methodology. Clinically many chiropractors and dentists are realizing that the relationship between posture and the stomatognathic system makes collaborative efforts necessary [5].

Conclusion

With any case report the finding however apparently significant need to be evaluated from a cautious perspective because of the bias of the research clinician, the lack of a control group, as well as comparative sham procedure. The pre and post sleep study findings do show some objective change and the patient did report significant clinical improvement relating to reduced pain and function. However follow up studies with this patient are indicated. Greater study is needed to identify the subset of apnea patients that could benefit from this approach.

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Improvement in a pediatric patient with craniosynostosis undergoing chiropractic care.
Julie Doucet, DC, DACCP, Joel Alcantara, DC

Introduction

Craniosynostosis, defined as the premature fusion of one or more of the cranial sutures, presents itself as a diagnostic and therapeutic challenge in pediatrics. For example, premature fusion of the lambdoidal sutures or the coronal sutures results in oblique deformities of the skull, but so does deformational plagiocephally. Different surgical techniques are recommended for the craniosynostosis, but conservative care allows for the management of plagiocephaly. Uncorrected, craniosynostosis results in increased intracranial pressure of the brain, asymmetry of the face and malocclusion. In the most comprehensive review on the subject to date, Kabbani and colleagues[1] estimate the prevalence of craniosynostosis to one per 1,800 - 2,200 births, but caution that it may be higher. Potential complications of surgery specific to correcting craniosynostosis include massive blood loss, air embolism and mortality. Conservative means such as chiropractic should be investigated to assuage the need for surgery. Towards this end, we present the chiropractic care of a patient with medically diagnosed craniosynostosis.

Clinical Features

A 3-week-old girl with sagittal craniosynostosis was brought to this office by her mother for chiropractic care. The patient's birth history was uneventful, consisting of a short labor without the need for labor induction, the use of forceps or epidural anesthesia. At birth, her APGAR scores were 9, 10 and 10 at one, five and ten minutes following birth. Based on head circumference measurements, digital palpation of the anterior and posterior fontanel and comparisons with standard growth charts, an obstetrician and pediatrics concurred the diagnosis of craniosynostosis. On physical examination, the patient's head appeared small compared to children cared for by the attending clinician. Digital palpation revealed the posterior fontanel as fused and the anterior fontanel as small and diamond-shaped with a slight bulging that measured approximately 1cm in diameter.

Segmental dysfunctions (vis-à-vis static and dynamic palpation) were detected at the C1, T5, L3 and S2 spinal segments.[2] The right temporomandibular joint along with right frontal/parietal and left parietal/occipital cranial distortions were also determined by inspection and static and motion palpation. The relative relationship of the cranial bones (i.e., frontal bone to the front, parietal bones superiorly, sphenoid bones anteriorly, temporal bones inferior-anterior, and the occiput posterior-superior directions and the nasium separate from the frontal bone, inferiorly) to each other were visually and digitally palpated for cranial subluxations.[2]

Interventions and Outcomes

The patient was cared for with contact-specific, high-velocity, low-amplitude type thrust judiciously modified to account for the patient's immature neuromusculoskeletal system and to

sites of spinal subluxations[3] along with cranial therapy.[2] Following 6 visits, the patient's cranial diameter measured 39.2cm compared to 34.5cm at birth, with the anterior fontanel remaining open. Long-term follow-up revealed the patient's cranial development progressing without the need for surgery.

Discussion

We caution the reader on the generalizability of the care presented, as case reports have limitations and bias; the natural history of the disorder, the role of placebo, regression to the mean, the demand characteristics of the clinical encounter, and subjective validation are confounders to making cause and effect inferences. To what extent these competing explanatory variables (i.e., placebo effect) occur in a 3-week-old infant or on the part of the parent (i.e., demand characteristics and subjective validation) remains to be determined. With respect to the natural history of craniosynostosis, it is said that without surgery to reopen the used sutures, pressure on the growing cerebral cortex results in a detrimental effect on the child's intelligence, although unequivocally raised intracranial pressure is only present in about 50% of patients, even with multiple suture fusions.[4]

With respect to the chiropractic care provided, we acknowledge the genetic component in the pathophysiology of craniosynostosis[1] but mechanical factors may have been involved in maintaining sutural patency. Skull growth matches brain size in infants with microcephaly and hydrocephaly as well as in infants with normal brains with brain growth generating tensile strains in the sutures. Henderson and colleagues[5] measured the bone deposition rate and tensile strains in normal infants and found that both showed an approximately exponential decrease from 1 month to 4 years of age; however, the results suggested that tissue level strains in the sutures might be too small to influence osteoblast biology. The correction of cranial dysfunction (i.e., cranial tissue alignment) may possibly augment the optimum tissue level strains in the sutures to influence osteoblastic activity.

Conclusion

This case report provides documentation that in this case it is possible that chiropractic may have been helpful for this patient with deformational craniosynostosis. More research is indicated to evaluate whether this case was a novel presentation or may offer options offering low risk and benefit for children with similar conditions.

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Successful resolution of congenital torticollis with non-synostotic deformational plagiocephaly in a 3-month-old infant: A case report.

Beth Forgosh, DC, Stéphane Provencher, DC, Charles L. Blum, DC

Introduction

Pediatric torticollis is due to contracture of the neck musculature involving the sternocleidomastoid (SCM) and other muscles and prevalence is estimated to be 0.3% to 2% in the United States and 0.006% in eight European countries. Although the etiology is uncertain, the possible causes of injury are intrauterine constraint and birth trauma. Conventional medical treatment includes observation, application of orthosis, active home exercise program, gentle manual stretching, vigorous manual myotomy, medications and various types of surgical procedures. Consequently, the outcomes of treatment are difficult to compare given the diverse management strategies [1,2].

Since parents will not commonly choose to watch and wait if their child's condition will spontaneously resolve, particularly with presentations of ongoing congenital torticollis and plagiocephaly, conservative safe procedures are preferred in the early stages of care. When home therapies suggested to parents (observation, application of an orthosis, an active home exercise program, and/or gentle manual stretching) are not helpful, parents will seek other alternative therapies. Chiropractic and cranial care for young children can be helpful and offers a low-risk procedure as compared to the other less conservative methods, such as surgery, injections and medications. If the conservative methods are not successful, chiropractors are trained to know when to refer for more extensive testing or therapeutic interventions.

Clinical features

A 3-month-old male presented with congenital torticollis with cervical motor impairments. During delivery, the baby changed position from posterior occiput, and was delivered left anterior occiput. Post birth, he was unable to lift or turn his head to the left. According to the parents he habitually woke up screaming. The patient's condition was consistent from birth to 3 months, and this was consistent with his presentation to this office. The parents noted some deformational plagiocephaly but it was unclear if this was birth-related or due to the child's inability to turn his head when sleeping.

Interventions and Outcomes

Upon exam, the patient demonstrated 0° of left cervical rotation and an antero-posterior cranial strain pattern, consistent with non-synostotic deformational plagiocephaly. Hypertonicity of the left SCM and bilateral suboccipital muscles was also observed. Visual analysis of head tilt, head flattening, orbital dimension (small or large orbits), anterior triplanar analysis[3] and vertex strain analysis[3] was utilized to assess the cranial strain.
Treatment was guided by visual assessment of asymmetry, palpation of increased muscle tension or asymmetry, regions of sensitivity illustrated by the child's positional preference away from

certain regions of touch or with signs of distress, and lastly a controversial method of assessment involving muscle testing. Surrogate muscle testing is an extremely individualized method of analysis and was not used as the only method of assessment, but as part of a group of tests, so the findings pre and post treatment could be assessed along with the test itself. While there was no great reliance on surrogate muscle testing with this child, it did appear to work successfully, based on the outcome assessments and the child's response to care.

The assessment process determined that there was a left spinous process rotation at T1, left posterior lateral atlas, left internal temporal bone distortion pattern, left posterior occiput distortion pattern, left TMJ condyle posterior, right posteriorly rotated sacral segment at S2, right anterior hip displacement at the acetabulum, and the right aspect of the frontal bone had an internally rotation distortion.

Sacro occipital technique (SOT) cranial strain corrective techniques were utilized for the correction of an anterior posterior (A-P) strain[3] and left internal temporal bone distortion pattern with the parent's aiding with dorsiflexion of child's feet to assist correction via a direct method. Manual correction of A-P strain was performed via the direct method, with gentle oblique hand pressure "squeezing together," or molding, of the right frontal bone and left occiput. Manual correction of internal temporal bone distortion pattern involved contacting the parietal bone, just above temporal squama with 3 fingers, and just above mastoid process with thumb, directing temporal bone externally while mother dorsiflexed the child's feet to assist correction. Spinal adjustments were made by using the activator instrument at a low-force setting to the anterior right hip, left atlas, T1, temporomandibular joint (TMJ) (contacting doctor's thumb, overlying TMJ) and right posterior S2 sacral segment.

Results

After the initial adjustment, the patient gained 30° of right cervical rotation. After the next adjustment, he was able to lift and turn his head to the right from the prone position. After the third adjustment, the cranial strain appeared resolved and he recovered full cervical ranges of motion (ROM). The parents reported that the child was no longer waking up with vocalizing distress. The patient's positive outcome was consistent with the visual, palpatory and functional examination changes exhibited during each office visit and used to guide treatment.

Discussion

Schertz et al[1] demonstrated that congenital muscular torticollis in the pediatric population is associated with an increased risk of concomitant early gross motor delay. Furthermore, minor developmental problems occurred after one year of age, including cognitive delays. Children with a history of plagiocephaly also appear to have a greater risk for developmental impediment. Chiropractic literature has demonstrated the effectiveness of spinal adjustment for congenital muscular torticollis. Some authors discussed the positive response via cranial adjustments for torticollis and/or cranial strain patterns. The normalization of facial features, improved sleeping, resolution of agitation, and improved feeding patterns may be some positive responses from

cranial and/or spinal adjustments in the pediatric population presenting with congenital torticollis and/or cranial strain.[4, 5]

A search of PubMed [September 6, 2010] for risks or adverse reactions to "sacro-occipital technique," "SOT," and/or "cranial manipulation, technique, or therapy" did not locate any published studies relating to specific risks associated with SOT cranial adjustments. Caution in treatment of an infant is needed because the vault of the neonatal skull is largely membranous in origin. Specific and gentle cranial manipulation under certified SOT training is advised to prevent potential insult to the delicate vault tissues.

With any case report it is extremely difficult to make any assumptions between the treatment rendered and a subject's response to care. In this case the child did not appear to be in the process of resolving his congenital torticollis and it was unclear if the deformational plagiocephaly was a separate coincidental finding or related to the child's inability to sleep in different positions due to very limited cervical ROM. It is possible the child might have recovered without any treatment; however, the child's parents were not going to "wait and see." Therefore a conservative means of care was preferred, and if the patient would not respond in a reasonable period of time, a referral for more extensive care could be made.

Conclusion

This case report demonstrated a resolution of congenital torticollis with concurrent deformational plagiocephaly (cranial strain pattern) via SOT, cranial and chiropractic treatment. SCM spasm and rigidity associated with spinal and cranial strain may be a suggested mechanism for delayed cervical motor skills. Further research is needed to understand the relationship between torticollis, cranial and spinal strain and its relationship to birth trauma. Cranial therapeutic interventions and chiropractic care of children with plagiocephaly or congenital torticollis should be evaluated in large comparative-case control situations to determine if there is a significant relationship between the treatment rendered and patient response.

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Cranial bone imbalance, TMJ dysfunction and craniocervical syndrome, and its affect on the sucking reflex in a 2-month-old female infant: A case report.

Beth Forgosh, DC, Stéphane Provencher, DC, Charles L. Blum, DC

Introduction

Full-term healthy newborns display strong nutritive sucking reflex within hours of birth, which depends upon coordinated sucking, swallowing and breathing patterns.[1] Feeding disorder is relatively common in early infancy. A recent parental survey found that 35% of infants exhibit food sensitivity and refusal.[2] The most common treatments used to help an infant's reduced sucking capacity include options such as cup feeding, tube feeding, bottle-feeding and nipple shield. However, since breastfeeding has significant attributes for the infant and mother, all available opportunities to continue with breastfeeding is preferred. The La Leche League International has programs that contribute to increasing breastfeeding incidence and duration among full-term and preterm low-body-weight infants. The La Leche League's mission is to help mothers worldwide to breastfeed through mother-to-mother support, encouragement, information and education, and to promote a better understanding of breastfeeding as an important element in the healthy development of the baby and mother.

The benefits of breastfeeding are numerous and multifactorial. They vary from the touch and connection with the mother, which is essential to healthy developmental motor skills and has even been found to be associated with increased cognitive function, as well as a reduction in the risk of schizophrenia. Breastfeeding decreases the incidence and/or severity of a wide range of infectious diseases, including bacterial meningitis, bacteremia, diarrhea and respiratory tract infection, as well as recurrent otitis media necrotizing enterocolitis, otitis media, urinary tract infection, and late-onset sepsis in preterm infants. Some studies suggest decreased rates of sudden infant death syndrome in the first year of life and reduction in incidence of insulin-dependent (type 1) and non–insulin-dependent (type 2) diabetes mellitus, lymphoma, leukemia, and Hodgkin disease, overweight and obesity, hypercholesterolemia, and asthma in older children and adults who were breastfed, compared with individuals who were not breastfed. Lastly, postneonatal infant mortality rates in the United States have been comparatively reduced by 21% in breastfed infants.[3]

From an orofacial developmental standpoint, breastfeeding is important to the proper development of the swallowing action of the tongue, proper alignment of the teeth, and the shaping of the hard palate. Occlusion and a high palate contribute to an optimal airway passage development and could contribute to the prevention of obstructive sleep apnea in adult life. While breastfeeding is clearly a healthy option for children, it is interesting that studies have also found that the mother also benefits from breastfeeding. For instance, breastfeeding mothers who have depression issues benefit from breastfeeding and this benefit appears to carry over to their child. Nurses Health Study (NHS) and Nurses Health Study II (NHS II) have even found that each year of breastfeeding is associated with a reduction in the likelihood of the mother's later development of Type 2 diabetes.

The infant sucking reflex requires that the labial and facial muscles assist the tongue to compress the hard palate. The piston-like motion of the temporomandibular joint (TMJ) and the tongue create suction during feeding. Disruption of the infant cranium and other parts of the body

subsequent to labor and delivery may affect infant coordination and alertness, which can result in a dysfunctional sucking reflex. There are various theories why the cranium may be involved, since occipital condyle mechanical dysfunction may contribute to cranial nerve IX, X and XII entrapment(s) that could alter tongue or swallowing function. Temporal bone involvement may affect the TMJ function and craniofacial imbalances may affect the child's comfort level during sucking. Birth trauma could relate to cranial bone distress and it would be reasonable to assume that in some instances there may be a relationship between poor sucking and cervical spine or cranial related mechanical dysfunction contributing to related neural dysafferentation and associated reduced muscle function.

Clinical features

A 2-month-old underweight female presented with nutritive sucking dysfunction since birth as reported by her mother. The infant preferred right-sided breastfeeding. The mother was 1½ weeks post due when labor began. Complications developed when labor failed to progress. Pitocin was administered to expedite delivery. Since the child had limited sucking capacity, she was taken by the mother for two visits to an osteopath before seeking chiropractic care at this office. According to the mother the child was taken to the osteopath "to address underdevelopment of cranial structures/ jaw." The mother had a good experience with the osteopath, but her lactation consultant recommended she seek chiropractic care since the baby was not sucking strongly enough, was underweight, and she had to continue supplementing the infant's feeding with formula.

Outcome and Interventions

Treatment was guided by visual assessment of asymmetry, palpation of increased muscle tension or asymmetry, regions of sensitivity illustrated by the child's positional preference away from certain regions of touch or with signs of distress, and lastly a controversial method of assessment involving muscle testing. Surrogate muscle testing is an extremely individualized method of analysis and was not used as the only method of assessment, but as part of a group of tests, so the findings pre and post treatment could be assessed along with the test itself. While there was no great reliance on surrogate muscle testing with this child, it did appear to work successfully, based on the outcome assessments and the child's response to care.

Visual analysis of the patient revealed a head tilt, left sided flattening of the skull, orbital dimension (small left eye), and flattened left ear. The patient's history of weak sucking directed investigation into evaluations of TMJ related structures and their possible contribution to the patient's symptoms. Gentle static and motion palpation revealed segmental dysfunction positioning at the left mandibular condyle (posterior), left malar (inferior), left temporal bone (internally rotated), left greater wing of sphenoid (inferior), and left atlas (lateral).

SOT cranial corrective techniques were utilized for the correction of left mandible condyle, left malar, left temporal bone and left greater wing of sphenoid. The activator instrument was utilized to assist in correction of left lateral atlas and left TMJ. The activator instrument, set to a very low

setting, was placed over the doctor's finger contact, which was to both the atlas and TMJ as a means to control direction of the gentle impulse over the small surface area.

Results

Within minutes following initial treatment, the child's sucking strength improved significantly. Five days later, the baby returned and sucking strength had sustained. Mom described the sucking as strong and direct for the first time ever, beginning minutes following the first treatment. At the follow-up office visit, the mother reported that the baby no longer exhibited preference for right-side breast, and was nursing equally on both sides.

Discussion

Proper nutritive sucking reflex in infants allows for proper growth, development and a multitude of secondary conditions, and even affects the health of the mother. Organizations such as the La Leche League have pioneered supporting breastfeeding for mothers and children. Collaboration between chiropractors treating pediatric patients with sucking dysfunctions need to be aware of the need for cross-referrals to facilitate optimal mother and child breastfeeding behavior. The support from La Leche League groups, advisors, and mother-to-mother forums can be crucial for mothers attempting to have a normal breastfeeding experience with their child. As exhibited in this case report, it is possible that some children who are having trouble with sucking or breastfeeding may not just have a behavioral issue but instead have some mechanical type of dysfunction amenable to chiropractic and SOT cranial type therapies.

Arcadia noted in a clinical setting where she observed and treated 1,000 newborns (ages 1 hour to 21 days), for failure and/or difficulty with breastfeeding. She found that in 800, or 80%, birth induced Temporomandibular Joint Dysfunction was the cause, and the majority of the patients responded well to cranial and spinal manipulation. Other chiropractic research studies have found a relationship between cranial and spinal manipulation and improved sucking or breastfeeding.

With the patient in this case, both intra-uterine constraint and complications associated with the birth process may have contributed to cranial patterns of distortion, TMJ and atlas segmental dysfunction, which could have led to a diminished sucking reflex and a positional preference when breastfeeding. SOT cranial care has some specific methods to evaluate and treatment craniospinal and craniofacial imbalances secondary to fetal inter-utero position and birth trauma.

Due to the temporal nature of the treatment and child's response it seems unlikely that the child's response was casual or coincidental to the care rendered, but rather that there was some causal relationship. However, because this is a single subject case without controls or placebo it is difficult to generalize this to the infant population at large. Studies developing a prediction instrument may help determine what subset of infants that have difficulties sucking or breastfeeding may respond to chiropractic and cranial care.

Conclusion

This case report illustrated a relationship between cranial imbalance, TMJ dysfunction and a craniocervical syndrome, which may have adversely affected this infant's nutritive sucking reflex. Her improvement, virtually immediately following a chiropractic and cranial corrective technique, suggests a relationship between cranial strain, spinal misalignment and impaired sucking reflex. Further case-controlled studies into the nature of this relationship is needed in order to determine which children with reduced sucking may benefit from chiropractic interventions.

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Cranial treatment for a patient presenting with Down syndrome: A case report.
David Simmons, DC, Charles L. Blum, DC

Introduction:

Down syndrome or "trisomy 21" is a chromosomal disorder caused by the presence of all or part of an extra 21st chromosome. It is named after John Langdon Down, the British physician who described the syndrome in 1866. Often Down syndrome (DS) is associated with some impairment of cognitive ability and physical growth, and a particular set of facial characteristics. Individuals with Down syndrome tend to have a lower-than-average cognitive ability, often ranging from mild to moderate disabilities. A small number have severe to profound mental disability.

The incidence rate of Down syndrome in 2006 was estimated as one per 733 live births in the United States (5429 new cases per year) [1]. DS occurs in all ethnic groups and among all economic classes. Maternal age influences the chances of conceiving a baby with Down syndrome. At maternal age 20 to 24, the probability is one in 1562; at age 35 to 39 the probability is one in 214, and above age 45 the probability is one in 19. Although the probability increases with maternal age, 80% of children with Down syndrome are born to women under the age of 35, reflecting the overall fertility of that age group. There has been no evidence that a Down syndrome birth is due to parental behavior (other than age) or environmental factors.

While DS children are a high risk for many conditions (congenital heart disease, thyroid disorders, malignancies, gastrointestinal disorders, infertility, neurological, as well as ophthalmology and otolaryngology disorders), there are no specific treatments for DS and therefore DS patients will need to be treated on a case-by-case basis. The level of DS cognitive dysfunction between each child and with this particular case the cognitive dysfunction was significant. From a chiropractic standpoint ligamentous laxity can be a factor in treatment application and atlantoaxial instability can be a common finding with DS patients. The purpose of this case study is to investigate a DS patient's response to a specific cranial technique application.

Case Presentation

A 38-year-old female with Down syndrome was brought to this office by her mother to see if chiropractic treatment might assist her daughter's ability to function, thrive, and possibly improve her cognitive abilities. She had previously tried various medical interventions as well as acupuncture care with minimal to no results. The patient appeared to be mentally at the level of a five year old. She could not read or write. She was unable to independently dress, bath, or wash her own hair.

Intervention and Methods

Since the patient's mother wanted to make sure that her daughter could have some improvement cognitively aside from standard sacro occipital technique (SOT) care the patient was also treated with cranial techniques. Upon cranial palpation and symptom presentation it appeared that a specific method described by DeJarnette (Exhalation Fault Cranial Adjustment) is used to increase general cranial function into its inhalation or flexion phase. The patient was able to understand and comply with the requests associated with the cranial procedure. On the following office visit due to the patient's adverse reaction to the cranial treatment, the reverse procedure was used. This specific method described by DeJarnette (Inhalation Fault Cranial Adjustment) is used to increase general cranial function into its exhalation or extension phase.

The Exhalation Fault cranial adjustment is performed with bilateral thenar pad contacts to mastoid processes. Patient exhales deeply and holds breath out as long as possible while the doctor's thenars direct mastoids lateral superior (indirect). Constant pressure is maintained to the mastoid processes while patient quickly inhales, then exhales and holds as long as possible. The procedure is repeated 6 times and then pressure is released to the mastoids. The Inhalation Fault cranial correction has the same contact however the patient inhales deeply and holds breath as long as possible while thenars direct mastoids medial posterior (indirect). Constant pressure is maintained to the mastoid processes while the patient quickly exhales, then inhales and holds as long as possible. The procedure is repeated 6 times and then pressure is released to the mastoids [2].

Results

Following the initially office visit it appeared that the Exhalation Fault cranial technique appeared to adversely stimulate her nervous system. She became agitated and hyperactive which alarmed her mother. The patient's condition was then reevaluated and on the following office visit, to "antidote" the initial reaction the opposing cranial technique was used, the Inhalation Fault cranial adjustment which had a dramatic effect on the patient. Almost immediately following the adjustment she became calmer and more responsive to her environment.

Through continual application of the inhalation fault cranial procedure during subsequent office visits, 20 office visits over 4-6 months, and she began to recognize words such as store signs and billboards, something that was completely novel for her. She was able to begin the process of learning how to write and found that with help she was becoming capable of writing short notes. She even surprised her mother one day by dressing herself and washing her own hair without being asked to and without any outside assistance. As treatment progressed 4-6 months later she was beginning to be independent with her dressing, bathing, and washing her own hair as well as beginning some independent reading and writing. Around the 6-month point in care her mother passed away and this limited her ability to receive care at this office with the last visit occurring a few months later.

Discussion

One aspect of chiropractic healthcare and particularly the system of SOT analysis and treatment is that there is an indicator-based system, which can relate to patient's response to care. In this manner, a treatment while therapeutically intended, can also function as a diagnostic process. In this case the patient responded adversely to an extension cranial fault adjustment and similarly to using positional preference for pain provocation or centralization to direct care, the patient's adverse reaction suggested that the opposite direction might be preferred. Using this logic a flexion cranial fault adjustment was performed and the patient had a profound positive response.

In an attempt to understand why the inhalation fault maneuver was so beneficial for this patient it was theorized that her brain was overwhelmed by efferent stimuli and by slowing down the rate the stimuli reached her brain; her brain might be capable to differentiate which stimuli were most important and which could be ignored or at least given secondary consideration. Further research is needed to test this hypothesis or to determine if it was due to some other factor or if even the intervention is not universally applicable for Down syndrome patient and instead was effective only on this one individual.

SOT cranial treatment was also found effective for a DS child with severe tachypnea, a history of chronic pneumonias, a failure to thrive, chronic fevers of unknown origin, and a possible atrial-septal defect [3]. There may be some basis for cranial treatment for DS patients since as compared to normal DS children have a larger cranial base angle; reduced elevation of sella; reduced anterior and posterior cranial base lengths as well as reduced anterior and posterior face heights [4].

From a cranial diagnostic standpoint there are craniodural balanced tension patterns, which tend to vary physiologically, creating normal cranial compliance to the ebb and flow of CSF pulse waves or fluctuations. In pathological or subclinical states some patients will have either more tension (cranial extension or exhalation), which creates an increased anterior and posterior cranial base length or less tension (cranial flexion or inhalation), which creates a decreased anterior and posterior cranial base length. The cranial inhalation fault adjustment in this patient's case may have improved cranial dural and helped to increase the patient's decreased anterior and posterior cranial base length [5].

It is difficult to clearly know whether or not this patient may have been at a tipping point just before coming into the office and the treatment was coincidental to her remarkable change in cognitive function and ability to become independent. What was clear is that the patient's mother had not seen any shift in two decades with her child's behavior prior to the 2nd office visit. It is also worthy to note that the first treatment appeared to create agitation and had an adverse effect, so the subsequent office visits and her response could not be solely attributed to satisfying the doctor or mother.

Conclusion

Without a control group or comparative sham procedure analysis it is difficult to extrapolate the finding of this one case. However as a qualifier this patient was evaluated and treated when the clinician was new in practice and had not yet perfected his skills of cranial diagnosis and treatment. So it is both likely and possible that at this time (years later) he would have been able to assess that the patient so that the initial treatment might have been what appeared to be the appropriate cranial adjustment. However it is interesting to note that the cranial adjustment itself had a significant effect both when performed inappropriately and appropriately so that experience and skill in application of cranial techniques are suggested. Further research is indicated to determine if other patients with Down Syndrome might respond similarly to cranial adjustments.

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Vision induced migraine headaches: A case report.
Charles Beck, DO

Introduction:

What direct relationship might the eyes or vision play in the causation of headaches or other symptoms related to physical changes in the fascia (both internally and externally) of the cranium? If the eye muscles, visual reflex centers, or other neurologically related circuitry have a direct relationship to sustained myofascial imbalance, this may be an important part of a clinical differential diagnosis.

A series of case reports involving both spinal and cranial manipulative interventions have discussed a relationship between vision and successful treatment [1-4].

In a case control study, Monaco, et. al. found a positive correlation between ocular correction effects on EMG activity of stomatognathic muscles in children (n=320) with functional mandibular lateral-deviation. This showed a relationship between standard prescriptive ophthalmic evaluations and how they could be improved with a functional assessment tool to evaluate any related myofascial interrelationship [5].

Weiner, et. al., performed the first published case series study (n=6) evaluating the use of cranial manipulative treatment of patients utilizing ocular changes for treatment purposes. They found "significant changes in ocular refraction, corneal curvature, and ocular position noted and measured as a concomitant of the use of dental appliances and/or osteopathic craniosacral manipulations in ongoing therapies for treatment of temporomandibular joint (TMJ) syndrome and other related head, neck, and shoulder problems. The near-immediacy in time of these variations and the absence of other reasonable causes suggest that precise monitoring of these patients before treatment begins and during subsequent therapy can assist the practitioner in quantifying the progress and effects of the treatment of chronic head, neck, and swallowing problems [6]."
Their six case histories demonstrated "significant changes in hypereye, proptosis, corneal astigmatism (and axis), and refractive error. The magnitude of these alterations ranges from 25% to 300% of the pretreatment condition [6]." They cautioned that, "while the subjective symptom improvement of these cases would have to be regarded as anecdotal, visual parameter analysis of a large patient population may help to provide predictive cause and effect assumptions [6]."

Therefore the purpose of this study is to determine if a relationship can be found between vision and its affect on the cranium, stomatognathic system and posture, and if this relationship can be used to for both assessment and treatment of patients in an interrelated and interdisciplinary manner.

Case History:

A 53-year-old white female patient presented with a history of migraine-type, intense headaches, "dizziness" and "eyestrain" that began approximately 7 months ago. The patient stated that "I

can read but I cannot see" and that her "eyes cannot focus". She denied any trauma associated with the onset. Patient denied any traumatic or pathologic visual problems including: amblyopia, anisometropia, diplopia, strabismus, glaucoma, ophthalmoplegia, pterygium, retinitis, or macular degeneration.

The patient had a history of lower back pain that began after a motor vehicle accident in 1983. She said that the eyestrain makes the back pain worse. She had recently gone back to school to study Chinese Medicine and had noticed a significant increase in the symptoms and severity since classes began. The symptoms improved with rest and sleep and worsened with continuous use of her eyes when studying.

Frequent breaks from studying allowed the patient to complete her schoolwork, but interfered with her quality of life and significantly lengthened her study time. She made special arrangements to have extra time for examinations due to the headaches and dizziness brought on by reading. The patient has been to see five different eye doctors prior to her initial visit to the clinic and received and filled six different eyeglass prescriptions in an attempt to alleviate the problem. She had also seen a neurologist who reported no pathology and did not recommend medication or imaging studies. She was referred to the office by her local osteopath for evaluation of visually induced somatic strain. She was wearing corrective lenses with bifocals. She stated that she felt that the clinic is her last hope to be able to continue in school.

Her medical history was remarkable for Hashimoto's thyroiditis since 1997, thyroidectomy in 1997, a prescription for Synthroid 0.1 mg daily and a blend of 38 Chinese herbs for thyroiditis from her Chinese Medicine practitioner. Physical examination revealed blood pressure 118/70 mmHg and a heart rate of 78 pulses per minute. Her pupils were equal, round, and reactive to light, sclerae were non-icteric and extra ocular muscles were intact. There was no ptosis of the eyelids, no pterygium present, conjunctivas were normal and no cataracts noted visually. Cranial nerves II-X were intact and normal function was noted. Muscle strength was 5/5 in all extremities and deep tendon reflexes were 2/4.

Methods:

Osteopathic manipulative therapeutic evaluation revealed the cranium to be the area of greatest restriction, with significant tissue texture changes noted at the sub-occipital region. The following additional restrictions were noted: thoracic outlet restricted fascially in right rotation, T_1 (Flexed, Rotated and Side-bent - Left) FRS_L, right 1st rib exhalation restriction with a primary bucket handle component, increased paravertebral muscular tension noted bilaterally between T_{12}-L_2, L_5 (Extended, Rotated and Side-bent - Right) ERS_R, left superior innominate shear, left superior pubic shear, left/right sacral torsion, right anterior innominate rotation, and left proximal fibular head anterior.

The patient was evaluated cranially for meningeal and sutural stress patterns with glasses on and off. Her current eyeglass prescription markedly limited her cranial amplitude and caused a noticeable anterior fluid shift. Her glasses were removed for the remainder of the evaluation and the treatment. She was found to have the following cranial suture restrictions: right

maxillary/frontal, left occipital/mastoid, right frontal/parietal, right spheno/squamous, and left premaxilla.

The patient was assessed with acute and chronic headaches, migraine and tension type, possibly secondary to eyeglasses. Somatic dysfunction of the cranium, cervical, thoracic, and lumbar spine, sacrum, pelvis, lower extremity, rib cage and abdominal soft tissue were found.

Treatment:

Osteopathic manipulative therapy (OMT) was performed to all areas listed above utilizing functional, balanced ligamentous tension, muscle energy, visceral, and facilitated positional release techniques. The cranium was treated with a combination of indirect and direct sutural manipulation, fluid and visceral (brain parenchyma) techniques. The treatment was tolerated well and the patient reported a complete resolution of the acute headache.

The patient was then evaluated for cranial strain with her eyes closed and covered to occlude any incoming light. The same evaluation was then performed with her eyes open and the results were compared. With her eyes closed and covered the patient was found to have no cranial strains present, as she had just undergone treatment to remove all above noted strains. When the cover was removed and the eyes opened the patient's cranium immediately changed with noted strains of cranial extension, a right torsion, vertical strain and a left lateral strain pattern. Due to those findings it was determined that there may be a need to prescribe a modification to her eyeglasses to help neutralize the cranial strains. Utilizing ophthalmologic principles as they relate to "Osteopathy in the Cranial Field" the prescription that removed or significantly reduced her cranial strains was:

OD: -4.37 sphere, -1.25 x 023° cylinder
OS: -4.12 sphere, -1.00 x 177° cylinder
+1.00 reading addition bilaterally

The numbers represent an eyeglass prescription. "OD" - ocular dexter - latin for the right eye whereas "OS" - ocular sinister - latin for the left (or evil) eye. The first minus signifies near-sightedness; the number is the strength of the lens (sphere). The second set of numbers is the astigmatism. The minus being the strength of the lens and the degree number is the axis of rotation of that lens (cylinder). The +1.00 is an addition for bifocal lenses.

The patient noted considerable relief in her eyestrain and physical tension with this prescription in the trial frames. She noticed that her entire body felt relaxed and that the pressure in her head had disappeared. The cranial strain patterns noted above were no longer present with eyes open or closed and covered. The patient was instructed to have ophthalmological prescription filled and to return in two weeks.

The patient returned in two weeks with the new eyeglass prescription. When placing the glasses on her face, she noted a feeling of pressure at the frontal bone that was similar to the feeling presenting just prior to her headaches. This was identified as a cranial vertical strain. The

frames were then re-fitted to her face using ophthalmologic principles (face form was adjusted until the vertical strain was removed, the frames were "x'd" with the right lower portion of the lens being adjusted toward the face to remove a small left cranial side-bending rotation, and the pantoscopic tilt was adjusted to balance the muscle tension of the suboccipital muscles). *["x"ing the frames is when one lens is bent forward (the lower part of the lens) and one backward when looked at from the vertical plane*.] The patient was instructed in how to care for the glasses and what to expect from the eyeglass treatment. The fitting of the glasses resolved the vertical strain and the patient's feeling of pressure. A brief cranial treatment to further release the frontal area (ethmoid bone and right frontal/nasal suture restriction) and the brain parenchyma was rendered at that time. She left the office symptom free.

The patient phoned the office the next day to say that her headache symptoms were very aggravated. She was instructed to continue to wear the glasses and take "over the counter" pain relievers as necessary. A return office visit one week later revealed that, after three days of symptom aggravation, the headaches had completely disappeared and her eyestrain was improved, but still present. Additional eyeglass frame adjustment alleviated the feeling of eyestrain (added refinement of face form adjustment). A frontal bone right-sided intra-osseous strain and brain parenchyma release completed this treatment. She was then instructed to return as needed for adjustments of the glasses and for treatment only if symptoms did not improve after seeing her local osteopath.

The patient has been followed for over one year with approximately bimonthly eyeglass adjustments and one revised prescription. Her headaches have completely resolved and she is doing very well in college.

Discussion:

In this case the patient's symptoms appeared to be a direct result of visually induced somatic strain influencing the cranial bones and causing headaches and other complaints. This seems a reasonable explanation due to her unresponsiveness to other forms of care, her response to the OMT and cranial care, ophthalmological prescriptive modification, and then modification of the eyeglasses.

Diagnoses of cranial strain patterns consisted predominately of palpatory tests for the following patterns, which are commonly found in cranial osteopathic examinations [7]:

- flexion
- extension
- torsion (left or right)
- side-bending rotation (left or right)
- lateral strain (left or right)
- vertical strain (superior or inferior)
- compression

Testing for inter and intra-examiner reliability of cranial bone dynamic patterns has been performed with some success [8-13]. A recent study had particularly significant findings for intra-observer reliability for cranial strain patterns as were used in this case report [14].
It can be reasoned that myofascial imbalance caused by her eyestrain resulted in an abnormal tension on the cranial bones that induced the strain patterns which in turn resulted in her headaches. This was deduced by comparing the patient's cranial movement and strain patterns with the eyes closed and covered (no visual input) with the eyes open (visual input). It is surmised that the process of light entering the patient's visual processing system caused cranial strain (visually induced somatic strain or visual somatic strain). This strain was neutralized with eyeglass lenses and frame adjustments giving the patient a cranium that would now accept a treatment and remain stable longer between treatments. Her eyes were able to relax and not place abnormal tensions on the cranium.

This patient's case was complex. The patient's local osteopathic physician treated her well, but her cranial strain pattern continued to return. The suspected cause of this appears to be a possible visual somatic strain. Although each of her previous eye doctors performed the best that he or she could, they were not able to incorporate an osteopathic functional cranial assessment to evaluate the relationship of her eyes or vision to cranial patterns. Also, if optometrists and opticians do not perform thorough eyeglass fittings, this can lead to visual somatic strain [15]. Symptoms related to visual somatic strain are not part of the standard curriculum taught at osteopathic medical schools.

Much of the knowledge of osteopathic visual somatic strain has come about in the last ten to fifteen years from Jim Jealous, DO, Joe Field, DO, Paul Dart, MD and others. They have mapped out the effects of visual strain on the cranial system and worked out corrections for these problems. In this case, the patient's eyeglasses were over-prescribed, a common issue with eyeglass prescriptions [16]. This led to a persistent lateral strain (from over-prescribed cylinder), extension lesion (from over-prescribed sphere), torsion (from incorrect cylindrical axis) and vertical strain, side-bending rotation and sub-occipital muscle tension (from the prismatic effect of incorrectly adjusted frames) each time the patient wore her glasses [17]. These effects were present even with her eyes closed, but were increased when she opened her eyes [17]. Lateral and vertical strains, both being non-physiologic patterns, can cause headaches [18]. These strain patterns can restrict motion of the extra-ocular muscles and can lead to ophthalmologic migraines [19]. At a minimum, this contributed but may have been the sole cause of this patient's chronic headache.

A careful application of the known laws of physics as they apply to optics and the principles of osteopathy in the cranial field allowed a precise, unique, objective eyeglass prescription and frame adjustment to neutralize this patients visual strain [17]. Cranial or brain parenchyma treatment to aid the body in adapting to the change in the mechanism is necessary in most of the cases. This easing of the visual strain with the correct prescription and frame adjustment can result in cranial pattern shifts that can further change the patient's prescription or require eyeglass adjustment as the cranial strain patterns begin to resolve [20]. Thus it is important to develop a good rapport with these patients and follow their progress closely.

Conclusion:

This case study illustrates that a subset of patients may present with a clinical condition that either affects vision or the vision affects the condition. This dynamic interrelationship can be classified as a visual somatic strain. Functional assessments to evaluate for a visual somatic strain can be used to improve the neuromusculoskeletal head, neck, and postural kinematics where vision plays an important role. Collaborative efforts can be made to develop interdisciplinary co-treatment opportunities between osteopaths, chiropractors, podiatrists, ophthalmologists, dentists, and other allied professionals so that the sufferers of the effects of visual somatic strain can be helped and their quality of life improved. Greater research into this phenomenon should be investigated initially with case controlled and practice based studies.

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Vision induced chronic low back pain: A case report.

Charles Beck, DO

Introduction:

What direct relationship might the eyes or vision play in the causation of low back pain or other symptoms related to physical changes in the fascia (both internally and externally) of the cranium? If the eye muscles, visual reflex centers, or other neurologically related circuitry have a direct relationship with sustained myofascial imbalance, this may be an important part of a clinical differential diagnosis.

A series of case reports involving both spinal and cranial manipulative interventions have discussed a relationship between vision and successful treatment [1-4].

Monaco, et. al., found a positive correlation between ocular correction effects on EMG activity of stomatognathic muscles in children (n=320) with functional mandibular lateral-deviation in a case control study. This showed a relationship between standard prescriptive ophthalmic evaluations and how they could be improved with a functional assessment tool to evaluate any related myofascial interrelationship [5].

Weiner, et. al., performed the first published case series study (n=6) evaluating the use of cranial manipulative treatment of patients utilizing ocular changes for treatment purposes. They found "significant changes in ocular refraction, corneal curvature, and ocular position noted and measured as a concomitant of the use of dental appliances and/or osteopathic craniosacral manipulations in ongoing therapies for treatment of temporomandibular joint (TMJ) syndrome and other related head, neck, and shoulder problems. The near-immediacy in time of these variations and the absence of other reasonable causes suggest that precise monitoring of these patients before treatment begins and during subsequent therapy can assist the practitioner in quantifying the progress and effects of the treatment of chronic head, neck, and swallowing problems [6]."
Their six case histories demonstrated "significant changes in hypereye, proptosis, corneal astigmatism (and axis), and refractive error. The magnitude of these alterations ranges from 25% to 300% of the pretreatment condition [6]." They cautioned that, "while the subjective symptom improvement of these cases would have to be regarded as anecdotal, visual parameter analysis of a large patient population may help to provide predictive cause and effect assumptions [6]."

Therefore the purpose of this study is to determine if a relationship can be found between vision and its affect on the cranium, stomatognathic system and posture, and if this relationship can be used for both assessment and treatment of patients in an interrelated and interdisciplinary manner.

Case History:

A 34-year-old white female patient presented with a history of low back pain that has been present for nearly two years. She was currently being seen by her gynecologist for the treatment

of hypothyroidism and taking bio-identical hormone supplementation for irregular menses. Her gynecologist referred her to the clinic for a musculoskeletal evaluation of her back pain. She was cheerful on initial presentation and indicated that her back is the only real issue and concern. She stated that other than her back she "feels fine". Her symptoms improved with rest and sleep and worsen as the day progresses. The pain is dull, achy, non-radiating and she points to her lower lumbar spine when asked about its location. She rates the pain as an "8" out of 10, with 10 being most severe.

The patient denies any trauma associated with the onset and further denies any motor vehicle accidents, slips or falls, or other trauma. The patient is employed as an accountant at a local large company. She stated that her back pain is "just getting worse". When asked how long the pain had been present, the reply was "...2 years". In questioning what else might have happened in the time period in her life she responded, "I can't remember any trauma, but that's when I had my bilateral lens implants". The patient stated that the surgery was for her poor vision and that she had been able to see well since the surgery and had not needed corrective lenses to read the eye (Snellen) chart. She denies any other traumatic or pathologic visual problems including: amblyopia, anisometropia, diplopia, strabismus, glaucoma, ophthalmoplegia, pterygium, retinitis, or macular degeneration.

Her predominant medical condition was recently diagnosed as hypothyroidism and hormone imbalance. Surgically of note was the bilateral lens implants in 2006. Medication includes Iodine Plus tablets, 50 mg per day for hypothyroidism; progesterone cream, 0.1 mg daily applied topically. Aside from infrequent mild headaches her main musculoskeletal complaint is the chronic low back pain (L4-S1).

Methods:

Osteopathic manipulative therapeutic evaluation revealed her cranium to be the area of the greatest restriction, with tissue texture changes noted at the suboccipital region. The right occipitomastoid suture was restricted. She had two mildly exaggerated kyphoses, focused around the cervicothoracic junction and at the T_7 vertebra. The C_2 vertebra was rotated right. The thoracic outlet was restricted fascially in left rotation, the C_7 vertebra was ERS_R (Extended, Rotated and Side-bent - Right), the right 1st rib joint exhibited an exhalation somatic dysfunction, there was increased paravertebral muscular tension noted bilaterally between T_1-T_5 and L_3-S_1. L_5 was ERS_R (Extended, Rotated and Sidebent - Right). Additionally, there was left superior immoninate shear misalignment, left superior pubic shear misalignment, left/right sacral torsion, and a right anteriorly rotated innominate.

After an initial screen and repeated questioning about the back pain, the blinds in the exam room were closed and the patient was informed that the lights would be switched off. The patient was seated on the exam table, the lights were switched off and she was allowed to remain motionless for approximately 30 seconds in the darkened room. This experiment is a test for somatic dysfunction that was induced or exaggerated by light (visual somatic strain). When asked at the end of this period how her pain was, she replied, "It's gone". The lights were turned on and she was asked again about her back pain. She reported that it had returned. This experiment was

repeated for a total of three times until the patient (and the physician) were convinced that her back pain was related to her eyes. She was then re-examined in the darkened room and, although her somatic dysfunction was still present, its severity was significantly lessened.

The patient was examined cranially with her eyes closed in a darkened room. She was then examined with her eyes open in a lighted room. This was done to maximize the differences. The cranial rhythm presented with good amplitude in the darkened, eyes-closed exam, but was restricted in the lit, eyes-open exam. She was also noted to have a marked lateral strain, a minor cranial flexion, and increased tension in the suboccipital muscles present in the lit, eyes-open exam that was absent in the darkened, eyes-closed examination.

She was assessed with a history of headaches and low back pain worsened by visual input. She presented with hypothyroidism, hirsutism, an irregular menstrual cycle as well as somatic dysfunctions of the cranium, cervical, thoracic and lumbar spine, sacrum, pelvis and rib cage.

Treatment:

Osteopathic manipulative therapy (OMT) was performed to all areas listed above utilizing functional, balanced ligamentous tension, muscle energy, and facilitated positional release techniques. Cranium was treated with a combination of indirect and direct sutural and fluid techniques. The patient tolerated the treatment well. She was then evaluated for cranial strain with her eyes closed and covered to occlude any incoming light. The same evaluation was then performed with the eyes open and the results were compared. With her eyes closed and covered she was found to have no cranial strains present, as she had just undergone treatment to remove the above noted occipitomastoid strain. When the cover was removed and the eyes opened the patient's cranial appearance immediately changed with noted strains of mild, but perceptible cranial extension, a mild right torsion, and a pronounced left lateral strain pattern. It was decided at this time to prescribe eyeglasses to neutralize the cranial strains. Utilizing ophthalmologic principles as they relate to Osteopathy in the Cranial Field the prescription that neutralized her cranial strains was:

OD: -0.12 sphere, DS (no astigmatism)
OS: -0.12 sphere, -1.12 x 77° cylinder

The numbers represent an eyeglass prescription. The first minus signifies near-sightedness; the number is the strength of the lens n diopters (sphere). The second set of numbers (if present) is the astigmatism. The minus being the strength of the lens in diopters and the degree number is the axis of rotation of that lens (cylinder).

The patient was instructed to get this prescription filled with metal, full-rim frames and to return in two weeks. She was asked to call the office if she needed any assistance before then.

The patient returned in two weeks with the new eyeglass prescription. She noted 80% symptomatic relief in lower back pain with this prescription prior to her entering the office. She noted that her pain had dropped to a "2" on a 10 scale. She was assessed cranially and the

frames were fitted to her face using ophthalmologic principles - optical centers of the lenses were centered on the pupils by adjusting the nose pads (this corrected a small right torsion), temple arms were adjusted to keep the frames on the face (temple bend), face form was adjusted until the minor superior vertical strain was removed, the frames were "x'd" with the right lower portion of the lens moving toward the face to remove a small left side-bending rotation, and the pantoscopic tilt was adjusted to balance the muscle tension of the suboccipital muscles. The patient was instructed in care of the glasses and what to expect from the eyeglass treatment. The patient was then evaluated structurally and found to have the area of greatest restriction at L_5 ERS_R (Extended, Rotated and Side-bent - Right), followed by L_3 FRS_L (Flexed, Rotated and Side-bent - Right). These were treated utilizing functional methods. The patient left the office symptom free (pain now a "0"). Follow-up examination was scheduled for two weeks.

At her second follow up appointment she reported that her headaches had not returned at all since the initial evaluation and treatment and that her back pain was greatly improved, but not completely resolved. Evaluation for this visit revealed that the pelvis was the area of greatest restriction, with a left superior innominate shear, left superior pubic shear, left/right sacral torsion and right anteriorly rotated innominate (it was noted that the end feel of this motion was markedly better than her initial visit). She was treated using a combination of high velocity/low amplitude, muscle energy and functional techniques. Her glasses were evaluated cranially and did not need further adjustment at that time.

This patient has been followed for over two years with approximately monthly visits for osteopathic manipulation and checkups on her glasses. She has had two minor revisions on her prescription. Both times the right eye did not change, but after the first revision, the left eye no longer needed any spherical correction (plano). While her back pain has been significantly reduced we are evaluating the need for prolotherapy to see if that could help alleviate any residual low back discomfort or instability.

Discussion:

In this case the patient's symptoms appeared to be a direct result of visually induced somatic strain influencing the cranial bones and causing headaches and chronic lower back pain. This explanation seems reasonable because of the patient's unresponsiveness to other forms of care, her positive response to the OMT and cranial care, the comparative diagnosis evaluating patient with eyes open and closed or with and without light, the ophthalmological prescriptive modification and then modification of the eyeglasses.

Diagnoses of cranial strain patterns consisted predominately of palpatory tests for the following patterns, which are commonly found in cranial osteopathic examinations [7]:

- flexion
- extension
- torsion (left or right)
- side-bending rotation (left or right)
- lateral strain (left or right)

- vertical strain (superior or inferior)
- compression

Testing for inter- and intra-examiner reliability of cranial bone dynamic patterns has been performed with some success [8-13]. A recent study had particularly significant findings for intra-observer reliability for cranial strain patterns as were used in this case report [14].
In this case the majority of the patient's symptoms appeared to be a direct result of visual somatic strain influencing the cranium and causing lower back pain and other complaints. It can be reasoned that her uncorrected eyestrain (astigmatism) resulted in abnormal tension (lateral strain) on the cranial bones that induced the strain patterns that resulted in the patient's lower back pain. This was noted by comparing the patient's cranial movement and strain patterns with the eyes closed and covered (no visual input) with the eyes open (visual input). The process of light entering the patient's visual processing system resulted in cranial strain (visual somatic strain). This strain was neutralized with eyeglass lens and frame adjustments. This reduced the strain on the patient's cranium so that it no longer adversely influenced the lumbar and sacral area via the dura and its connections. The eyes were able to relax and not place abnormal tensions on the cranium.

Postural reflexes can be subcategorized as the following: visual righting reflexes, labyrinthine righting reflexes, neck righting reflexes, body on head righting reflexes, and body on body righting reflexes [15]. Therefore, it is possible for visual righting mechanisms to have an influence on posture which could affect the ability of the low back to respond to head/neck postural righting. This may be a contributing factor in some patients presenting with vision-related low back pain. Vision, craniomandibular, cervical and postural balance have been found to have clinical interrelationships [16-8].

Baroni, et. al., [19] evaluated two astronauts during space flight using kinematic analysis. "The astronauts were instructed to perform specific axial movements from an erect, upright posture. Their results suggest that visual input for postural control may be independent of gravity-based postural cues." [20]. Another seemingly unrelated study found that a stress response to respiratory systems in women consisted of an increase in vision, headache, and back pain [21]. It is not clear in the case presented in this paper whether the increased stress secondary to hormonal imbalance may have been related to her particular condition.

With this patient, the pantoscopic tilt of her glasses was a major influence on her postural muscle tension. Pantoscopic tilt (which is the degree of vertical tilt of the lens toward the cheek) [22], can significantly influence the suboccipital muscles of the neck (and dura) directly [23-4], and all of the other postural muscles indirectly. The prismatic effect from light entering the tilted lens of the eyeglasses causes light to deflect (prism) superiorly or inferiorly from the patient's perceived horizon line [25]. If the resulting light does not strike the fovea, the head corrects for this by moving the chin superiorly or inferiorly [25]. This correction results in a prismatic effect on the light entering the lens of the eye that opposes the external prism and returns the focus to the fovea [25]. This optical correction affects the postural muscles that are now required to hold the head at a non-neutral location on the neck [25]. This prismatic effect and its influence on the body can be noticed in automobiles with sloping glass, eyeglasses, and even seemingly eutropic individuals whose fovea do not receive light from the perceived horizon [25].

The anatomical relationship between the cranial and sacral dural attachments [26] could result in lower back pain [27] if the dura was placed under tension from the body's correction of a prismatic effect. When combined with the strain on the postural muscles from the non-neutral head tilt, lower back pain with a visual origin may result.

This patient's case had an initial straightforward presentation, but her pain was not completely due to visual somatic strain. Even after visual correction her symptoms did not completely resolve. Subjectively her pain improved by 80%. Thus, the majority of her pain may be related to a visual somatic strain, since it resolved after prescribing and adjusting eyeglasses.

Much of the knowledge of osteopathic visual somatic strain has come about in the last ten to fifteen years from Jim Jealous, DO, Joe Field, D.O., Paul Dart, M.D. and others. They have mapped out the effects of visual strain on the cranial system and worked out corrections for these problems. In this case, the patient's eyes were not adequately assessed after her surgery to find out if any visual correction was necessary. The patient likely slipped through the system because her vision had no major disturbances. She was able to see 20/20 without correction, although she had some blurriness with her left eye when tested alone. She met the legal requirements to operate a motor vehicle and the standard of care was met [28]. However, her left eye astigmatism led to a persistent lateral strain (from non-corrected cylinder), flexion lesion (from non-corrected sphere), and torsion (from non-corrected cylindrical axis) [25]. These effects of her lens implants were present even with her eyelids closed, but were increased when she opened her eyes [25]. Lateral strains are a non-physiologic pattern and can cause headaches [29]. These strain patterns can restrict motion of the extraocular muscles and can lead to ophthalmologic migraines and back pain [30]. There is a reciprocal relationship between the cranium and the pelvis due to the dural attachments. This contributed to this patient's low back pain and headaches.

Conclusion:

This case study illustrates that a subset of patients may present with a clinical condition that either affects vision or the vision affects the condition. This dynamic interrelationship can be classified as a visual somatic strain. Functional assessments to evaluate for a visual somatic strain can be used to improve the neuromusculoskeletal head, neck, and postural kinematics where vision plays an important role. Collaborative efforts can be made to develop interdisciplinary co-treatment opportunities between osteopaths, chiropractors, podiatrists, ophthalmologists, dentists, and other allied professionals so that the sufferers of the effects of visual somatic strain can be helped and their quality of life improved. Greater research into this phenomenon should be investigated initially with case controlled and clinical based studies.

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Treatment of Low Back Pain by Cranial Adjustment: A Case Report.

William J. Boro, DC

Introduction:

Lower back pain (LPB) is a commonly occurring reason for patients to present themselves for chiropractic care. The evidence base of information is growing to support chiropractic's care of low back pain. Whereas a 2011 Cochrane review found "combined chiropractic interventions slightly improved pain and disability in the short term and pain in the medium term for acute/subacute LBP, [1]" Lawrence et. al., determined that "as much or more evidence exists for the use of spinal manipulation to reduce symptoms and improve function in patients with chronic LBP as for use in acute and subacute LBP [2]." While studies have found positive effects of chiropractic care for patients with acute pain a study was performed to evaluate short-term changes in care of chronic LPB. Using inflammatory markers interleukin-6 (IL-6) and C-reactive protein (CRP) a total of 9 chiropractic lower back manipulations caused the mediators of inflammation to present a normalization response in individuals suffering from chronic low back pain [3].

A comparative cost-effectiveness study of medical and chiropractic care for the treatment of LBP found that, "Chiropractic care appeared relatively cost-effective for the treatment of chronic LBP. Chiropractic and medical care performed comparably for acute patients. Practice-based clinical outcomes were consistent with systematic reviews of spinal manipulation efficacy: manipulation-based therapy is at least as good as and, in some cases, better than other therapeusis [4]." Similarly to the Roy et. al., study [3] which found inflammatory changes in chronic low back patients, Haas also found "There was a positive, clinically important effect of the number of chiropractic treatments for chronic low back pain on pain intensity and disability at 4 weeks. Relief was substantial for patients receiving care 3 to 4 times per week for 3 weeks [5]."

The purpose of this case report is to examine if there could be a possible clinical connection between lower back pain and dysrelationships of the cranium.

Case History:

A 39 year old male policeman, 5'9", weighing 275 pounds suffering from an injury, 3-4 years previously, to his lower back presented to this office. The initial injury was due to lifting a suspect on a stretcher subsequent to a fight to subdue and restrain the suspect. He had received physical therapy treatment and his LBP condition had resolved. In July of 2011 the policeman was involved in another work related altercation and injured his knee. Due to this injury, he found himself limping and once again experiencing LBP. He had his knee operated on surgically on March 2012. Following the surgery, his back pain became constant and unresponsive to rest or physical therapy. One month later (April 2012) he presented to this clinic for examination and treatment for his unremitting LBP.

Method/Intervention:

The patient complained of pain in his knees of 4/10 and pain in his low back on flexion of 5/10. The examination results included the following: Posture evaluation revealed: Hip low on the right, right shoulder low, and ear low on the left. Trendelenburg test was positive on the right, the left arm fossa test [10] positive in upper fossa, pressure to L5 spinous was positive to pain on the left. Following the exam, adjustments were performed using a Van Rumpt double thumb toggle.

Sacro occipital technique evaluation procedures and analysis [11] were used in conjunction with methods developed by Van Rumpt [12]. Using Van Rumpt's cranial patterns [12] the patient was determined to have an anterior cranial distortion pattern. In addition to cranial adjustments to the sphenoid, temporals and mandibular regions, adjustments were made to the frontal, parietals, nasal bones, maxillas, zygomatics and the occiput. All bones were rechecked after the adjustment to verify that the subluxations originally present no longer created a reactive leg response (pre- and post-assessment test developed by Van Rumpt) upon testing. Various muscles were tested to determine if a positive functional change could be found clinically following care [13].

Results:

Shortly post-treatment the patient stated that he "felt great and all the pain in his knee and his lower back had resolved." Upon getting off the table the patient responded that he felt "different." The next day, he reported a marked reduction of LBP that was sustained and it was the first time in a month that he could walk without a limp and not concurrently experience LBP. On reevaluation posture presentation revealed a right hip low, shoulders level, and left ear low. Trendelenberg was negative bilaterally, arm fossa test was negative bilaterally, however the left sided pain at L5 spinous process on pressure shifted superiorward to pain on pressure at lumbar 4 spinous process, also on the left.

Muscle	Pre-Treatment	Post-Treatment
Transverse Abdominals	+4 bilaterally	+4 bilaterally
Psoas Major	+4 bilaterally	+5 bilaterally
Adductor Brevis	+4 bilaterally	+5 bilaterally
Gluteus Maximus	+4 bilaterally	+5 bilaterally
Multifidus	+4 bilaterally	+5 bilaterally
Iliocostalus Lumborum	+4 bilaterally	+5 bilaterally
Sternocleidomastoid	+4 bilaterally	+5 bilaterally
Splenius Capitus	+4 bilaterally	+5 bilaterally
Gluteus Medius	+5 bilaterally	+5 bilaterally

Discussion:

Most cranial techniques and concepts have their basis and origin in the work of William Garner Sutherland [14,15]. He examined the bone anatomy, studied their articulations, and manufactured apparatuses to compress and put forces into his own skull in order to affect /impair its natural movement. He also used these apparatuses to correct the dysfunction that he had created in himself as a result of his experimentation. With the results of his experiments he became convinced that cranial bones moved and began developing manual techniques to create movement and undo fixations that might exist in a patient's skull.

Gray's Anatomy states that "suture closure begins at twenty-two years in the sagittal and sphenofrontal, at twenty four years in the coronal and at twenty-six years in the lambdoidal and occipitomastoid. The process is most rapid from twenty-six to thirty years then slows down and may not be complete until old age [16]." A study looking at the fronto-zygomatic suture, however, demonstrated that individuals even in their 80's and 90's still had non-union [17]. Retzlaff et. al. [18] and Todd and Lyons [19] also found that sutures do not fuse in later life. More and more there can be less and less debate about whether cranial bones move. Frymann [20], St. Pierre [21], Michael [22], Retzlaff [23], Moskalenko [24,25], and Oleski [26] have performed studies to investigate the possibility of cranial bones motion and its clinical application. The letter to the editor by Blum and Cuthbert [27] offers some significant studies suggesting that cranial bone therapeutic interventions does have evidence based support.

The methods and chiropractic techniques used in this case study were those developed and researched by Richard Van Rumpt, D.C [28,29]. "VanRumpt (1904 - 1987) was a professional boxer in New York at the young age of 16. When Dr. VanRumpt and the other boxers would prepare for a fight, the boxing trainer did a rudimentary leg check before performing a cervical manipulation. This experience left him with a curiosity about leg checks, and he subsequently spent many years observing the phenomena involving dynamic changes of relative leg length [30]." Van Rumpt graduated from National College of Chiropractic in 1922 and by the late 1920's had met Dr. Major DeJarnette and became his student . Not much later he was chosen by DeJarnette to head up the SOT east coast research group. By the late 1940's the two men parted ways and Van Rumpt began to teach his own adjusting technique and system of subluxation analysis.

Van Rumpt's protocol was fairly direct. He had discovered a neurological reflex that was elicited when the feet of a patient are moved very specifically around an axis of rotation of the subtalar joint [31]. When one foot is fully everted and the other foot is everted only half way, a whole body reflex is elicited which triggers contraction of muscles all along the half-everted side of the body creating a relative short leg to occur. That shortening can be as little as an 1/8 of an inch or more than a full inch. Once the doctor has established this "leg shortening reflex", he/she can use it as a feedback tool, in conjunction with a body tissue challenge, to identify the presence of nerve interference almost anywhere in the body.

A study by Shelley found a positive response relating to fertility with a 32 year old female and initially "surface EMG showed significant muscle asymmetry,with a marked elevation of muscle tension on the left side in the area of L3 [32];" whereas a follow-up at 6 weeks found that "surface

EMG showed a substantial improvement in muscle symmetry, as well as a reduction in the muscle tension previously noted at L3 [32]."

Van Rumpt utilized a simple Descartian system of three dimensional analysis to determine if the body's proprioceptive receptors are working properly. The doctor challenges any anatomical structure to the right or the left, anterior or posterior, cephalad (superior) or caudad (inferior). After challenging the structure, the doctor performs the foot eversion procedure to check for leg shortening. If the reflex activated leg demonstrates relative shortening, then there was some mechanoreceptor dysfunction, assuming that the reflex was not inhibited at the spino-cortical level. Purportedly if there was no response to the "subtalar reflex challenge" that it was due to some inhibition of the local proprioceptor response, and therefore there was no interference with the reflex activated leg mechanism. The doctor would then adjust the "offending" structure to reset the proprioceptor, removing the subluxation.

Applying this to the cranium, Van Rumpt researched challenging the external bones of the skull, including the sphenoid, temporals, parietals, frontal, occiput, maxilla, zygomatic, nasal bones and mandible. He analyzed for anterior, posterior, superior, infierior, medial and lateral subluxations. Van Rumpt identified what he called four basic patterns of subluxations: an anterior pattern, a posterior pattern, or a mixed pattern. The anterior pattern consists of an anterior-superior sphenoid, anterior-superior temporal bones accompanied by an anterior-inferior mandible. The posterior pattern consists of posterior-inferior sphenoid and temporal bones, accompanied by a posterior-superior mandible. A mixed pattern consists of one side of the cranium having an anterior pattern and the other side of the cranium having a posterior pattern of the sphenoid and temporal bones. The fourth pattern consists of a skull which does not follow any of the other three configurations, wherein any of the bones may be atypical.

Van Rumpt wrote very little about his research and cranial techniques [12] and likely incorporated a wide variety of chiropractic cranial methods of care such as DeJarnette [33]. Van Rumpt's approach, however, excepting significant concern for proper anatomy, bears little resemblance to other cranial techniques. The analysis is not based on findings of visual observation, palpation or limited ranges of motion of the cranial bones. Rather, the focus of the adjustment is determined by the assumed bio-electric reaction that the patient's body has when the cranial structure is challenged and found to not be communicating appropriately with the central nervous system [34].

There are various possible rationales why a cranial adjustment might have facilitated this patient's relief of lower back pain. Theoretically correcting cranial bone imbalance could change the center of gravity of the skull thereby causing a general shift in posture contributing to the relief of back pain. Correcting cranial subluxations may change the intermembranous tensions of the dura allowing for improved cerebrospinal fluid circulation and a better integrative firing pattern of nerve impulses down the spinal cord returning muscle activity to previously impaired muscles.

In a 2009 study, Unger et al described a change in cranial bone distortions patterns due to modification of the pelvis via pelvic wedges or blocks with a supine patient [6]. Chinappi and Getzoff suggested that based on their study the position of the jaw, head and vertebral column,

including the lumbar region, are intricately linked [7]. Beck and Blum found that a patient who had a relationship between visual dysfunction and LBP, had improvement in vision and LBP through the use of cranial manipulation [8]. While Fink also discussed a functional relationship between the craniomandibular system, cervical spine, and the sacroiliac joint [9], research studying a relationship between cranial adjusting and low back has not been readily found in the literature.

Conclusion:

While there have been few studies investigating Van Rumpt techniques in the treatment of back pain, in this one case, it appears that a "Van Rumpt style" cranial adjustment offers a therapeutic benefit to an adult with chronic lower back pain. With case reports where there are no control groups utilized, there is always the chance of biased reporting. It is also possible that the improved clinical findings are related to a regression to the mean. However, considering the relative immediate response to care and the prior unremitting nature of the condition (4 weeks), as well as its lack of improvement to rest or physical therapy, suggests a compelling temporal relationship. Further research is needed to determine how long this improvement will last from this one correction. Also further research would help determine the best subset of individuals with lower back pain who might be best served by this type of cranial adjustment.

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The Relationship of Cranial Facial Growth and Development to the Sacro Occipital Technique (SOT) Category System: Three Case Studies.

Harvey Getzoff, DC

Introduction:

The intent of this paper is to examine whether deficiencies in cranial facial growth and development can impede normal homeostasis of functional systems as described by the SOT Categories[1]. Cranial facial growth and development is determined by the growth of its various structural parts in relationship to the development of its organs, functional spaces and soft tissues of the head necessary for human function[2]. The organs are the brain, eyes, ears, teeth and tongue. In addition to the four pairs of sinuses, the functional spaces include the nasal and oral pharynx used for ingestion and respiration[3]. The soft tissues are the muscles and the periosteal tissues lining the sutures, sinuses, mandibular condyle, teeth and the surfaces of the cranial bones.

Ian Walters in his chapter on Craniofacial Orthopedics in Darryl Curl's book *Chiropractic Approach to Head Pain* states that, "Alteration in shape, size and position of bone as well as its origin and maintenance are secondary, compensatory and obligatory to prior changes in soft tissue, organs and functional spaces[4]." The growth and development of the cranium is a process of outward displacement essential to life. Walters refers to it as, "microcosm of an expanding universe[4]." An often found limitation of cranial facial growth and development in the mid face (primarily the maxillae), inhibits not only respiration but the positioning and development of the mandible. This results in malocclusions and TMJ disorders. Albert Chinappi DDS wrote in his paper "The Unity of Form and Function-A Dental Paradigm," that, "the mandible hasn't been allowed to develop to its full potential because of maxillary constriction[5]."

The three functional systems in question are the Primary Cranial Sacral Respiratory Mechanism[6] (PCSRM) (SOT category one), the weight-bearing system of the body (SOT category two) and the lumbar spine and its relationship to the cervical spine and the pelvis (SOT category three)[7]. Major Bertrand DeJarnette, D.C. founder and developer of the Sacro Occipital Technique (SOT)[8,9] addressed the understanding of human function by classifying three clinically definable but interrelated categories. These categories not only have methods of identifying the level of dysfunction (called indicators) and specific treatment protocols, but they give us a model of function for which to strive[7].

Category One addresses The Primary Cranial Sacral Respiratory Mechanism (PCSRM). The PCSRM is a system of harmonious functional units that allows the central nervous system to be nourished and protected as it regulates and coordinates function throughout the body. The components of the PCSRM are the inherent motion of the sacrum and the cranial bones/sutures, the dura and it attachments, the movement of cerebral spinal fluid and the expansion and contraction of the ventricles and the brain[6]. Upledger states that, "The physiological nature of the suture determines the type of motion in which it participates and which it will allow[10]." This is not an isolated concept and has been also discussed by Retzlaff[11] and Moss[12].

Category Two addresses the weight bearing qualities of the body as it functions in a gravitational environment. Further stated, Category Two is the ability of the weight bearing structural system of

the body to fully communicate through the nervous system so that maximum weight bearing function can occur within the demands of a gravitational environment. Roger Sperry PhD, determined that, "90% of the brain's activity is used to balance your body within the gravitational field of earth[13,14] ." In SOT the key components of the weight bearing system are the weight bearing portion of the sacroiliac joint, the entire spine, the cranial suture system along with the position of the head[15].

Category Three addresses subluxations of the lumbar spine and its compensatory methods. As stated by DeJarnette in his 1980 SOT Manual, "The lumbar subluxation is primary in the Category Three[16]." Understanding the importance of the compensatory qualities of the cervical spine, the styloid processes of the temporal bone and the pelvis to the lumbar spine can be crucial in identifying and adjusting the Category Three[17]. The Step Out Toe Out (SOTO) procedure is a key component of Category Three, helps define the severity of the lumbar subluxation while initiating a pelvic response[18].

The following case studies will examine not only the functional systems in question but the cranial and dental findings as they relate to these three patient presentations.

Case Study #1

Female, Date of birth, 11/08/1947.

Basic History: Initial visit on 3/20/1985. The patient's symptoms included left jaw joint pain, difficulty opening mouth and chewing, teeth feel out of alignment, pain sudden, and onset three weeks previous after yawning. Also reported was left neck pain and generalized headaches. Prior to onset of jaw joint pain the natural spaces between the two upper central incisors and lateral incisors had been closed by a dentist.

Key Findings: On standing plumb line analysis the head was positioned with a noticeable head tilt (left ear lower than the right) associated with the left shoulder higher than the right. Standing with eyes closed there was motion in all directions, limited, while always returning to the center. In the seated position the cervical ranges of motion were limited on the left in both lateral flexion and rotation. There was a left leg length deficiency with heel tension (reduced manual induced ankle dorsiflexion). Palpation of the occipital fibers[19] revealed a line two area five on the left along with a thoracic seven line two finding. Occipital fibers are swelling at the region of the suboccipital region that DeJarnette utilized to assess visual and vestibular righting and specific vertebral imbalance. A right crest sign (increased paravertebral muscle tension at L4/5 region) was related, via a Lovett Brother Relationship[20], to the ipsilateral temporal bone function and indicated a right temporal bone imbalance. Utilizing the SOT cough test, the sacrum was found to be in nutation and termed an SB+[21]. There was no arm/fossae[22] or step out toe out[18] findings. There was no leg length discrepancy in the supine position. Cranial ranges of motion revealed restriction of the right maxillary/malar and temporal/frontal sutures[23]. The left temporal mandibular joint (TMJ) was painful and restricted on opening.

SOT Diagnosis: Category one with right temporal and frontal external restriction as the key findings were found and did not clear with pelvic blocking. All SOT findings (indicators) were addressed as part of the category one adjusting protocol[1]. A referral to the Orthodontist was made at the initial visit, because of the recent dental history, the difficulty opening the mouth, and the appearance of a maloclussion.

Dental Diagnosis: Class 2 division 2 occlusion with a deep bite, a retruded jaw and a narrowed maxillae.

Summation: After three weeks and six adjustments the pain and dysfunction were reduced. All findings were still present but with greater mobility of the cervical spine. Orthodontics was begun five months after her initial chiropractic adjustment. She successfully completed orthodontics (maxillary expansion and mandibular repositioning). The dental spaces were reopened, enhanced laterally, and later all spaces were restored with bonding. At her adjustment in mid-January 2013 she stated she has not had a headache or jaw pain, which had persisted for twenty five years. There was no head position or cranial findings and the patient attempts to receive chiropractic adjustments approximately every 3 weeks.

Case Study #2

Male, Date of birth, 08/12/1947.

Basic History: The patient noted pain in his right hip area and down the right leg posterior and lateral and into the right ankle. There was numbness in the right foot. There was mild pain in the lumbosacral area. Sitting, bending, getting up and standing worsened all symptoms. The onset was two months prior to the initial visit on 01/17/1983. There was no history of trauma but there was a previous episode 5 years earlier. He reported having difficulty sleeping due to the pain and was taking three different medications for the pain. The patient was referred by the orthodontist to the chiropractic office because of the extensive back, hip, and leg pain.

Key Findings: On the plumb line the head was positioned with the left ear lower than the right, while the spine was leaning to the right with very limited motion when the eyes were closed. The right styloid process was tender to palpation[17]. There was a right leg length deficiency, a left iliofemoral joint restriction and a right SOTO restriction[18]. Tenderness was elicited at the interspinous space of lumbar 4/5 when palpated. The Straight Leg Raise (SLR) [24] was possible bilaterally at 40 degrees and the right psoas muscle was constricted. Cranial ranges of motion[23] revealed restriction of the left maxillary/malar suture. The left TMJ was restricted on opening.

SOT Diagnosis: Category three, with a subluxation of lumbar 4/5 and resultant disc pathology as the key finding was found on evaluation. All SOT findings (indicators) were addressed as part of the category three adjusting protocol[1].

Dental Diagnosis: Class 2 Division 2 deep bite, with missing lateral incisors and narrow maxillae. The left TMJ was in a closed lock.

Summation: After 5 and ½ weeks and 15 adjustments the pain was greatly reduced. Pelvic blocks were no longer necessary to reduce any pelvic torsion or discopathy. There were no spinal lean or unilateral styloid tenderness. There were no longer any psoas, iliofemoral or SOTO findings. The SLR progressed to 60 degrees bilaterally. Orthodontics began 04/12/1983 and was successfully completed 1 year later (maxillary expansion, mandibular repositioning). The orthodontics was so successful that the lateral incisors were able to be restored and the TMJ functioned normally. The patient was last seen in the chiropractic office December 2012 doing well, and presently receives one adjustment per month as a preventive measure. As of April 2003 it was noted that since December 2012 normal head position has been found at each chiropractic visit.

Case Study #3

Female, Date of birth 06/15/1966.

Basic History: The patient's initial office visit 06/09/2003 and she presented with bilateral TMJ pain primarily on the right with generalized headaches which began 4 months prior. The initial onset of the pain was 8 years prior to the initial office visit. Bilateral neck and trapezius tightness was presented along with a chronic history of ringing in the ears, allergies and sinus problems. The patient was referred to the office by the Orthodontist.

Key Findings: On the plumb line the head was position on the right while the spine was curved to the left. There were unilateral differences at the thoracic 1/first rib junction and postural instability when the eyes were closed. There was left leg length deficiency with a left upper arm/fossae finding (findings of weight bearing sacroiliac joint instability)[22]. Also found was a right rotational restriction of the cervical spine and an occipital line[19] 2 area 4 - thoracic 6 subluxation. The cranial ranges of motion[23] revealed restrictions primarily at the right maxillary/malar suture. The right TMJ was unable to translate and opening was limited

SOT Diagnosis: Category two (weight bearing sacroiliac joint instability) with right maxillary/malar suture restriction as the key finding was found. All SOT findings (indicators) were addressed as part of the category two adjusting protocol.

Dental Diagnosis: Class 2 Division 2, narrow maxillae, with a right cross bite. There was a history of a four bicuspid extraction and a closed lock of the right TMJ.

Summation: Improvement was significantly noted regarding head position, negative arm/fossae finding, no leg length differential, stability during plumb line analysis, full cervical ranges of motion, along with normal cranial and the TMJ findings. Orthodontics began one week after her initial office visit. There were 15 adjustments over a 9 month period. Orthodontic care was successful relative to maxillary expansion with the result that the cross bite was eliminated and her mandible was restored to a more functional position leading to normal translation and opening.

Discussion:

Cranial facial growth and development is an ongoing homeostatic process affected by the development of organs, functional spaces and soft tissue responses influencing osteoblastic and osteoclastic activity to maintain structural integrity. Guyton in his text book *Human Physiology* says, "the shape of bone can be rearranged for proper support of mechanical forces by deposition and absorption of bone in accordance with stress patterns[25]." Arey in his textbook *Developmental Anatomy* stated, "although the shape of a cranial bone and its architectural design are hereditary the final appearance is modified in conformity with the stresses actually encountered in post natal life[26]." Wolff's law states; "The shape of a bone depends upon the physical stresses applied to it".[27,28] Ian Walther sums up the process by stating that, "The periosteal matrix (soft tissue) may therefore be said to orchestrate growth through a concert of apposition and resorption[4]."

While the cranium is responding to the developing soft tissue, organs, and spaces, the rate of growth is ongoing and defined. Chinappi describes it this way:

> "The vault and cranial base develop first because of their relationship to the expanding brain. This growth is complete by about six years of age. In close proximity to the cranial base, the second growth area is the mid face or maxilla. The growth in the width of the maxilla is ninety five percent complete for males and ninety eight complete for females by twelve years of age. The growing mandible depends on the process of intra-membranous bone formation and remodeling for the bulk of its substance. The overall mandibular remodeling and condylar growth are geared to accommodate housing for the developing teeth to adapt to the mandibular displacement movements and to adapt to the complex growth changes occurring throughout the whole head[5]."

Cranial bone development is both controlled and responsive to the functional needs of the tissues involved. It is important to understand that mandibular positioning as well as head position is dependent on the growth of the mid-face (the maxillae) and the need for the mandible to sustain function. Chinappi states that "Ultimately, the malocclusion is a result of the system failing to provide a correct environment. Once the maxillary dentition has made its accommodation to the process, the later developing mandible is at mercy[5]."

Chinappi comments on the effects of maxillary expansion and mandibular repositioning by saying that "unexpected but frequent observed functional changes include improvement of the cervical curve and relief of temporal mandibular disorder type symptoms including but not limited to headaches and muscle spasms[29]." DeJarnette noted that "the cranial lesion can produce any effect humanly possible to produce in the human body and it can affect all tissues of that body[30]." The stressors associated with poor head position are both neurological (vestibular and proprioceptive)[31] and mechanical (postural and the destructive effect on all types of soft tissue). Physicians should consider cranial growth and development as part of patient evaluation and care. Chinappi suggested that orthodontic care be based on "a philosophy of treatment that seeks to alter the shape of the bony alveolus in the maxilla and, in turn, the location of the mandible and its alveolar processes[29]."

As summarized by Donald Enlow in his textbook *Facial Growth* "Development is a process working toward an ongoing state of aggregate, composite, structural and functional equilibrium. Any change

in any given part must be proportionately matched by appropriate growth changes and adjustments in many other parts, nearby as well as distant, to sustain and progressively achieve functional and structural balance of the whole[32]."

Conclusion:

It appears that head position and cranial function can be altered by deficiencies in cranial growth and development. Structural functional systems also respond to head position and cranial function. Cranial and dental diagnosis can play a critical role in functional systems' assessments (SOT categories). Application of the theory that maxillary deficiencies and resultant mandibular positioning associated with postural accommodations can be co-treated with dental and chiropractic procedures was examined in this paper. The success of these three cases, each representative of one of the three SOT categories, demonstrates that a chiropractor and a dentist working together can create synergistic beneficial outcomes. Further research is indicated to examine dental and chiropractic interdisciplinary care for a subset of patients with compromised dental growth and development consistent with functional system breakdown.

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A Shared Legacy: early cranial manipulation in osteopathy and chiropractic.
Michael Greer

Introduction:

Nephi Cottam is widely regarded as the originator of cranial manipulation in chiropractic, and William Garner Sutherland is often cited as the first developer in osteopathy. However, they were not the only practitioners to develop cranial concepts at the beginning of the 20th century. By mid-century chiropractors Willard Carver, Leo L. Spears, and Major Bertrand DeJarnette as well as osteopaths Dain L. Tasker, Charlotte Weaver, and Beryl Arbuckle, to name just a few, had developed cranial concepts. This research identifies and discusses the available comparative literature on the history of cranial manipulation in chiropractic and osteopathy in the first half of the twentieth century. To conduct this literature review, the researcher used multiple search strategies which yielded 11 relevant sources, including 7 articles, 2 senior research projects and 2 books, from the years 1981 to 2012.

Across three articles[1,2,3], chiropractor Calvin Cottam names dozens of practitioners who used cranial manipulation, all in an effort to establish that his father, Nephi Cottam, was the first to use cranial manipulation for health benefits. This information mostly takes the form of names and dates. There is very little detailed comparison of theory or technique, mentioning only the technique of Leo L. Spears, Richard Van Rumpt and Dain L. Tasker. Another article by Cottam and Erin MacGillivray Smith[4] also spends about half of its text trying to establish that Nephi Cottam, and not William Garner Sutherland, was the first developer of cranial manipulation. Cottam and Smith cite eleven other pioneers, but again acknowledgement of their contributions is in the form of names, and in some cases published works, only. Only the techniques of chiropractors Richard Van Rumpt and Willard Carver are described. Relatively little space is devoted to osteopaths, one exception being Dain L. Tasker.

In her senior research project, future chiropractor Mary Harrington[5] describes Sutherland's elements of the PRM (primary respiratory mechanism) and then focuses her attention on chiropractors Nephi Cottam, George Goodheart, and especially Major Bertrand DeJarnette. Harrington spends little time comparing the techniques or theory of any two cranial manipulators. An article by chiropractor Charles Blum[6] proposes that Sutherland and chiropractor Nephi Cottam were the two main originators of cranial manipulation. Chiropractor Doug Hays[7] mentions a number of early cranial manipulators, both osteopaths and chiropractors, but again we see that Cottam and Sutherland emerge as the leading figures. Hays acknowledges chiropractors George A. Cole and Willard Carver and also introduces us to chiropractors Joseph Janse and Frank L. Finnell, who developed the Nasal Specific Technique. This latter technique is briefly described. Hays also recognizes osteopaths involved in the early development of osteopathy in the cranial field: Harold I. Magoun Sr., Paul Kimberly, Howard and Rebecca Lippincott, and especially Beryl Arbuckle.

The most comprehensive book on cranial manipulation across several professions - Leon Chaitow's[8] *Cranial Manipulation: Theory and Practice* (1999) - focuses most of its attention on the developments in the second half of the 20th century. His coverage of the early history, both

theoretical (except Sutherland's) and practical, is virtually non-existent. Nephi Cottam, Charlotte Weaver, Beryl Arbuckle are treated briefly.

Torstem Liem[9], on the other hand, acknowledges Charlotte Weaver as a co-developer of osteopathy in the cranial field. He also touches on osteopath Dain L. Tasker. Liem does discuss the contribution of chiropractic to cranial manipulation, but in a mere three short paragraphs. He mentions chiropractors Nephi Cottam, and Major Bertrand DeJarnette, and mentions in passing the contribution of Willard Carver, Leo L. Spears, and Richard Van Rumpt. What Liem also does is provide a chronological table of the major contributors to the development of cranial manipulation, outlining their major contributions in a sentence or two. In short, Liem's history of cranial manipulation provides a good, but rudimentary, introduction to the history of cranial manipulation.

Conclusion:

This research confirms that there is a scarcity of in-depth, comparative literature examining the early cranial concepts emerging from chiropractic and osteopathy. There is a gap in the literature. Further comparative research would serve to foster a broader understanding of the roots of the phenomenon of cranial manipulation and the extent to which it evolved along a parallel time frame across the two professions. A greater knowledge of *all* developments in cranial manipulation will inform our knowledge and practices of chiropractic craniopathy and osteopathy in the cranial field and serve to acknowledge the early pioneers in chiropractic and osteopathy who shared a legacy in the exploration of the cranium, its mobility, and its manipulation for health benefits.

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Michael Greer is a registered massage therapist (RMT) who lives and works in Nova Scotia, Canada. AT t he time of this published article he was a 5th year student of osteopathy at the College d'Etude Osteopathique in Montreal (Halifax campus) and is currently writing his dissertation on the early history of cranial manipulation in chiropractic and osteopathy. He welcomes any e-mails on that subject at michael_greer@hotmail.com (underscore between michael and greer).

Chiropractic care and its effects on a patient with a moderate traumatic brain injury.
Ryan Pollard

Introduction:

Chiropractic is a health care profession that has an emphasis on disorders of the musculoskeletal and nervous systems. Chiropractic care is used to treat neuromusculoskeletal complaints, including but not limited to back pain, neck pain, joint pain and headaches[1]. There has been emerging evidence that suggests chiropractic care may play a role in treatment of head injuries.

According to Ghajar, "with the increase in the attention to traumatic brain injuries, there has been a call to find ways treat these injuries. A moderate traumatic brain injury has been defined as having a Glasgow coma scale score of 9-13 and includes symptoms like lethargy and stupor[4]." Ghajar goes on to note that "… neurological damage does not all occur immediately at the moment of impact but evolves afterwards (secondary injury). Most secondary brain injuries are caused brain swelling with an increase in intracranial pressure and subsequent decrease in cerebral perfusion leading to ischemia[4]." Some mild traumatic brain injuries and most severe injuries can cause permanent impairments[5]. A persistent headache is a common symptom following a minor head injury concussion possibly related to simultaneous injuries of structures of the cervical spine[6]. Headaches that result from head trauma are often accompanied by other symptoms such as dizziness, difficulty in concentration, nervousness, personality changes and insomnia. These constellations of symptoms are known as "post traumatic syndrome[7, 8]."

Chiropractors use multiple techniques to analyze the biomechanics, structure and functions of the spine to assess how the vertebrae may be affecting the neuromusculoskeletal system. The effects of vertebral neuromuscular dysfunction are termed "subluxations" within the chiropractic profession. A subluxation is defined as a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity and may influence organ system function and general health[11,12]. There are various techniques used to analyze and treat subluxations. The technique that was used in this case was Sacro-Occipital Technique (SOT), developed by Major Bertrand DeJarnette DO, DC. Dr. DeJarnette created three specific categories that are associated with the anterior and posterior aspects of the sacroiliac joint and lumbosacral region. These categories have methods of identification (called indicators) offering pre and post treatment assessment, protocols, and a system based approach to care[9, 10].

The purpose of this paper is to discuss how conservative chiropractic care and specifically SOT may be utilized to treat a patient suffering from the long-term effects of brain trauma.

Case Report: *Patient History*

The patient presented for chiropractic care in 2003 presenting with secondary symptoms related to injuries from a moderate traumatic brain injury. He had been thoroughly evaluated multiple times by both an orthopedist and neurologist prior to presenting at this clinic. Those examination findings were incorporated into the chiropractic evaluation and assessment.

The patient was injured in 2003 while working as a construction supervisor on the set of a television program. He was struck twice in the head. The second blow rendered him unconscious. He was taken to the urgent care and treated by a worker's compensation doctor who sutured the open head wound was told to rest.

Subsequent to being dismissed by the urgent care physician he experienced neck pain as well as difficulty with thought processes, difficulty with concentration, irritability and short temper, phonophobia, difficulty reading and comprehending, short and long term memory, blurred vision, balance difficulty, hot flashes and night sweats, fatigue, sleep difficulties, dizziness, severe headaches, and sensations of disconnectedness.

A review of the reports from the urgent care doctor, neurologist, and orthopedist note that the patient had a well healed laceration on his head, with no battle signs or raccoon eyes noted. His blood pressure at the time of their evaluation was 120/70, 70 per minute pulse, and 12 breaths per minute. The urgent care doctor reported that the patient had trouble concentrating and providing full history. At that initial post-accident examination he showed no deficits with his neurological exam, though he did have diminished grip strength in his right hand and a trace drift.

An MRI following the urgent care visit was performed that found a 2x2x1 centimeter mass of mixed signal in the right cerebellar peduncle involving the right superior pars. It noted a subacute hemorrhage and calcification suggestive of an injury to the skull. The medical radiologist reviewing the study suggested that the signal consistent with a cavernous angioma.

The neurologist's report following the injury described that the patient had decreased sensory finding with spotty distribution without clear dermatomal pattern loss. Deep tendon reflexes were brisk on the left as compared to the right. Plantar stimulation was ambivalent bilaterally. His gait was moderately wide and ataxic. He was unable to perform tandem gait, and Romberg was positive. He was diagnosed with post closed head trauma with residual post traumatic head syndrome, including headaches, concentration difficulties, problems with coordination, difficulties with speech and mentation, emotional liability and fatigue. The neurologist remarked that it is unclear how much of the patients deficits are due to direct frontal trauma or how much is secondary to his midbrain pathology.

Chiropractic Examination

The chiropractic assessment questioned the patient regarding his function prior to the injury and he reported that he worked full time and was a high functioning martial artist. He described some exercises he commonly would perform prior to the accident which involved standing on a 4 inch by 4 inch post that was 2 feet off of the ground for one hour while performing leg kicking and then moving to the other foot and repeating this exercise. He was deeply concerned that following his head trauma that not only would he never do that exercise again but that he would be unable to stand on his own two feet securely.

The patient was observed to have difficulties with dizziness, cognition, headaches, as well as loss of balance. The patient was assessed while walking, standing, sitting, and lying in prone and supine positions. The assessment involved visual, palpation, assessing muscle strength and flexibility with the goals of looking for body asymmetry in position and function.

The patient was observed to have hypertonicity on the left of his body which appeared to affect his neck, left shoulder, scapula, rib cage, pelvis and hip. These presentations were consistent with a person exhibiting a possible upper motor lesion. Along with his multiple presenting symptoms, lack of balance, disorientation and having lost consciousness at the time of the trauma all these findings were highly suggestive of a moderate traumatic brain injury. Based on SOT evaluation protocols he was found to have left scapular fixation and increased tension at the left diaphragm, quadratus lumbar, and iliopsoas muscles. Reduced internal rotation of the right hip along with reduced external rotation of the left hip was noted. Based on cervical transverse process sensitivity he was determined to have a spinous rotation of L3/4. Findings of a posterior sacroiliac joint chronic instability syndrome (category two) was noted and it was unclear whether this was due to his fall at the time or injury or due to his unsteady awkward gait. The cervical spine was assessed with SOT's cervical stairstep procedure and a thorough cranial assessment was performed determining some cranial dural and CSF pulsation imbalance as well as temporomandibular joint dysfunction (TMD).

Interventions/Methods:

The patient was initially seen twice a month for 3 months and then approximately once a month for two years. He is still under care 10 years later and seen approximately 6 times per year. At this time a typical pattern of presentation and care has been determined. He commonly presents with tension in the myofascia on the left side of the pelvis to the left scapula and initially is treated supine as follows:

1. Release left iliopsoas muscle with SOT psoas release.

2. Release left quadratus lumborum with SOT's CMRT psoas kidney procedure.

3. Release left diaphragm anterior and posterior crural tension.

4. Release left scapula muscles so scapula can move freely.

The patient is then directed to turn over and is treated in the prone position:

1. Right restricted hip internal rotation is released with SOT hip extremity technique to free posterior hip external rotators as they attach to the posterior hip joint capsule. This technique is performed by rotating the bent leg at 90 degrees while pressure is applied to the posterior hip joint capsule.

2. He commonly presents with right C3-5 transverse process pain and swelling which relates to L3-L1 anterior transverse process rotation based on the Lovett brother

relationship or the R+ C factors as described by DeJarnette[12]. He is treated with orthopedic blocking; one block placed between the left ASIS and greater trochanter and pressure is applied on the right spinous process with pressure from right to left and is held until the right cervical transverse process pain subsides (approximately 2-3 minutes).

3. About 10% the time he will present with a positive sacral cup, which is weakness and pain on prone straight leg extension, which becomes strong and pain-free with P/A pressure to a sacral segment. When the sacral segment is found that improves function it is adjusted P/A with constant thumb pressure as he raises and lowers his straight leg. It can vary which leg and which sacral segment needs the specific pressure.

He then turns over to be treated in a supine position:

1. Consistently he presents as a Category Two and with pelvic torsion (physiological left short leg). His category two indictors relate to sensitivity at his inguinal ligament, medial/lateral knees, and particularly with asymmetrical scalenus muscle tension (most commonly on the left side). Category two blocking is both a mechanical and neuromuscular approach to affect whole body balance by reducing pelvic muscular and osseous distortion. Treatment entails the placement of wedged blocks (patient is supine) underneath the iliac crest one side and the opposite side block placed under the greater trochanter [14]. During the pelvic blocking the pain in the inguinal ligament and knees subside. Sensitivity of the scalenus muscle subsides becoming symmetrical compared to the right side. Once the sensitivity in the inguinal ligament and knees subside and the scalenus muscles become symmetrical the blocks are removed.

2. The patient's cervical spine is assessed with a cervical stairstep procedure as utilized within SOT but modified with the head laterally flexed to analyze the ipsilateral articular facet position and function. When a compromised articular facet is found, most commonly fixated, the joint is held at the particular cervical stairstep step with the head laterally flexed and pressure is applied vectored to the cervical vertebra to facilitate tissue relaxation. The whole cervical spine is assessed and treated in this manner until normal coupling motion is attained throughout the cervical spine.

3. Following balancing the cervical spine motion and position then the cranium is assessed and treated. Generally the internal periosteal/meningeal dura is assessed and balanced using sphenobasilar symphysis technique, which assesses the cranial dura in flexion/extension, torsion, side bending, lateral and vertical strain patterns, and A/P or lateral compression strains. Theoretically the intraspinal membranes enable the cranium and sacrum to function in unison[15]. If any cranial dural strain patterns are found they are treated with gentle (commonly indirect cranial) procedures until normal cranial motion is attained.

4. Lastly his CSF pulsations are assessed by palpation and balanced so pulsation symmetry is found throughout the cranium side-to-side and anterior to posterior.

While there were no return to full function the treatment rendered appears to reduce pain and neurological imbalance for periods of time, sometimes lasting for a few weeks. The care aids with his balance, walking, and general flexibility. Following care the patient finds it easier to sleep and perform activities around his home. He has not worked since the 2003 accident At this time the care is considered supportive and the focus is to prevent worsening of his condition and facilitate sustaining his quality of life by helping him be as independent as possible.

Results:

The initial goal of his treatment was to maintain as much balance as possible in the myofascia until such a time as his nervous system could recover greater inhibitory function. There were noted improvements in his cervical range of motion that was based on doctor and patient observation. Following care the patient's gait was slightly improved, with less widened base, but any improvements were not long standing due to lapse in care. Any time care lapsed for more than a month there would be degeneration in the patient's progress.

Discussion:

Traumatic brain injury and Sacroiliac dysfunction

There have been some studies that discuss the relationship between the sacroiliac sprain, cervical spine and TMJ, but in this case this relationship is not clear. [17-20] With any form of traumatic brain injury, application of a high velocity low amplitude adjustment (HVLA) may not be indicated to the cervical spine. Prior to treating the cervical spine, treatment was aimed to reduce any reciprocal lumbar imbalances through orthopedic blocking [21]. Hochman illustrated a relationship between blocking placement to the pelvis; category two blocking not only increased range of motion in the lumbar vertebra but also within the cervical spine[14]. Giggly and Tepee also found that orthopedic blocking had a positive effect on cervical spine extensor isometric strength[22].

Chiropractors practicing SOT have traditionally found that patients can present with ascending problems from the lower extremities to the pelvis, spine and the cervical and craniomandibular regions. Other times there may be descending presentations which are lumbosacral or cervical spine dysfunctions secondary to craniomandibular, temporomandibular, or occlusal imbalances[21]. From an SOT perspective it is suggested that most patients present with mixed kinematic patterns of ascending and descending influences.

The patient appears to have an upper motor neuron dysfunction affecting the left side of his body. His altered gait and imbalance appears to ascend through his body's kinematic chain as he attempts to maintain balance via his compromised visual and vestibular righting reflexes. The patient is found to have an extremely hypertonic psoas. Knutson notes that the psoas courses in front of the sacroiliac joint and some of its fibers intermingle with the anterior ligaments[16]. So it is theorized that the increase in psoas tonicity, may be splinting secondary to his pelvic instability along with his unusual ambulatory gait. DeJarnette questioned the use of HVLA thrust

into an unstable sacroiliac joint and preferred using supine blocks (category two) to slowly reduce pelvic torsion and improve joint force closure. The loads imposed through blocking are thought to allow the sacrum to slowly approximate its position to the ilium ultimately into normal juxtaposition[22].

Traumatic brain injuries and temporomandibular dysfunction

It would be reasonable to assume both impacts to the patient's forehead may have caused a cervical whiplash injury and possibly contribute to his TMD presentation[23-25]. In the first year of treatment the patient was noted to have altered dental occlusion, TM joint translation, masticatory muscle tension, and nighttime bruxism and clenching. While treated with chiropractic cranial therapy the condition continually returned. He was referred to a dentist who produced a nighttime dental splint to protect his teeth and facilitate TM muscle balance. He was also given specific exercises utilizing tongue position to improve his TM joint translation. Treatment of the cervical spine utilized the cervical stairstep treatment which is a gentle technique that involves no thrust into the cervical spine. When an articular facet motor unit is determined to have altered motion, then the cervical spine is held at that level. While held at that level a very small group of motions can be applied one at a time[10].

SOT cranial technique uses active and passive cranial palpation evaluation assessments[26]. In various locations in the body the fascia arranges itself along a transverse plane. This occurs at the pelvic diaphragm, the respiratory diaphragm, the thoracic inlet, the cranial base and tentorium cerebelli. The fascial gliding mobility tends to be more apparent in the longitudinal direction than in the transverse. Upledger determined that fixation or restriction within any transverse planes of the fascia can easily impair the normal gliding mobility of the longitudinal fibers[14]. By affecting the sphenobasilar and releasing the fascia he could affect the transverse fascia that may affect whole body kinematic chain function[15,27].

Gregory, noted TMD was improved following chiropractic (SOT) treatment for a sacroiliac sprain and suggest that cranial treatments could help pelvic balance, and pelvic balance could be associated with helping TMJ function[28]. Gregory stated that through category two blocking unrelated symptoms have been found to diminish. Gregory found success in easing TMD and sacroiliac joint pain with as few as two separate visits performing category two blocking[28].

Traumatic Brain Injury

Data from the TBI model systems' national database suggest that change is more common than stability for long term global outcomes of subjects with moderate or severe TBI, who require rehabilitation. After ten years as many as 1 in 3 persons decline from previously achieved outcome with most deteriorating two levels on the Glasgow outcome scale[4]. There is evidence that a subset of TBI's trigger progressive degenerative processes is affecting cognitive and/or motor function[5], much like in the patient's case.

Advances in critical care such as imaging have lead to reductions in death and disabilities resulting from TBI. The next advance maybe related to prevention associated with pre-hospital recognition and the treatment and care of TBI's[4]. Too often research has focused upon a

reductionist model for the treatment of TBI, when sometimes recovery is a multifactorial process[29]. Hopefully future multidisciplinary care will be employed so that traumatize patient can be properly triaged. Hurst states that subjecting all aspects of clinical practice to audits in the chiropractic realm would demonstrate an attempt to achieve higher standards[30].

Protocols and procedures in management of traumatic brain injuries

Ideally assessments and treatments of TBI, would involve an interdisciplinary approach[31] in management of many conditions associated with TBI's. It could involve chiropractic care, neuropsychologist, speech therapist, physical therapist for balance and rehabilitative exercises, biofeedback, acupuncture, and other integrative low risk interventions.

Chiropractors as well as other health care providers need to keep in mind that treating TBI's is not a "cookbook approach" and programs need to be tailored specifically to each individual. Age, gender, socioeconomics, and culture all play a pivotal role in the patients' recovery[32]. Patients should receive a battery of questioners and physical assessments, to keep a baseline and monitor progress. The patient should be tested on the Glasgow assessment questionnaire as well to denote progress or deterioration[4]. Chiropractors treating TBI patients need to continually assess are the patient's vision, eye movement, pupil reaction, hearing, balance, coordination, mood, gait, and cardiac condition. These key elements play an important factor in a TBI patient's recovery[32,33].

With rehab of the muscles, removal of neuronal interference and normalization of the visual and vestibular apparatus, the patient may slowly improve balance and gait control. Chiropractors should encourage patients to keep a journal to help keep track of thoughts, incorporate improved memory and prevent frustration due to lack of memory. Improving sleep may be another key factor in TBI patient recovery[34]. With TBI patients stress management[35] may play an important factor since maintaining emotional stability helps the patient both personally and socially.

This case discusses a patient with chronic long-term effects from a work related head trauma causing TBI with a CNS and global whole body effect. Supportive care[36] at this clinic has focused on preventing a worsening of his condition with the hopes of over time he may develop strategies for improved function and coping. It is possible the patient might have had an improved outcome if the patient had access to greater care offering various therapeutic interventions (biofeedback, physical therapy, cognitive therapy, etc.) along with chiropractic care.

Conclusions:

This case report discusses the care of a patient who suffered head trauma and may have had a subsequent bleed of a prior cavernous angioma creating neurological related complications affecting his ability to function. The chiropractic supportive care has as its focus supporting his activities of daily living, preventing worsening of his symptoms and asymmetry, and continually working toward the possibility of improvement. With challenging TBI cases low-risk interdisciplinary care may hopefully represent future healthcare options for these

patients. Further research is indicated for chiropractic's role in the treatment of TBI patients. Also to be studied is whether supportive care represents an important strategy for TBI patients to prevent losing ability to function, having a decreased quality of life, and becoming an increased burden to society.

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Chiropractic cranial treatment protocol increases successful outcome of the multidisciplinary care model for traumatic brain injury (TBI) patients: A case series.

Esther M. Remeta, DC, Charles L. Blum, DC

Introduction:

Notoriously, all traumatic brain injury creates challenges that have various levels of negative impact on the patient's life and family. The goal of all TBI treatment plans is to try to achieve the highest state of wellness possible to increase the quality of life for the patient. Since often the prognosis of patients with TBI is dismal, offering a method of care that has low risk, reasonable benefit, and some biological plausibility is preferred. The goal of care should be to relieve patients of disability and pain while facilitating their ability to have normal activities of daily living. This article seeks to share a novel manner of multidisciplinary care, which incorporates the fields of allopathy, chiropractic, psychology, acupuncture, neurorehabilitation, and nutrition.

Case Report:

Case # 1: A 28 year old female suffered TBI from a violent attack resulting with severe debilitating headaches requiring daily bed rest for two years with her condition consistently devolving prior to initial office visit at this clinic. She was diagnosed with chronic migraines and informed that she would need prescription medication the rest of her life.

Case # 2: A 30 year old female sustained a TBI from a motor vehicle accident. PETscans noted decreased bilateral occipital lobe metabolic activity. She had chronic headaches of 2 year duration with transient paralysis of her left extremities and short term memory loss. She was informed by her neurologist that due to the duration of her post concussion syndrome that no recovery could be expected.

Case # 3: A 70 year old male suffered a TBI from a stroke causing complete paralysis of the right upper and lower extremity. He also suffered from swallowing difficulty and speech problems. His neurologist had informed him that he would never work again, would need to walk with assistance, and have compromised use of his right hand.

Treatment/Intervention:

A focal point of this multidisciplinary care at this clinic is Sacro Occipital Technique (SOT) cranial manipulation protocols[1,2] along with specific neurological rehabilitation training and home exercises. Home therapy focuses on physical, mental and emotional balance which increases efficacy of treatment. The care model is implemented for a minimum of 1 year with most patients remaining in the model for 5 years.

Results:

Case # 1: When treatment began there was a significant initial improvement along with a gradual increase in function so that now at 2 years later (1 treatment per week) headaches occur only once every 2 weeks lasting 12 hours. She is off all 10 of her prescription medications except for 1 and is currently tapering off of it under medical supervision. She now is able to live a more normal life with her young 8 year old daughter taking part in her life activities as well.

Case # 2: After 5 years of treatment (1 time per week) she is headache free, has neither short term memory loss nor any paralysis episodes.

Case # 3: After 9 months of care he was back at work full time and without paralysis, speech or swallow problems. After 5 years of care (1 treatment per week) there were no obvious symptoms associated with the left parietal lobe infarct despite brain MRI scans showing damage was still present.

Discussion:

Rehabilitation has been found effective using an interdisciplinary approach and "recovery from TBI can continue for at least 5 years after injury[3]." In another study they found, "that traumatic brain injury may cause decades-lasting vulnerability to psychiatric illness in some individuals[4]" and for a "subset of persons with moderate to severe TBI, neuropsychological recovery may continue several years after injury with substantial recovery[5]."

Conclusion:

Success was measured based on improved quality of life and return to activities of daily living along with decreased subjective and objective symptomatology. Barriers to successful outcome included patient non-compliance to treatment plan and patient financial challenges. Highest success was achieved with the 5-year model and with the inclusion of SOT cranial manipulation protocols. The temporal nature of the patient's response to care and their gradual worsening of symptoms prior to treatment at this clinic suggest the patient's conditions would have worsened. This care model gives greater hope for those suffering from TBI as well as gives the health care profession at large more options to create treatment plans resulting in better prognosis.

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Chiropractic sacro occipital technique (SOT) and cranial treatment model for traumatic brain injury along with monitoring and supplementing for neurotransmitter balance: A case report.

Esther M. Remeta, DC, Charles L. Blum, DC

Introduction/Rational:

The purpose of this paper is to present a novel treatment model incorporating laboratory testing to evaluate neurotransmitter balance and chiropractic cranial care for the treatment of a patient with traumatic brain injury.

Recently some studies have investigated a relationship between traumatic brain injury and neurotransmitters[1]. "Traumatic brain injury (TBI) releases harmful mediators that lead to secondary damage. On the other hand, neuroprotective mediators are also released, and the balance between these classes of mediators determines the final outcome after injury[2]."

Cohen et all found that "mild to moderate cases of traumatic brain injury (TBI) are very common, but are not always associated with the overt pathophysiogical changes seen following severe trauma. While neuronal death has been considered to be a major factor, the pervasive memory, cognitive and motor function deficits suffered by many mild TBI patients do not always correlate with cell loss[3]." One aspect of their research focused on the hippocampus, and how "TBI regionally alters the delicate balance between excitatory and inhibitory neurotransmission in surviving neurons, disrupting the normal functioning of synaptic circuits[3]."

Case History:

A 33-year-old female presented at this office for care secondary to an attack that included strangulation and repeated facial trauma. Her main symptom was chronic debilitating headaches unresponsive to rest, medication, or other interventions. Prior to being seen at this office she was under the care of a neurologist and taking medications, which caused her extreme side-effects, yet did not relieve her headaches.

Method/Approach:

She has been under care for three years, which consisted of chiropractic sacro occipital technique (SOT) and cranial treatment[4,5]. Within the past year laboratory tests were instituted to monitor neurotransmitter balance of the HPA axis and used to help direct nutritional supplementation. The patient was seen once per week for chiropractic care and laboratory tests, while usually performed every 4 months, in this case was performed annually. This was due to the patient not performing the laboratory tests in a timely manner, believed due to her profile, which included inability to cognitively function in scheduling situations.

Results/Effects:

Overall all of her symptoms improved which included headaches, which are less frequent, and

less debilitating. Her headaches went from being daily constant, and chronic to 2-3 times per week with significantly less intensity and debilitation, allowing her to function in her activities of daily living. Prior to care she could not function when she had a headache. While she was making good progress with the chiropractic care during the 1st two-years, when nutritional supplementation based on laboratory analysis for neurotransmitter balance was instituted, headaches and function improved including better sleep patterns and mental clarity.

Discussion:

With minor TBI or head trauma side-effects can present even in the absence of loss of consciousness. "In fact, there is no significant difference in frequency of reported symptoms in patients who are only stunned or dazed when compared with patients having suffered a brief period of unconsciousness. While occasionally these symptoms may be ascribed to specific injury to certain tissues of the head, experimental studies reflect that the majority of time the injury is to fine processes of the nervous system and to neurotransmitter systems[6]." Also while considered not related to TBI one theory of the cause of complex regional pain syndrome (CRPS) may be due to the "increase in the sensitivity of neurotransmitter receptors may be the cause of CRPS[7]." Alteration in these neurotransmitter receptors secondary to head trauma may be related to patients presenting with TBI and chronic pain.

Patients presenting with complex presentations secondary to TBI often are at a loss at what they might do for care. A study has found that rehabilitation can be effective using an interdisciplinary approach and "recovery from TBI can continue for at least 5 years after injury[8]." In another study they found, "that traumatic brain injury may cause decades-lasting vulnerability to psychiatric illness in some individuals[9]" and for a "subset of persons with moderate to severe TBI, neuropsychological recovery may continue several years after injury with substantial recovery[10]." A recent case series illustrated how SOT cranial care could be an effective tool in the treatment of three patients presenting with TBI[11].

Conclusion:

Treatment of brain trauma is a very individualized process and what may help one patient may not help another. It is not possible with case reports to determine if effective treatment for one patient can be generalized to the brain trauma population at large.
However, it is worthy of consideration when a patient does not respond or has an adverse reaction to medications and is non-responsive to traditional approaches that a chiropractor trained in SOT and cranial treatments might be considered for collaborative care. Greater research is needed in interdisciplinary settings to determine how this subset of patients may be best served.

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Dental-Cranial functional model and the understanding of cranial facial distortions in dentistry: A Commentary.

Richard C. Gerardo, DC, Charles L. Blum, DC

Introduction

The purpose of this presentation is to facilitate an understanding of cranial facial distortion (CFD) patterns as a reaction to compromised growth and development of the cranial facial structures, along with the results of these patterns on the whole body's kinematic chain. There are various factors that will be discussed which include cervical headgear (CHG) and its effect on craniofacial growth and development, the orthotropic paradigm, related sympathetic nervous system overload and stress, and suggestions for interdisciplinary treatment and prevention.

Cervical Headgear

Cervical headgear (CHG) has been most commonly used to treat anteroposterior (class II) malocclusions for over a century[1]. In its most common iteration, headgear attaches to the braces on the teeth via metal hooks or a facebow. Straps or a head cap anchor the headgear to the back of the head and/or neck. Elastic bands are used to apply pressure to the bow or hooks with the purpose of restricting maxillary growth so that the mandible is not too far posterior relative to the maxillary dentition. In general its purpose is to inhibit the upper jaw from growing, thereby preventing or correcting an overjet (maxillary incisors too far forward relative to the mandibular incisors).

While CHG may maintain an aesthetic maxillary and mandibular incisor positioning there are other secondary iatrogenic factors that many in the dental field have referred to as the "Head-Gear Effect" (HGE)[2]. The (HGE) causes a cranial facial distortion (CFD) associated with alterations in the growth and development of the facial structures and due those modifications in craniofacial growth and development compensations and distortions are subsequently developed throughout the entire musculoskeletal system. In order to better understand this phenomenon, the HEG's dental cranial relationship will need to be explored and discussed. As Isaac Newton noted there is always a cause and effect, an action and reaction[3]; in sacro occipital technique (SOT) terminology DeJarnette called this "resistance and contraction" (R+C) factors[4].

There is published literature that discusses the effect of cervical headgear on the cranial base and the convexity of the maxillary profile. Alió-Sanz et al noted that "cervical headgear treatment induced cephalometric flattening of the cranial base and a decrease of the angle measured from the anteroposterior relationship of the maxillary basal arch on the anterior cranial base[5]." Also Kirjavianen noted that "Cervical headgear treatment in Class II correction is associated with a decreased facial convexity caused by the restriction of forward growth of the maxillary A-point, while the rest of the facial profile, including the mandible, continue to grow forward at a normal rate[6]."

In traditional or orthodox orthodontic care, "headgear" conjures up an image of a child's face with straps that wrap around the head to some sort of metal bar that attaches to braces and mouth

piece. As previously stated, the primary purpose of this is retraction and/or intrusion of maxillary teeth (pulling them toward the back of the head). Historically the orthodontic approach tended to focus on the belief that there are too many teeth (or the teeth are too big) for the mouth. Protocol in traditional orthodontics recommends the extraction of four bicuspids[7] or premolars [8.9] to reduce crowding and make space so that they can then pull teeth together and straighten them.

However, there is significant concern amongst functional orthodontists that removing teeth can lead to various secondary issues aside from facial morphology[10]. For instance Broadbent noted that, "most occlusal "chewing" function occurs with the first molar and premolar teeth. It is reported that 90% of chewing function occurs at the first molar and bicuspid region. Physiologically oriented orthodontists must consider: soft tissue profile and facial esthetics, incisal misguidance (interference), narrow or constricted maxilla, underdeveloped or retruded maxilla, overdeveloped or prognathic mandible (Class III actual of effective condition relative to maxilla), crowding or displacement of teeth, and (TMJ) temporomandibular joints must be considered[11]."

The functional dental approach as described by Broadbent believes traditional orthodonture creates posterior pressure on the remaining six front teeth, maxilla, cranium, and compromises the airway space[12]. A primary goal of traditional orthodontics is helping the patient to achieve an attractive smile with straight teeth along with an improvement in facial aesthetics. These traditional orthodontic modalities utilized are predominately braces and sometimes headgear. While traditional orthodontic perspectives support their methods of treatment,[13] physiological based or functional dentistry questions the long-term effects of removing teeth.

Stack described how historically "providers of orthodontic services were solely concerned with esthetic/cosmetic considerations of the teeth. In more recent years emphasis has been placed on the interdigitation of the teeth in centric occlusion combined with the absence of occlusal interferences in sliding/gliding jaw movements with the teeth in partial contact with each other (protrusive, cuspid disclusion, etc.) [14]." He continued that, "still more recently true jaw function, or, function of the entire stomatognathic system, as opposed to the more limited functional movement of the teeth as influenced by their inclined planes when in partial occlusion, has come to the fore[14]."

So in conjunction with removal of teeth and use of headgear, the term "headgear effect" (HGE) has been used in dentistry to describe the "downward and backward growth" of the oral facial structures even without the use of cervical headgear. This pattern of growth and/or development in SOT cranial terminology would be called a "cranial facial distortion" (CFD), which can have a relationship to the cranial-sacral and the musculoskeletal systems as well as the oral facial structure.

Clinically it is believed that the CFD is associated with restricted or distorted growth patterns of the upper jaw inhibiting normal growth patterns, restricting upper arch width and/or length. Since the lower dentition will attempt to fit within the shape of the upper dental arch this upper arch restriction may lead to decreased growth and advancement of the lower jaw, commonly resulting in a narrowing and elongation of the face.

Orthotropic Paradigm

John Mew, DDS described a model of the growth and development of the oral facial structure which utilizes an "orthotropic" (growth guidance) paradigm[15]. According to Mew, treatment to straighten crooked teeth treats only the symptoms, not the cause Mew proposes this is the reason there is commonly a relapse following completion of treatment. Often by removing teeth, this narrows and shortens the oral cavity ultimately hindering orofacial growth and development[16].

Orthotropic paradigm's orthodontic objective is to facilitate growth of maxilla up and forward versus down and back. Mew believes that some types of malocclusion are related to vertical growth instead of horizontal. He suggests that cases should be started by eight years old, since it is around that age that maxillary growth and its affect on the cranium is most optimally controlled [17]. Instead of aesthetics, Mew believes that the most important factor to focus care is to change (expand) the shape of the dental arch as a means to restore nasal breathing and eliminate mouth breathing. By reestablishing a more protrusive mandibular position, this helps bring the tongue forward opening the airway space therefore helping to optimize TMJ position and function[18].

Sympathetic Nervous System Overload and Psychogenic Stress

With the stresses or tensions associated with iatrogenically induced CFD and its affect on craniofacial growth, secondary effects such as temporomandibular joint disorders (TMD) and airway space compromise can create a cascade of clinical presentations. Research appears to have found a relationship between TMD and psychogenic or stress disorders[19,20] that are experienced by orthodontic patients[21].

From a chiropractic perspective it does seem reasonable to assume that stress to the craniofacial and cervical region could have an inhibiting factor on the parasympathetic system[22] due to its compromise on the craniosacral autonomic outflow. So it is not unreasonable to find clinically that TMD patients who have had orthodontic care presenting with a HGE/CFD would be challenging chiropractic patients to treat. Clinically, patients presenting with HGE/CFD often, due to chronic nature of their condition, tend to be difficult, sensitive and psychologically challenged, due to their heightened sympathetic response that leads to reduced coping skills. In fact, at times this subset of patients may be so sensitive that typical high velocity, low amplitude manipulations are not possible due to patient guarding, necessitating that treatment focuses on only passive or indirect manipulations. Once HGE/CFD patients can be separated into their own specific subset, then specialized care can be rendered, ultimately making them (as a group) easier to manage.

However, what appears interesting is that similar psychogenic stressed patterns have also been found with non-orthodontic patients. Therefore while TMD patients are often hypersensitive and psychogenically challenged, those with HGE/CFD-- particularly with dental extractions -- appear to have significantly stressed systems. HGE/CFD can be present in patients with TMD with or without the use of cervical headgear, though those TMD patients with HGE/CFD will tend to have a lower pain threshold[23,24] and increased fear avoidance behavior[25].

Wahlund et al compared adolescents [n=60] with chronic TMD to a healthy control group evaluating sensitivity to all types of somatic and emotional stimuli. In their study "the results showed that adolescents with TMD pain reported significantly greater sensitivity ($p<0.05$) to aversive somatic and pleasant somatic stimuli than the controls[26]." Their findings suggested "chronic TMD pain states in adolescents are accompanied by amplification of bodily, but not purely emotional stimuli and that cognitive systems are implicated, not only an alteration of the nociceptive systems[26]."

Airway Compromise, Head Posture, and SOT

Patients presenting with CFD patterns display a relationship between the upper cervical spine and chronic TMD or HGE affecting airway function. This was initially described by Casey Guzay's Quadrant theory, in which he determined that the forces of the mandible and the bite rotate around a point in the sub-occipital region in the cervical spine[27]. The lever action of the mandible and associated musculature create an inferior pressure, distorting the cranial sutures and dural membranes via the temporalis, masseter and pterygoid muscles. This also results in a tilting of the entire head forward and downward to help to open airway space, creating a forward head posture as a reaction and compensation. This attempt to maintain airway space, proper dental occlusion, condylar position, and tongue position can lead to sleep–apnea/open mouth breathing habits along with bruxism, parafunction, and grinding patterns[28].

The mechanics of the mouth breather is often related to the compromise of the airway and associated musculature in and around the mouth. The head, neck, and TMJ relationships tend to be more balanced with nasal breathing and with the lips closed (lip seal). Ultimately the pressure coming from outside the teeth (lips & cheeks) needs to match the pressure from inside the teeth (tongue) to maintain the maxillary dental arch. So, when the mouth is open a significant part of the day and/or night to breath, the tongue tends to not reside within the maxillary arch but more commonly in the lower mandibular region. With this lower tongue placement it will significantly decrease any upward and outward pressure on the maxilla and the lingual surface of the teeth, thus inhibiting the necessary craniofacial growth and development[29,30].

With mouth breathers, not only will the tongue not stimulate upper arch development but inward forces from the cheeks and lips will not be counter balanced, further causing the dental arch to "collapse" inward, down, and backward. This will lead to the maxillary arch becoming narrower, the palate becoming higher, and the maxilla will be restricted from expanding anteriorly or laterally. This maxillary arch restriction can be associated with craniofacial suture tension[31], trigeminal nerve irritation[32], and TMD changes leading to posture and compensations throughout the musculoskeletal system[33-35].

With mouth breathing patterns, bruxism and grinding can be an attempt by the patient to unconsciously find a way maintain good airway space and still have adequate dental occlusion. Airway space and proper dentition cannot adequately function independently, so when there is airway compromise or obstructive apnea the dentition is commonly challenged and results in clenching, bruxism, and parafunctional activities. This pattern is associated with the need for

adequate oxygenation, excessive stimulation of pain receptors, and leads to increased systemic stress load.

From a clinical cranial SOT perspective, the CFD patterns associated with narrowing of the face and skull[5,17] keep the cranial system restricted (extension phase) and unable to release all the way into its flexion phase (inhalation). This restricted growth and development has a functional affect on the cranial suture system reducing cranial compliance, limiting cranial motion associated with CSF pulsations or cranial rhythms. With cranial motion limited, this can lead to an increased predisposition for the craniofacial and craniosacral systems to have cranial extension restrictions or fixations.

In SOT the narrow face and high narrow upper dental arch are associated with what is called cranial internal rotation or extension (SB+). The ability of the craniofacial and craniosacral system to enter into internal rotation or extension (SB+) and external rotation or flexion (SB-) allows for a balanced functional system[36]. This can have far reaching implications since cranial internal/external rotation or flexion/extension is associated with the ability of CSF pressure variants, pulsations, or fluctuations to be buffered as the cranium moves through increased and decreased pressure changes in response to these pressure variants[37]. Also the ability to have this craniofacial bone or suture flexibility allows muscular forces, most particularly associated with mastication, to be distributed throughout the craniofacial system and not focused at one point of muscle insertion. For instance, Buckland-Wright has noted that small movements have been observed between facial bones in animals, indicating the presence of a flexible component within the skull, thus allowing large forces to be exerted during biting without overstressing the facial bones[38,39].

In addition, cranial meningeal tensions are reflected to the sacral region via the pia (filum terminale) and dura (internal attachments at S2) so that the craniosacral system is responsive caudally to tensions found cranially. Therefore if the craniofacial system is restricted in only one phase of flexibility, such as extension, this may have an adverse affect on the functional motion at the sacrum, affecting sacral nutation (extension) and counternutation (flexion) [37,40].

This imbalanced sacral nutation is believed to have a physiological effect since normal sacral nutation plays an important role in CSF circulation from the lumbosacral cistern, cranialward[41]. Also it is purported that a stressed craniofacial craniosacral system may also lead so inhibition of parasympathetic nervous system activity. This reduced parasympathetic activity tends to lead to increased sympathetic stimulus[42] creating a persistent state of musculoskeletal tension[43] as an adaptive and compensating mechanism in the body.

So this HGE/CFD, airway compromise, parasympathetic inhibition, and other subsequent related physiological effects will over time create a multifactorial condition with secondary compensations or body distortions. The internal craniofacial tension caused by altered dentocranial growth and development can create increased stress in all of the cranial sutures while concurrently affecting the shape of the cranium. The muscle tension secondary to TMJ disorders or airway compromise increases tensions in the suboccipital muscle region, creating a forward head posture[28,44,45].

As this tension pattern persists it can lead to increased tension along the falx cerebri to the internal aspect of the frontal bone creating an inferiorward tension which transmits throughout all of the facial bones and sutures. The maxilla, zygoma, and mandible are under a craniofacial tension drawing the bones inferiorly, posteriorly, and medially. This starts a cascade of changes, beginning with increased muscle tension in muscles of mastication, compromised stomatognathic function, and a tendency for clenching and/or bruxism.

Clinically it has been found that the CFD subset of patients tends to have the following types of presentation:

1. Loss of cervical curve, increased forward head posture and increased tension in cervical musculature[28,44,45].

2. Suboccipital tension[27].

3. TMD/CMD (craniomandibular disorder) – symptoms[46,47].

4. Decreased lumbar curve and/or increased lumbosacral disc angle[48].

5. Unstable or dysfunctional sacroiliac joint[33,49,50].

6. Pain in feet and metatarsals, poor foot mechanics – collapse of arches[51,52].

7. Muscle tensions may be present in any of the areas mentioned above.

The narrow craniofacial with a high hard palate or extension distortion leads to a diminished nasopharynx cavity and reduced air flow and oxygenation. It also reduces and decreases nasal breathing, while increasing the tendency to mouth breath and sustaining these vertical growth patterns of the oral facial structures. This tendency is perpetuated because the tongue has no ability to locate itself in the upper hard palate that is considered the tongue's physiological rest position. As the tongue rests downward it forces mouth breathing and subsequent retro-positioning of the mandible, or a dental class two position.

The basic concepts of proper craniofacial growth and development as described by Mew[15] or Chinappi[46] consider craniofacial and stomatognathic system as necessitating function to allow for proper physiology locally and distally affecting the whole kinematic chain. This relationship is far reaching since there appears to be airway compromise affecting oxygenation as well as increased sympathetic nervous system function.

Dental therapeutic interventions (orthodontic, restorative, etc) from a physiological perspective need to consider growth and development, TMJ (occlusion and condylar position), airway passages, and stomatognathic function. If not, it is possible that they could contribute or cause some CFD patterns by not addressing whole-body relationships. Therapies have to consider the various stressors to the system, along with the myriad of secondary problems associated with apnea [53,54] and possible sympathetic overload[55,56].

The reduced oral cavity created by reduced size of the upper dental arch, lingual tipping of the mandibular dentition, retro-positioning of the mandible, and relative size and position of the tongue all creates airway compromise, reduced oxygenation, and excessive sympathetic nervous system stimulation. The musculoskeletal system will develop adaptive compensation distortions, and it is not uncommon for the patient to have increased fear avoidance behavior[25], low pain thresholds[57,58], and a limited physiological adaptive range[59].

Within the subset of patients with CFD, generalized pain can aggravate and complicate this pattern. The compromised airway and oxygenation along with sympathetic stimulus will eventually overload the patient's physiologic adaptive mechanisms. Ultimately the body will attempt to compensate and adapt to the imbalanced stressors until it begins to fail. As the body begins to fail to compensate there will be alteration in sub-optimal posture, compromise of musculoskeletal function, osteoarthritis, degenerative joint diseases, decreased flexibility or joint hypermobility, as joints are challenged muscles will increase tension to maintain support, and lowered pain thresholds leading to generalized pain syndromes.

Therapeutic Interventions

There are various methodologies available to deal with CFD associated with HGE or poor growth and development. One aspect can be incorporating dentistry and chiropractic (SOT cranial techniques)[47,60] preventatively to facilitate a child's growth and development allowing for upper dental arch development and good orofacial behavior. From a dental perspective this incorporates focusing on upper dental arch expansion, leading to optimal dental occlusion, good condylar position, and appropriate tongue to oral cavity space and function. It is not about a focus on removing teeth (bicuspids) or using head gear to retroposition a mandible[61].

Chiropractic (SOT cranial) care is focused on maintaining good anterior sacroiliac joint (sacral nutation – category one) motion and posterior sacroiliac joint (weightbearing ligamentous integrity – category two) support. Assessment and treatment is directed to the whole body kinematic chain from an ascending (feet, knees, hips, pelvis, spine to craniofacial and TMJ regions) as well as a descending (TMJ, craniofacial, spine, to the pelvis) orientation[62,63]. SOT craniofacial treatments facilitate growth and development, improve TMJ function, and help integrate these changes into the patient's entire neuromusculoskeletal kinematic chain[47,60, 62-65]. Autonomic nervous system balance is important and can involve balancing viscerosomatic/somatovisceral reflexes to help the patient cope with any sympathetic nervous system overload of parasympathetic nervous system inhibition[66].

Oral myofunctional therapy (OMT) can be incorporated into care with resistant TMD and CFD cases[67,68]. OMT involves a neuro-muscular re-education of the oral facial muscles, is a modality that promotes the stability of the stomatognathic system. OMT treatment commonly consists of jaw stabilization exercises, habit elimination and behavior modification, and re-patterning the oral facial muscles and changing their function for optimal tongue rest position, chewing and swallowing so that the tongue does not drop into the airway[69,70].

The interdisciplinary relationship between the dentist, chiropractor and OMT therapist incorporates myofunctional aspects regarding internal and external pressures to the dental arch and its affect on function and growth and development. For instance the pressure pushing out on the dental arch from the tongue is supposed to match pressure pushing inward from the lips and cheeks. With a mouth-breathing patient, their mouth is open a large part of the day and night due to the lack of ability to get enough oxygen through the nasopharyngeal and this position allows the lips and cheeks to have a slow consistent long term sub-optimal effect on the dental arch. With a mouth breather it is found clinically that the tongue does not press into the maxillary arch, and so this arch slowly collapses inward, backward, and down or a combination of these distortions. This pattern becomes persistent since when the tongue is not in it physiological rest position (upper dental arch) aside from growth and development being affected the back of the tongue closes off the airway space leading to airway compromise.

Another preventative factor that can be investigated is the use of nutrition to facilitate proper stomatognathic function and dental growth and development This was studied in animals by Pottinger. Pottinger demonstrates in his book "Pottinger Cats[71]." how a compromise in the developmental patterns of cats can be attributed to moving away from raw to cooked food diets. Pottinger found that cats moved from raw to cooked food diet had a significant loss of teeth, poor dental arch development, swollen organs, fertility, hair loss, skin problems, and significant behavioral changes[71]. Pottinger also, through radiographic study, noted a relationship between mandibular underdevelopment and microtrauma and fracture in the feet suggesting a possible relationship between these distal osseous boney structures[71].

In humans, this concept is further investigated by considering "developmental nutrition[71]."Developmental nutrition as discussed by Price in his book "Nutrition and Physical Degeneration" examines how diets of processed food can significantly alter oral facial structure as well as general development. Price, a dentist, performed anthropological studies in the 1930s traveling globally and studying the diets and nutrition of various cultures. His book concluded that aspects of a modern Western diet (particularly flour, sugar, and modern processed vegetable fats) cause nutritional deficiencies that are a cause of many dental issues and health problems. The primary dental issues he observed from a "modern Western diet" included the improper development of the facial structure (overcrowding of the teeth) in addition to dental caries[72].

Conclusion

The significance to dentists and cranially trained chiropractors or osteopaths is the realization that there is a common pattern of compromised craniofacial growth in a subset of our patients. Looking at the body as a matrix of structure and function, with the dental growth and development, airway, and autonomic nervous system balance as integrated aspects of a patient's health, can be an essential aspect of healthcare treatment or prevention. This concept of a comprehensive, whole body approach to diagnosis and can facilitate the treatment of myriads of problems that are seen clinically.

Examples can be patients presenting with migraine headaches, teeth grinding, bruxism or clenching, TMD/CMD, tinnitus, vertigo, general loss of strength, chronic fatigue, snoring, sleep

apnea, low pulse oxygen levels, and loss of cervical curve or forward head posture. It is not uncommon to find with the CFD subset of patients cervical and lumbar muscle tension from the resulting compromised or compensatory posture, predisposing them to thoracic outlet syndrome, carpel tunnel syndrome, and other upper extremity type disorders. Therefore these patients may have interrelated disorders throughout their entire neuromusculoskeletal system and kinematic chain.

Ideally the future for these patients will be more hopeful if interdisciplinary relationships can be developed between dentists, chiropractors, osteopaths, OMT, podiatrists, nutritionists, and other healthcare practitioners. The ultimate goal is to improve dental or craniofacial growth and development as well as airway space, and reduce related secondary apnea or upper airway resistance syndromes and excess sympathetic nervous system activity. This field of study and care should warrant significant further research since it may represent a large, understudied portion of our patient population.

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Sacro occipital technique and autism spectrum disorders: A case series

Susan Colby Allen, DC, Charles L. Blum, DC

Introduction:

The prevalence of Autism Spectrum Disorder (ASD), a serious health problem with incredible societal implications, is rising exponentially. In 1975 the rate was 1:5000 [1]; in 2010 it was reported to be 1:68 by the CDC [2]. Researchers at Massachusetts Institute of Technology estimated ASD prevalence rate in the US of 1:2 by 2025 [3]. As a society we must face the debilitating costs to be absorbed by taxpayers: an estimated annual cost of $67,000-72.000 per impacted child, a staggering $3.2 million over a lifetime [4].

The purpose of this paper is to explore how sacro occipital technique (SOT) care may improve the functional level and quality of life of children with ASD. This decreased cost of care eases the societal burden while improving the quality of life for the child with ASD and their whole family. Some doctors are exploring various methods to treat ASD giving hope for parents who want to help their child [5].

Typical ASD patients' [6] presentations include conditions such as decreased ability to speak, high stimulation behaviors (stims) like arm flapping, repetitive movements, inability to tolerate stimulation from the environment, pre-verbal sound articulations (grunting, animal sounds, squealing, screaming), abnormal cranial formation (plagiocephaly), self-injurious behaviors (SIB's), and poor eye contact. In this case series (n=5) all children were diagnosed with autism prior to being seen at this office

While controversial, the parents of these five patients all reported a coincidental relationship between a developed regression, particularly after a severe inflammatory reaction from vaccination or a viral infection. Clinical assessment included parental subjective reporting and observations, scholastic noted improvements, ATEC (Autism Treatment Evaluation Checklist) [7], as well as visual improvements in cranial appearance, including photographs, for clinical measurements.

There is a paucity of research and literature discussing chiropractic and particularly SOT cranial work for children with autism [8]. Clinically ASD patients have been treated in this clinic as a sub-specialty beginning four years ago and notable progress in those cases utilizing SOT therapies has been found. Theoretically SOT may add an important piece to the therapies needed to make positive changes in ASD and is especially helpful as it combines the ability to do cranial adjusting (affect supratentorial function), chiropractic manipulative reflex technique (CMRT) [9] affecting viscerosomatic/somatovisceral reflexes (non-musculoskeletal care), in addition to treating spinal neuromusculoskeletal imbalance [10].

Patient #1: Case History

This patient is a ten-year-old male. He began treatment in January 27, 2011 at the age of five. He regressed six months after a vaccine, when right afterwards he developed a viral infection in

2008. He was subsequently diagnosed with autism and acquired aphasia. He had been on DAN (Defeat Autism Now) protocols, herbalism, hyperbaric oxygen, and homeopathy, among other therapies, with limited success. He had SIB's of hitting himself in the head about ten times daily, very limited speech with attempts to say words not understandable, and was extremely hyperactive on intake. His initial ATEC on July 8, 2009 was 93. It fluctuated with different modalities done over the years prior to treatment at this office. When performed on September 2, 2011 after SOT care, it was 13.

Treatment: This patient presented with an almond or football shaped cranium with ridging at frontoparietal sutures and peak at the parietals. The left side of posterior aspect of this cranium had signs of plagiocephaly. His cranial distortions were first addressed. Later after a few cranial treatment s he tolerated intraoral palatine spread. He received spinal manipulation and CMRT [11]. This patient's parents initiated an additional protocol several months after the chiropractic treatment began from Kerri Rivera's book "Healing the Symptoms Known as Autism[12]."

Results The mother reported an increase in verbalism immediately, following the first treatment. By six months the cranium appeared normally shaped upon visual inspection by the doctor and parents. The overall gains for this child were notable, particularly the reports of his improvements at school. Once Rivera's protocol was added by the parents, further improvement was also noted. His ATEC dropped after four chiropractic treatments on February 15, 2011 to a 6, the lowest ATEC to date. After six months of chiropractic and following Rivera's protocols the patient had improved eye contact, initiated speech, and no longer had SIB's. He transitioned out of a specialized school for autism into traditional schooling on an IEP (Individualized Education Program). His hyperactivity had reduced to where he could sit patiently in the office now. He was able to go into public, eat out at restaurants and to circuses and the zoo. Currently, the patient is still working to improve his speech. The patient did experience lapses in chiropractic, cranial and visceral treatment with obvious regressions. During a time of no treatment by this office, his ATEC jumped to 29 on December 29, 2014. After resuming treatment and another detoxification protocol by the parents it returned to 9 on March 29, 2015. On April 14, 2015 he was using his finger in the air to write letters, was able to lie compliantly on the table, and followed all directions. He is trying very hard to speak, initiate speech struggling with difficulties of stuttering, though post treatment the stuttering was nearly gone.

Patient #2 **Case History:**

A 13-year old female patient who was born premature, at 28-weeks via emergency C-section weighing one pound, five ounces presented in office with previous diagnoses of autism, failure to thrive, constipation, non-specific entercolitis and cerebral palsy. At birth, she had liver enzyme and platelet abnormalities. At three months she was vaccinated, immediately after which she screamed and cried, and then began regression of skills she had prior to vaccinations. Strabismus developed and was surgically corrected. By eight months she was diagnosed with hydrocephaly and delayed myelination. She was hospitalized at age two for rotovirus. Chronic ear infections were problematic and she was put on antibiotics frequently for them over the years. Upon intake at this office on April 30, 2012, her medical doctor had prescribed Zithromax and Diflucan monthly. The chief complaints from the mother were that the patient screamed

and cried when urinating, constant pressure on chin was sought, and had SIB episodes. The girl wore orthotic braces, and her left leg function was minimal and with externally rotated when walking. Previous treatments included Natural Pathways, gastrointestinal specialists, DAN allopathic doctor prescribed steroids - which were somewhat helpful, and sulfur based approach was not helpful.

Treatment: Initial examination noted the following cranial abnormalities: parietal inferiority, especially anteriorly near coronal suture, and bulging of the occiput near lambdoidal suture. She had severe anterior head carriage, scoliosis with levorotation of the thoracic spine, and extreme limited left lower extremity use. Treatments for this patient included specific cranial adjusting including temporomandibular joint (TMJ) balancing, area 1 spread (decompressing craniofacial sutures)[15], balancing sphenoid, parietals, occiput and frontal regions, spinal adjusting, extremity adjusting, CMRT, and muscle trigger points, and DeJarnette cranial sutural work to reduce cervical myofascial tension. On days when her speech is too rapid to understand, cranial treatment may be applied with the intention of creating a calming effect by working in the region of Broca's area.

Results: This patient is severely affected and results with her tend to vary. By her third office visit she was compliant for any treatment offered. At this time her mood is generally happy, and after the first adjustment the mother noted she was the happiest she had been in years. She does not have screaming from pain with urination that she presented with except on rare occasions. Five months after initial treatment, the parents then added Rivera's protocol. At this time the crying with urination further decreased, and her speech became understandable and increased to several word sentences. There are days her speech is very clearly understood. She continues to have vacillations of SIB's of pulling hair; however, the biting and hitting has reduced significantly. While these improvements have been noted in office, her mother and the school she attends have sent notes remarking on her behavioral improvements. Along with her social behavior improvements, her walking and muscle tone has also improved. She recently had a Botox injection in the external hip rotators at Children's Hospital. The shape of her cranium is improving and, though still narrow, the ridging and bulging is no longer present. Her social skills are improving and she looks forward to receiving chiropractic care. At this time her bowels are moving regularly. This patient shows regressions as noted by the parents as well as the autism school when time between care is inadvertently increased. A clear temporal relationship appears related to the patient's improvements and chiropractic care. Her initial ATEC in September 2012 was 101 and the most current taken was January 2014 and was 55, which represents a significant improvement in symptoms and function.

Patient #3 **Case History:**

A 20-year-old male presented for care at this office on November 26, 2013. He circled and colored in his pain diagram himself on the intake form to head, abdomen and low back. He was born without complications. While causal and coincidental relationships between vaccination and adverse reactions are challenging to discern, according to the patient's parents he developed normally until an adverse reaction to a vaccination at nine months old from which he recovered

only partially. The parents reported that "after the nine-month shots, we stopped hearing as much babbling and gurgling attempts at speaking, and his lack of eye contact was concerning."

At 15 months old he received a measles, mumps, and rubella (MMR) vaccination and, almost immediately following the vaccination, screamed for two days. The parents were told by their allopathic pediatrician to give him Tylenol. After that time, the parents noted that he never responded normally to spoken language again. Prior to his reaction at 15 months, the parents described, "He was responding to a lot of language, like, 'where's your blanket' or 'can you get your ball?' or 'let's go outside.' After the MMR, that was all gone, and the diarrhea started very shortly thereafter as well." He began having seizures in 2010 weekly, had "pee-tox" (believed associated with a urinary detoxification process [13,14]), aggression and anger beginning October 1, 2013, and ongoing headaches. The parents had started their son on Rivera's protocol September 11, 2013. He had been diagnosed by naturopath with spirochetes in live-cell blood darkfield microscopy prior to that. He had been seen by a chiropractor in 2001. His seizures appeared to be initiated when he is ill and happen following a fever spike. The seizures were so severe that one time he fell into the fireplace and was knocked unconscious. On intake at this clinic, the parents reported weekly seizures were part of his regular cycle for the past few years.

Treatment: On initial examination he had spinal tenderness with palpation at L4 and L5, with increased paravertebral myofascial tension. His organ scan using occipital fiber, vertebrae, and CMRT reflex assessment protocols were positive for spleen, liver, small intestine, and large intestine. He had an adverse (apprehensive) reaction to cervical foraminal compression testing (part of the orthopedic testing), which may have been due to sensitivity secondary to his chronic headaches. This patient did not show the severe head distortion (plagiocephaly) that has been noted in other patients with ASD, but imbalances were noted in the frontal, parietal and occiput cranial bones and sutures. He was treated with spinal adjusting, cranial adjustments and CMRT. This patient routinely has a frontal cranial bone imbalance and restrictions and responds well to this care. He frequently has TMJ parafunctional activity and strongly "grinds his teeth" during seizures.

Results: Of particular note, this patient reports immediate headache relief from adjustments with visually notable differences, seen in the photos taken. Following care when his headache subsides he demonstrates his relief by acting happy and smiling. The seizure frequency activity began changing with the first adjustment and showed increased time between episodes after nine treatments. After 26 treatments, he had a 40-day stretch between seizures, which represented a significant change in seizure activity. During the non-seizure time his TMJ function was more stable and the headaches less frequent. Although the seizures have not resolved, entirely they are less frequent and show decreased intensity. He no longer complains of low back pain, is not routinely angry anymore, and has started to like to sing more. There are certain songs he sings when happy and his mother reports he is singing more happy songs now. His speech has improved although some is still scripted repeats. Over the time of his care at this office, his eye contact improved and is now excellent. Independently the school he attends and the mother both have confirmed significant progress since the initiation of chiropractic care. His ATEC was 89 before he came to this office and has since dropped to 60. At this time his mother is more interested in keeping track of sick and seizure days than ATEC scores.

Patient #4 **Case History:**

A 19-year-old male presented to this clinic. His birth was a normal vaginal delivery. He did not have good sucking ability at birth and regurgitated frequently, and at two weeks he was diagnosed with microcephaly. He was breast fed for three months and was vaccinated as suggested according to the military schedule. He was constipated his entire life prior to being seen at this clinic. The patient was diagnosed with autism at age four while under the care of a neurologist for epilepsy/seizures at the Mayo Clinic. In 2007 he had sinusitis, which affected his eye, and was in the hospital for this condition. In 2011 he had surgery for sinuses, and in 2014 his wisdom teeth were extracted. This patient communicates through unique sign language with caregivers. He presented with very pale skin and thin.

Treatment: The frontal bone was observed to be severely sloped, appearing almost non-existent. He had parietal peaking and parietal-frontal ridging. He had marked kyphosis and scoliosis as well as anterior head carriage. He received cranial adjusting, including "area 1 spread" to improve motion at frontoparietal (coronal suture) region [15], spinal adjusting, CMRT of colon and stomach, and diaphragm release on the first visit. Follow up appointments consist of cranial, spinal and organ reflex as needed.

Results: After the initial adjustment he had a bowel movement on his own, which was unusual for him. He also put his toys back on the bookshelf for the first time ever. By the third adjustment he was very calm after the treatment, and the mother was very surprised. By the sixth adjustment the mother reported that he was reading. The parents are trying to implement a gluten, soy and casein free diet. By the eleventh adjustment he was reported to be much more compliant, overall better, eating better, and having better bowel movements. By the twelfth adjustment a weight gain had been noted, as well as more color in his skin, causing him to appear less pale. His bowel movements were overall improved, but fluctuations do occur. He is more observant of the world around him, as reported by parents, caregivers, and his school. His eye contact has also improved. The cranial changes are improved, but abnormalities are still present. As the cranium was observed to have rounding and lifting at the frontal bone, the patient also showed improved frontal lobe emotional control and increased cognition. This patient asks to be adjusted, and he is always more calm afterwards, noted by other patients, staffing, the parents, as well as the treating chiropractor. His kyphosis is beginning to reduce along with his scoliosis. The anterior head carriage has persisted and chiropractic care is gradually being shifted to deal with this presenting condition. His beginning ATEC was 71 on intake and is 45 as of April 13, 2015. The only change during this time has been the introduction of chiropractic care. He also was reported to initiate doing dishes, including putting them in the cabinets when finished, for the first time following his last treatment. His neurologist did a repeat annual EEG and, for the first time, he showed improvement in EEG activity. The neurologist told the mother, "Please continue to do whatever treatment you are doing."

Patient #5 **Case History:**

A five-year-old presented to this clinic. While he had a normal vaginal delivery, the day following his birth he had a fever and was admitted to the hospital by his allopathic pediatrician. In the hospital a lumbar puncture was performed to assess his cerebrospinal fluid (CSF) for infections and was put on two days of intravenous antibiotics. The only vaccine he was given was the Diphtheria, Tetanus, and Pertussis combination (DTAP). The first time the DTAP was administered, the boy screamed afterward; on the second dose of DTAP, there were noted developmental regressions, such as a significant reduction in eye contact. He was talking (saying "mama") and following directions until about one year old. By 18 months his pediatrician diagnosed him with autism. The mother did the Biomed approach [16] for 18 months, and then began on Rivera's protocol. The boy had liver problems on Biomed treatments. He has "stims" of arm flapping, poor speech and delayed academics.

Treatment: This patient presented with good posture and a relatively normal shaped cranium however a visual plagiocephaly was noted at the lambdoidal sutural area. The adjustments administered were cranial (focused on parietals, frontal, occipital, and temporal bones), spinal and CMRT.

Results: After the first adjustment, the boy slept on the car ride home, which was a novel experience. At his second adjustment, he presented with less arm flapping stims while in the office. By his fourth adjustment he was very calm after care, and for the first time ever he traced a letter with a paintbrush afterward. There was greater time between the 4th and 5th office visit and some stims (arm flapping) began to return. The stims were absent about five minutes after his treatment, and he calmed completely while he waited as his mother was also treated. She kept looking at him during the treatment since it was unnatural that he was so quiet. After his fifth treatment he took a nap during the day, which is unusual. He has only been treated five times at this office due to long travel time; however, even in that amount of time he has shown a temporal relationship between care and subsequent behaviors. As of the most recent visit, overall improvements seen by the mother include spelling words and singing. He is saying 3-4 word sentences also. This boy's ATEC went from 86 initially to 46.

Treatment/Intervention

It is very important that the metabolic ability of an ASD patient is considered in any treatment plan. Commonly these patients have increased toxic loads and sensitivities [17,18] so care in each session will be limited and determined on the patient's presentation. It is well documented that they often have a dysbiosis of their gastrointestinal system [19-22], and have high ammonia levels [23,24], which is theorized to be linked to parasitic infections [25]. CMRT [26] is also applied because it purportedly helps open the detoxification and circulatory pathways, and facilitates organ, as well as autonomic nervous system, function.

As a means to operationally define the cranial care rendered at this clinic, the following offers a six-step process of assessment and therapeutic application. Clinical observation suggests that ASD patients have some degree of cranial distortion or imbalance, which is noticed by both

visual and palpatory analysis. Treating this imbalance is the initial aspect of care. By treating the cranial region initially, this appears to calm the patient (possibly due to parasympathetic nervous system stimulation) and develops patient trust, which is essential for children with ASD. As part of the initial office visit, visual and palpatory cranial bone and sutures are noted and shared with the parents as they may relate to possible birth trauma and associated plagiocephaly [27-29].

Various functional assessments are utilized in order to guide care and offer metrics for parents, caregivers, and schools to monitor progress. These include, but are not limited to, pre- and post-care manual muscle testing [30], assessing gait and kinesthetic body use, social cues such as maintaining eye contact, reduced agitation, increased verbal or fine tuned motor use, and other types of behaviors. The visual examination and palpation of the cranium [31] along with the pre- and post-adjustment functional assessments also help to guide the efficacy of care and give a rational to the parent for the care rendered.

The initial cranial adjustment of the child is performed seated and in parts, as they often feel the need to intermittently walk around the room. Generally, after a few sessions, the patients become more compliant for adjustments and will sit or lie on the table; some eventually allow for cranial intra-oral work (pressures applied inside their mouth). Generally the cranial care (step one) focuses on adjusting the parietals with fingers contacting along the sagittal suture. If there are regions of sagittal suture tension or imbalance, or when pressure in various vectors upon the bones near a suture affects muscle strength, then the regions of symptomatology are treated using a "CSF directional technique". This technique has been utilized in the chiropractic and osteopathic profession since the 1930s [32]. The pressures are generally directed from the point of imbalance along the midline towards the corpus collosum and fourth ventricle [33].

Following reducing parietal bone tensions and attempting to improve CSF circulation, step two involves contact is made with one hand to the frontal bone and the other hand to the occipital bone. Each bone is assessed for balanced motion by torquing one clockwise and counterclockwise and replicating this functional motion assessment at the other bone. Ideally, balanced clockwise and counterclockwise motion is preferred. If there is unbalanced tension, the bone is held in the position it moves the easiest with gentle contacts pressing from occipital bone to the frontal bone. The goal of the gentle occipitofrontal contacts is to triangulate forces through Broca's area towards the frontal lobe. While the contacts are at the occiput and frontal bone, the attempt is made to balance falx cerebri and periosteal dura in the region of the corpus collosum. [34-36]

The third step involves evaluating the temporal bones and any temporomandibular joint disorder (TMD). Commonly, ASD patients have some degree of a TMD presentation; frequently an under bite (class two) is noted. The temporals can be torqued in a clockwise or counterclockwise position to test for motion, which can be bilateral in unison or alternation, or only on one side. Many of these patients also have forward head posture as an accommodation secondary to TMD-related airway compromise [37,38]. To correct this, a hand contact is made to each temporal bone and they are corrected together as a means to balance any bilateral or unilateral torsion (across petrous portion of temporals) patterns. In addition, if there is any temporomandibular joint (TMJ) imbalance this is also treated to balance the muscles and joints, and to improve function.

Step four involves assessing any frontonasal compression, which clinically in this office has been found to possibly be related to seizure activity or visually-displayed headaches. To treat imbalance or increased frontonasal tension, contact is made to the frontal bone near the glabella with very gentle anterior to posterior pressure while the nasal bones are lifted from posterior to anterior slightly inferiorward allowing the distracted tissues to relax and unwind.

While steps one through four may be all the treatment performed in the first office visit, as the patient develops trust and comfort further care can be rendered to facilitate the patient's improved function and relaxation. Step five utilizes intra-oral sphenoid balancing presented initially by Cleo Bludworth, DC [39]. This methodology may need to be repeated a few times in order to achieve sphenoid balance. While with an adult patient respiration assists are commonly used during the correction, in the ASD population breathing is not generally addressed.

> The Bludworth cranial method [39] of correction uses the mastoid processes as indicators for viewing and palpation. According to Bludworth the bilateral mastoids, when they have asymmetrical width, purportedly are associated with dysfunction of adaptation due to typical head birth presentation. Usually the greater width (90% of the time) is found on the left side.
>
> The width of the mastoid is the indicator for a starting point anterior to the soft palate. Independent of whether the occiput, temporal, and frontal are involved, the width of the mastoid will indicate the side on which to begin the correction.
>
> The importance of treating the cranium is indicated by various tests such as: dollar/crest sign (part of SOT's category one diagnostic and treatment), visual analysis, cranial palpation, muscle testing, and other indicators which can be monitored pre- and post-testing.
>
> Once cranial bone primary is determined then pelvic blocks are placed one at a time with the patient supine in a neutral position in between the greater trochanter and crest of the ilium. Trapezius fiber 5 (superior aspect of trapezius near midline) and 1st scalenus muscle tension is monitored as the block is vectored while monitoring ipsilateral trapezius and scalenus tension. When the tensions have relaxed, then the other block will also be placed on the opposite side using the ipsilateral trapezius and 1st rib tension as indicators. Once the pelvic regions have been relaxed then the cranial correction can continue.
>
> While the starting contact is determined by width of mastoid, the phase of respiration is determined by anterior or posterior position of mastoid: an anterior mastoid (external rotation) is contacted in exhalation and the posterior mastoid (internal rotation) is corrected in inhalation. The first stage following block positioning is releasing the external pterygoid muscles bilaterally, and then beginning the process to determine whether occiput, temporal, or frontal is the primary site of lesion.
>
> If the Occiput is the site of lesion (e.g., anterior left mastoid):

1. Finger contact is ¼ inch anterior to the soft palate and held on exhalation.

2. Then have the patient inhale and hold breath.

3. During exhalation, have the finger contact cross over the superior/posterior aspect of the hard palate from left to right palatine; hold as patient inhales.

4. As patient fully exhales pressure is applied to the right palatine towards the "small" mastoid

If the Temporal is the site of lesion (e.g., anterior left mastoid): correction is exactly the same but position starts ½ inch anterior to soft palate. The cross over is at the superior/mid-palate region. If the Frontal is the site of lesion (e.g., anterior left mastoid): correction is exactly the same but position starts ¾ inch anterior to soft palate. The cross over is at the superior/anterior palate region. [39]

In this clinic, the Bludworth protocol has been modified with autistic children. When the children's occiput cranial rhythmatic impulse (CRI) [40-42] does not respond with other care, then the Bludworth protocol is another cranial option utilized. Muscle testing is utilized to determine cranial therapeutic positional preferences with the patient supine and arms in a position of about 45 degrees lateral and 45 degrees anterior. Palpation of the hard palate is performed with the doctor's index finger, noting the angle of torsion, inferiority and tension. This contact is palpated on the anterior of one side and posterior of the opposite side of the hard palate. Removing the torsion attempts to affect the sphenoid (or internal dural membranes) which is achieved by holding the frontal bone with one hand just at the edge of the frontosphenoidal suture with thumb and fourth finger as the opposite hand is intra-orally. On inspiration the intraoral finger glides gentle along the back of the hard palate to the palatine bone, which is medial to the teeth and anterior to the soft palate. This contact is held during inhalation until a release is felt at the finger contact. Then, during exhalation, the hard palate contact is maintained as it glides to the opposite side of the palatine bone and the finger slides up to this contact, which is held until it releases. If the treatment is successful, the arm strength will improve.

Often these patients present with a narrow hard palate and commonly the mandible teeth have some crowding to fit within the envelope of the upper teeth. In these cases a cranial procedure to attempt to create lateral expansion across the maxillas, palatines, and mandible (interosseous) is often performed. This procedure (step six) also purportedly helps with relaxation of the face and cranium and can improve airway space by allowing for the tongue to position more easily in the physiological rest position. Attempts are made when indicated to help relax the tongue to help with airway function and for speech improvement.

Because it is difficult for many children with autism to be still and be relaxed, the use of SOT pelvic blocks and category treatment is not always possible. The initial contacts to the cranium attempt to stimulate parasympathetic nervous system, which helps calm and sooth, the child to allow for sacral and spinal adjusting. With the patients in this study it was common to find

sacral rotation patterns, and they were treated manually in order to relax the pelvis and sacrum into a balanced position. When possible, trapezius [43] and occipital fiber [44,45] analysis helped guide the location of spinal segment to be adjusted and used as a pre- and post-care assessment tool.
Often the respiratory diaphragm will need to be evaluated and treated, since imbalanced tension can complicate an already compromised airway disorder and create a low-grade discomfort that affects the patient's ability to relax. The therapeutic application attempts to relax and balance the diaphragm at its crural attachment at T11-L2 anterior vertebral body attachment, as well as at its insertion within the circumference of the lower costal margins.

In many cases there can be a non-musculoskeletal contribution to the patient's presentation, and these patients are treated with chiropractic manipulative reflex technique (CMRT) utilizing occipital fiber analysis and visceral reflex patterns to address the primary organ. Some of the most common active CMRT viscerosomatic reflex patterns in ASD patients include the liver (T8), spleen (T7), colon (L4), adrenal (T9), stomach (T5), and lungs (T3), theoretically suspected to be present due to the patient's compromised ability to detoxify their body and secondary weakened immune systems.

As a means to offer greater therapeutic responses to challenging ASD patient presentations, innovative protocols have been explored. Kerri Rivera has some provocative methods for helping patients with ASD. Rivera describes herself as not a doctor or scientist, (she recently has obtained a doctorate in homeopathy) but more as a mother with a child who has ASD and is looking for solutions. In her book "Healing the symptoms known as Autism" she outlines a diet, beginning with the crucial step of eliminating gluten, soy and dairy from the patient's diet, which is vital to recovery. It also has detailed the use of Chlorine Dioxide (CD) to oxygenate tissues and destroy and remove the overload of pathogens (yeast, bacteria, viruses, molds, and heavy metals), a low intensity non-systemic parasite protocol, and mild chelation. Finally, she describes the rebuilding benefits of hyperbaric oxygen treatments and GcMAF (Gc protein-derived macrophage activating factor**)** [46].

Rivera's protocol uses the ATEC test, a series of questions about speech, physical health and sociality to assess a child's with ASD response to care. Though not published in the literature, Rivera claims this protocol has helped 176 children recover from autism (as defined as an ATEC score of 10 or under). Currently no other protocols have been able to replicate this success. While the chief component of Rivera's protocol, the use of Chlorine Dioxide [47], or CD, has become a current hot topic of debate,[48] her protocol combined with SOT process described above seem to compliment each other.

Frequently the whole family may need to be considered when treating a child with ASD. While a child with ASD will be attempting to deal with his or her emotions and coping skills, the parents and caregivers also are experiencing high levels of stress and frustration that may need to be discussed and cared for as indicated [49-51]. Clinically, it has been found that emotional stressors for patient and family can be reduced by utilizing soothing light [52] and sound [53].

Results

In this study, five ASD patients had positive results, some faster than others. Patients 1, 2 and 4 presented with the most obvious cranial distortions and showed visual cranium improvement. Patient 1 showed the most improvement in all areas of improved cognition, increased daily functioning, decreased self-stimulatory and self-injurious behaviors as well as a decreased toxic load. Patient 1 and 2 both had laboratory studies from their treating DAN allopath, which included hair and stool analysis along with allergy and blood testing prior to beginning treatment at this office. Follow up testing was not performed due to financial issues and the parents' satisfaction with their children's progress. Patient 2 has had a significant decrease in SIB's, but they have not been eliminated. Patient 3 has complications because of the seizures. While the seizures persisted, his head and body pains have subsided, and he has improved cognition, speech and gastrointestinal health. At this time the focus of care is to stabilize him to where he is seizure-free. Patient 4 has showed profound gains of self-awareness, eye contact, and initiating new behaviors as well as having his ATEC scores cut almost in half during the time of treatment to date. This parent is open to a repeat brain MRI or CT scan in the future to see any brain growth. With his frontal movement and increased cognition occurring during the same time frame, it will be interesting to see if this has any relationship to any frontal lobe brain development. He saw the neurologist a week prior to the writing of this paper, and the annual EEG that was performed on him recently was improved over the one done a year earlier. The neurologist told the mother to continue doing whatever she is doing as it is helping her son. Patient 5 was treated only a few times and showed calming and increased cognition as well as decreased stims and a drop in his ATEC scores.

In general every patient who was selected in this case study demonstrated improvements in cranial visual observation, improved gastrointestinal health, decreased SIB's and "stims," as well as an overall calming effect confirmed independently by social workers, schools, and family members.

SOT and chiropractic adjustments appear to provide an immediate benefit of calming these patients possibly by stimulation of parasympathetic (cranial [8,54] and sacral [55]) function. Long-term benefits are decreased visual cranial distortions (pre- and post-care photographs taken over time), improved verbal communication, improved cognition, improved eye contact, decreased stims and self-injurious behaviors, decreased rigidity around routines, and increased quality of life for the entire family as they become able to interact with society in a more meaningful way. Of importance is that these improvements are noted by family members, caregivers, and the school along with improved ATEC scores [56].

Discussion

The goal of cranial, chiropractic and visceral care is to improve CNS and ANS function [57] while also clearing pathways for elimination of waste and decreasing toxic burden to aid ASD patients in achieving an improved quality of life and activities of daily living. ASD is associated with delayed or regressed neurological development as well as gastrointestinal dysfunction and increased inflammatory markers [58]. The imbalance in both the PNS and SNS are apparent in this

subset of patient population, which cranial adjusting, spinal manipulation, and visceral CMRT care all attempt to help improve.

While ASD has many components, the compromise of the viscera is universally problematic [59,60]. By adding the visceral work, it is hoped that this will help ASD patients with improved detoxification, more normal function of the organs, and better elimination of stool as well as toxins. Fatigue of the adrenal glands that is not commonly seen in children without ASD, seems to be very common for children with ASD [61], suggesting additional stressors in children with ASD. Interestingly this level of adrenal stress is found both with DAN laboratory testing as well as with CMRT protocols, and a correlation is also found as the child improves. The visceral manipulation attempts to ease the overall burden on these children which, theoretically, facilitates toxin removal, calms gastrointestinal issues, and helps improve digestive function.

Opening the detoxification pathways seems to be extremely important with ASD patients, and Rivera's first step is to get diet controlled by removing casein, soy and gluten [62]. The next is reducing pathogen load of viruses, bacterial overgrowth, and parasitic infection [63] while attempting to mobilize heavy metals to be eliminated via urine, stool or hair. It is important to note that this research is in its experimental stages, and published research to support its wide-scale usage is lacking. Consistent post-care testing of the patients who had the stool, hair, blood testing for pathogens and heavy metals would be a helpful marker for change, in addition to those assessment tools used in this study. Additionally, any tool that might aid in detoxification without overburdening the ASD patient theoretically would be beneficial.

There are various flaws to case reports, which this study characteristically has such as no control groups, no sham or placebo controlled intervention, difficulty in assessing possible regression to the mean, or ideomotor effects. Greater study and efficacy of interventions could be assessed by consistently performing pre- and post-care (at reasonable intervals) stool and hair analysis, as well as allergy and blood testing to measure toxic loads and their affect on patient presentations. It would be helpful to utilize methodology to measure cranial bone position and movement [64] along with qEEG [54] studies pre- and post-care to determine if there is a clear clinical relationship between care rendered and patient outcome.

At this time no side effect has been noted relative to the chiropractic, cranial, and CMRT care rendered to any patient in this study. It must be noted that caution is necessary when proceeding with detoxification since ASD patients are often very sensitive to toxic overloads and their bodies need to be strong enough to process various toxins being released. Therefore, working slowly and watching for patient response is crucial for a successful outcome. Rivera's protocol is still controversial and lacks sufficient evidence to recommend this option without the patient and their healthcare provider studying this methodology fully before moving forward.

Conclusion

ASD is on such a rise, so developing effective low risk and low cost options are important for future care of these challenged patients. This case series discussed how chiropractic, particularly SOT and cranial care, along with adjunct procedures appeared to help these five different

patients. Further research is needed to develop a pilot study with controls and greater pre- and post-care assessments to determine the value of chiropractic care for ASD patients following this treatment regimen. At this time, without greater study, no generalizations can be projected to ASD patients at large. Yet the temporal relationships of the patients' improvements as viewed by parents, caregivers, and schools suggest that further research is indicated.

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Autism Treatment Evaluation Checklist (ATEC)

Bernard Rimland, Ph.D. and Stephen M. Edelson, Ph.D.
Autism Research Institute
4182 Adams Avenue, San Diego, CA 92116
fax: (619) 563-6840; www.autism.com/ari

Project/Purpose:				
Scores: I	II	III	IV	Total

This form is intended to measure the effects of treatment. Free scoring of this form is available on the Internet at: www.autism.com/atec

Name of Child _____ _____ ☐ Male Age _____
Last First ☐ Female Date of Birth _____
Form completed by: _____ Relationship: _____ Today's Date _____

Please circle the letters to indicate how true each phrase is:

I. Speech/Language/Communication:

[N] Not true [S] Somewhat true [V] Very true

N S V 1. Knows own name
N S V 2. Responds to 'No' or 'Stop'
N S V 3. Can follow some commands
N S V 4. Can use one word at a time (No!, Eat, Water, etc.)
N S V 5. Can use 2 words at a time (Don't want, Go home)
N S V 6. Can use 3 words at a time (Want more milk)
N S V 7. Knows 10 or more words
N S V 8. Can use sentences with 4 or more words
N S V 9. Explains what he/she wants
N S V 10. Asks meaningful questions
N S V 11. Speech tends to be meaningful/ relevant
N S V 12. Often uses several successive sentences
N S V 13. Carries on fairly good conversation
N S V 14. Has normal ability to communicate for his/her age

II. Sociability:

[N] Not descriptive [S] Somewhat descriptive [V] Very descriptive

N S V 1. Seems to be in a shell – you cannot reach him/her
N S V 2. Ignores other people
N S V 3. Pays little or no attention when addressed
N S V 4. Uncooperative and resistant
N S V 5. No eye contact
N S V 6. Prefers to be left alone
N S V 7. Shows no affection
N S V 8. Fails to greet parents
N S V 9. Avoids contact with others
N S V 10. Does not imitate
N S V 11. Dislikes being held/cuddled
N S V 12. Does not share or show
N S V 13. Does not wave 'bye bye'
N S V 14. Disagreeable/not compliant
N S V 15. Temper tantrums
N S V 16. Lacks friends/companions
N S V 17. Rarely smiles
N S V 18. Insensitive to other's feelings
N S V 19. Indifferent to being liked
N S V 20. Indifferent if parent(s) leave

III. Sensory/Cognitive Awareness:

[N] Not descriptive [S] Somewhat descriptive [V] Very descriptive

N S V 1. Responds to own name
N S V 2. Responds to praise
N S V 3. Looks at people and animals
N S V 4. Looks at pictures (and T.V.)
N S V 5. Does drawing, coloring, art
N S V 6. Plays with toys appropriately
N S V 7. Appropriate facial expression
N S V 8. Understands stories on T.V.
N S V 9. Understands explanations
N S V 10. Aware of environment
N S V 11. Aware of danger
N S V 12. Shows imagination
N S V 13. Initiates activities
N S V 14. Dresses self
N S V 15. Curious, interested
N S V 16. Venturesome - explores
N S V 17. "Tuned in" — Not spacey
N S V 18. Looks where others are looking

IV. Health/Physical/Behavior:

Use this code: [N] Not a Problem [MI] Minor Problem [MO] Moderate Problem [S] Serious Problem

N MI MO S 1. Bed-wetting
N MI MO S 2. Wets pants/diapers
N MI MO S 3. Soils pants/diapers
N MI MO S 4. Diarrhea
N MI MO S 5. Constipation
N MI MO S 6. Sleep problems
N MI MO S 7. Eats too much/too little
N MI MO S 8. Extremely limited diet
N MI MO S 9. Hyperactive
N MI MO S 10. Lethargic
N MI MO S 11. Hits or injures self
N MI MO S 12. Hits or injures others
N MI MO S 13. Destructive
N MI MO S 14. Sound-sensitive
N MI MO S 15. Anxious/fearful
N MI MO S 16. Unhappy/crying
N MI MO S 17. Seizures
N MI MO S 18. Obsessive speech
N MI MO S 19. Rigid routines
N MI MO S 20. Shouts or screams
N MI MO S 21. Demands sameness
N MI MO S 22. Often agitated
N MI MO S 23. Not sensitive to pain
N MI MO S 24. "Hooked" or fixated on certain objects/topics
N MI MO S 25. Repetitive movements (stimming, rocking, etc.)

A clinical prediction rule for 52 patients with cranial dysfunctions and headache: A retrospective case-series report

Scott Cuthbert, DC, Charles L. Blum, DC

Introduction

George Goodheart, Jr., the son of a chiropractor and osteopath, was heavily influenced by and a life-long student of his father and his father's friend in Detroit, Major Bertrand DeJarnette. There are several important and potentially useful additions made by Goodheart (developer of Applied Kinesiology) to the unique approaches introduced into the chiropractic profession for treatment of the cranium by DeJarnette (developer of Sacro Occipital Technique). This report examines the most important of these concepts, examines its significance in cases of headache, and presents a retrospective case-series report to examine its potential usefulness.

It has been suggested by a number of cranial researchers that the extracranial muscles are the primary and most likely engine for the cranial rhythmic impulse (CRI) or cranial sacral primary respiratory mechanism (CSPRM). [1-2] This possibility has been supported by various researchers and shown to be a likely candidate for driving at least a part of the CSPRM. [3,4]

The concept of a primary respiratory mechanism (PRM) within the central nervous system was conceived over 75 years ago by William Garner Sutherland, DO. Since that time there have been many models seeking to confirm or more fully explain Sutherland's model for cranial-sacral motion. While the clinical results of cranial treatment have supported its continued use, cranial practitioners recognize that the conceptual model for the CSPRM needs to be updated. [5-7]

In recent years, chiropractic and manual medical research and theory have highlighted the role of muscles, joints, and nerves in the function of the neuro-musculoskeletal system. This system has been described as the Primary Machinery of Life [8] as it is how we, and all tissues within us, move and communicate. It is also suggested that a problem with the Sutherland model is that the amount of cerebrospinal fluid (CSF) produced per minute is too small a quantity to have the power to move the cranial sutures, and that the neuraxis does not itself have the contractile elements nor tensile strength to move itself -- and certainly not the whole cranium, its dural sleeves, nor the rest of the body. Essentially, we come down to the fact that motion in the body is likely the result of muscular action, whether striated, smooth, or cardiac.

It, therefore, may be time that a fundamental change or ***addition to*** the classical Sutherland model be introduced and tested – going from an 'internally driven' Primary Respiratory Mechanism, where an inherent spheno-occipital and/or "sacral boot" motion drives the CSPRM -- to an externally driven system where the muscles attaching to the entire neuraxis collectively move the bones and dura and CSF.

Cranial dysfunction (as used in this case-series report) involves a muscular weakness that is responsive to correction of the skull; that is, a section of the cranial respiratory mechanism is not moving correctly and when tested and or corrected, immediately improves muscle function. This lack of normal motion usually develops as a result of trauma to the skull or imbalanced muscular force affecting the skull. Evaluating the cranial mechanism by observing how muscles change

strength at different phases of respiration or when different pressures are introduced to the skull, makes the analysis of cranial dysfunctions easy and accurate. Challenge is utilized by mild pressure applied to various areas of the skull. These pressures will not influence muscle strength if there is no cranial fault present at that area. If there is one, there will be a temporary change of the muscle that will last long enough for the examiner to observe it.

It has also been hypothesized that the powerful muscles attaching directly to the cranial bones move rhythmically and in complex patterns, which are capable of exerting significant and constant pulls and pressures on the skull that demand a degree of resilience, flexibility and palpable motion in the sutures. [1-4, 9-10] Sabini and Elkowitz examined the coronal, lambdoidal, and sagittal sutures in 36 skulls and found the lambdoidal suture to be the most patent, and suggested this was due to external forces, such as the greater number of muscles affecting the lambdoidal suture when compared with the sagittal suture.[10]

Research has also demonstrated that cervicogenic and tension-type headaches (HA) arise from abnormalities and functional muscle inhibition and tenderness in the pericranial structures, along with sensitization of supraspinal neurons and decreased nociceptive activity from supraspinal structures – what are called *central mechanisms*.[10] Since patients with HA usually show an inhibition and an increased tenderness of pericranial, neck, and shoulder muscles that attach to the skull,[11-13] an examination of the frequency of muscle inhibition in cases of cranial dysfunctions associated with HA might be informative.

Methods

Fifty-two patient files (48 female, four male, with an average age of 45.7 years) of patients who presented with HA to this office were included in this retrospective case analysis. The files were limited to a two-year time frame (2013-2014), and were extracted alphabetically from a patient list that met the inclusion criteria of this study. The predominance of females in this study was not intended in the search for cases. With a lifetime prevalence of 93% in men and 99% in women, headaches are undeniably and extremely common problem that afflict both sexes.[14,15] However, women consistently report neck pain more than men.[16,17]

The following symptom clusters were utilized for inclusion criteria in this retrospective case study.

- Headache pain
- Cranial dysfunction

Exclusion criteria included any patients with suspected pathologies that might contribute to their HA or be contraindicated for chiropractic manipulative treatment. As part of the practice at this office, all patients fill out a symptom questionnaire, consent form, and Visual Analog Scale of Neck and Associated Pain (VAS) assessment form before examinations and treatments are administered. **(Appendix 1)** The VAS for pain in the cervical spine has a test-retest reliability of 0.95 to 0.97, and is a common scale used to quantify pain and has also historically been used as

an outcome tool.[19] The examination findings were recorded on the patients' first visit along with the patient filling out the assessment forms.

As a part of their first visit a thorough examination of postural muscle function was performed. Institutional review board exemption for this retrospective study was granted by Cleveland Chiropractic College on March 4, 2015.

Results

In this group of 52 patients with HA, 49 patients had cranial dysfunctions that when corrected improved all or a portion of the muscle inhibitions that were co-morbid with their HA. The three patients who did not have cranial dysfunctions, had upper cervical and/or TMJ dysfunction as the primary cause of their HA. Forty-two of these patients had sternocleidomastoid muscle inhibition on manual muscle testing (MMT), 33 patients had muscle inhibition of the deep neck flexor muscles. 24 patients had muscle inhibition of the anterior scalene muscles, 24 patients had muscle inhibition of the upper trapezius muscles, and three patients had no muscle inhibitions co-morbid with their HA at all.

Twenty-four of these patients had a positive ocular lock challenge, which in applied kinesiology (AK) testing is a sign of disturbance in the opto-kinetic reflexes.[20] Each of these cases was responsive to sphenoid bone cranial correction, which removed this challenge. Fifty-two of these HA patients also had a co-morbid upper cervical subluxation which also required treatment even after the cranial fault was removed. Thirty-nine of these patients had positive challenge to the temporomandibular joint (TMJ). **(Figure 1-3)**

In this retrospective case study, 40 patients who had HA and cranial and cervical dysfunctions also showed some degree of TMJ disorder. The muscular kinematic links with the mandible create a connection between temporomandibular and sphenoidal dysfunction, with influences being possible from either direction.[1, 9, 17, 21]

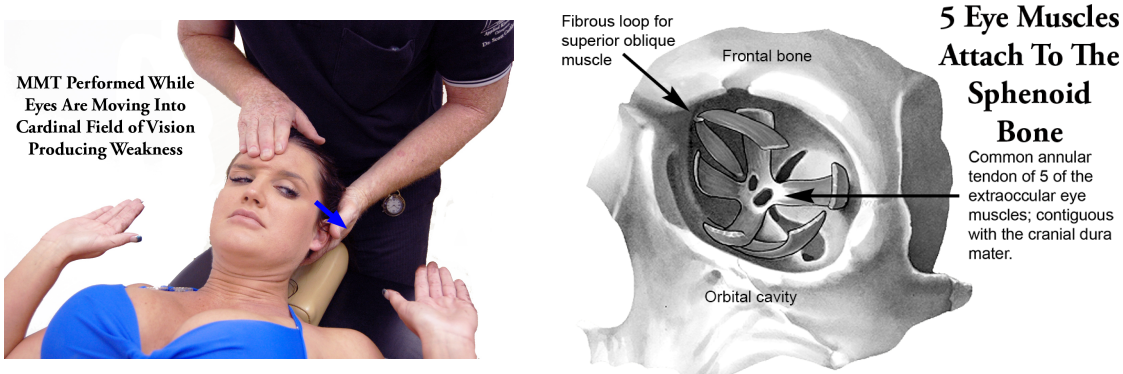


Figure 1. Ocular Lock (Opto-Kinetic) Challenge



Figure 2. Left sphenoid lateral strain correction



Figure 3. Challenge to left TMJ with opening of the jaw

The average Visual Analog Scale (VAS) of Neck and Associated Pain for these 52 patients was 6.75 (0 to 10 scale), and after treatment (averaging 1 to 5 sessions, with 4 patients requiring ongoing treatment to maintain their improved VAS level) the average VAS was reduced to 0.49. **(Table 1 & 2, & Appendix 1)**

Discussion

Sacro occipital technique (SOT) and Applied Kinesiology chiropractic technique offer a novel approach to treating head and neck pain by suggesting that manipulation of the cranial bones, sutures, meninges and related muscle of the human skull may impact whole body function. There have been some published studies that support the use of cranial techniques for the treatment of headaches and pain, though clearly more research in this arena is needed.[21-23]

The connective tissue matrix that binds the various cranial bones contain myelinated and unmyelinated nerve fibers that terminate as free nerve endings may be associated with pain responses caused by imbalanced myofascial compressive forces occurring at the sutures.[24] Some of the myelinated fibers terminate as branched free nerve-endings along the inner periosteal covering of the skull bones, and the nerve endings are believed to be pressure sensitive, producing pain sensations when under excessive force, possibly associated with muscular

contractions. [21] According to Retzlaff et al,[25] if the stimulus is excessive, all of the sensory-type receptors in the suture may produce poorly localized pain perception. Jones et al also explain that within the cranial sutures, certain nerve endings are considered sensitive to excessive pressure; when the pressure is relieved the pain is eliminated.[25] This relationship between nerve endings in cranial sutures and their response to pressure would be consistent with other studies suggesting a relationship between myofascial tension and headaches.[26-27]

Goodheart, a student of DeJarnette, stated that there is a need "to achieve zero defects both within the dura, and without." **(Figures 4-8)** It is also noted that various types of muscle dysfunction underlie many different abnormal musculoskeletal presentations. [28] It has been hypothesized that the various powerful muscles attaching directly to the cranial bones move rhythmically and in complex patterns, and these muscles may be specifically tested and treated.[9, 20] In a narrative literature review by Cuthbert and Goodheart, manual muscle testing (MMT) was found to be a reliable and valid functional assessment tool, [29] and it is reasonable to assume that improvement of muscle function during care would be associated with improved patient outcomes. [30]

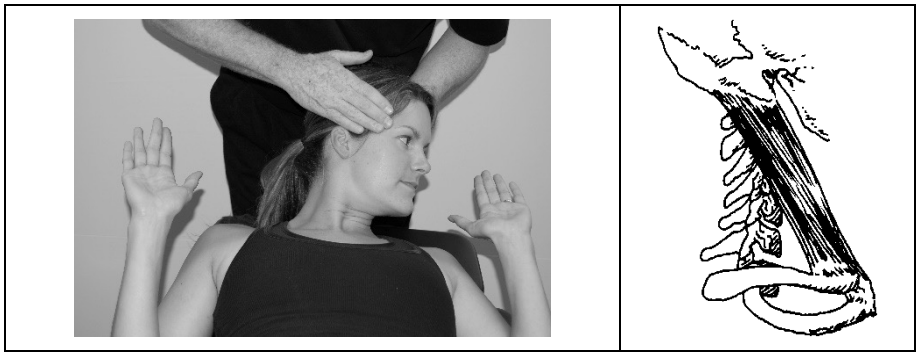


Figure 4. Sternocleidomastoid MMT and muscle

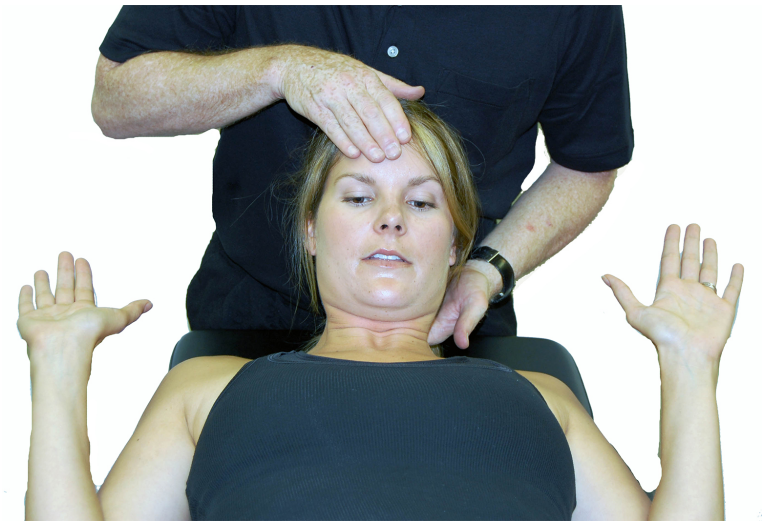


Figure 5. Deep neck flexor MMT

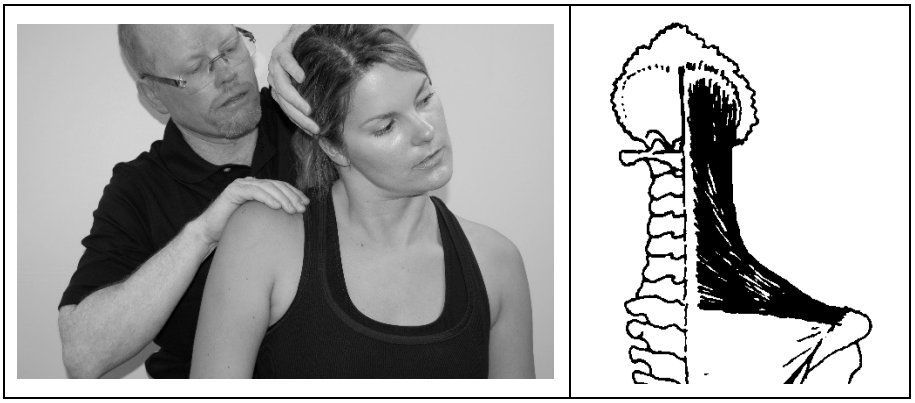


Figure 6. Upper trapezius MMT and muscle



Figure 7. TMJ Challenge during MMT

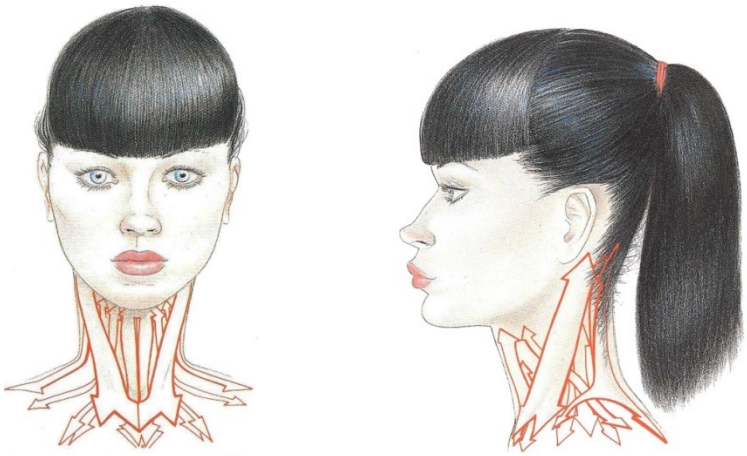


Figure 8. Manual muscle tests (MMT) are designed to replicate the primary vector of motion of a muscle while minimizing the contribution of secondary mover muscles. There is an ideal starting position and vector of testing force that places the cervical muscle being tested as the prime mover and the synergists at a disadvantage during the test. Accurate MMT must be done with a high level of anatomical and physiological knowledge.[20]

In 1920 Cyriax first described the relationship between muscle weakness (detected with a MMT) and headaches.[31] In 2008 an important literature review on neck muscle strength by Dvir (in a special issue of ***Journal of Manipulative and Physiological Therapeutics*** called "Cervical Outcome Measures: State of the Art") confirms that "overall studies indicate that compared to normal subjects, patients suffering from neck-related disorders present with ***significant reductions in cervical muscle strength.***" [32-36] Deficits in strength, endurance, and increased fatigability have been consistently demonstrated in the muscles that attach to the cranium in patients with whiplash-associated disorders, neck pain and headache.[12, 37-39]

In a recently published paper Cuthbert, Rosner and McDowall demonstrated that in a group of patients with mechanical neck pain (MNP), significantly increased MMT findings in the form of reduced strength levels were present compared to a control group (n=248).[39]**(Table 3)** This suggests that the MMT may potentially be a sensitive and specific test (a clinical prediction rule) for evaluating cervical spine muscular impairments in patients with MNP.

Table 3
Number and Percentages of Patients with Positive MMT findings, by Muscle Group

	Control Group (100 patients)	**Mechanical Neck Pain Group (148 Patients)**
Sternocleidomastoid	**18 (18%)**	**61 (41.2%)**
Anterior scalene	**13 (13%)**	**49 (33.1%)**
Upper trapezius	**4 (4%)**	**64 (43.2%)**
Cervical extensors	**2 (2%)**	**48 (32.4%)**

These data indicate that the body's reaction to injury and pain is ***not increased*** muscular tension and stiffness; rather ***muscle inhibition is often more significant*** as measured by several different methods of testing.[13-14, 31-39] These strength changes have been demonstrated specifically in patients with cranial bone imbalance, whiplash, neck pain and headache.

These studies suggest that the performance of the sternocleidomastoid (SCM), anterior scalenus (AS), deep neck flexor (DNF), and upper trapezius (UT) muscles are an invaluable diagnostic measurement in the evaluation of patients with headache, chronic neck pain, and chronic whiplash-associated disorders.[12,40] For instance, upper trapezius muscle dysfunction forces the occiput into flexion or extension and normalization of the strength and function of the muscle before treatment to the cranial base will optimize the treatment's outcome.[1, 39] Sternocleidomastoid muscle dysfunction forces the temporal bone into internal or external rotation, etc. [1, 9] Changes in upper trapezius and sternocleidomastoid strength have been found in patients with cranial bone imbalance, whiplash, neck pain and headache.[9, 12-14, 20, 23,39]

If there is a modifiable risk factor for cranial dysfunctions and headache, then it would be prudent to develop preventive strategies to help identify and target important subgroups of the population at greatest risk for these disorders so frequently confronted by SOT and AK practitioners. In this retrospective case series report, 49 of the 52 patients appeared to present with a cranial dysfunction contributing to their headache and also had a positive MMT in one or many of the muscles of the neck and head. This may mean that the MMT – and its responsiveness to cranial or cervical correction – could function as a clinical prediction rule for patients with cranial dysfunctions and HA.

Clinical prediction rules (CPRs) are derived statistically from research evidence with the aim of identifying the combinations of clinical examination findings that can predict a condition or outcome or favorable response. [41,42]

> "CPRs quantify the contribution of symptoms, clinical signs, and available diagnostic tests, and stratify patients according to the probability of having a target disorder. The outcome of interest can be diverse and be anywhere along the diagnostic, prognostic, and therapeutic spectrum." [41]
>
> Essentially, the identification of responder sub-groups is now a treatment priority, because it appears that larger treatment effects are observed if focused manual therapy is applied to those likely to respond.

Liebenson notes that there is a profound need to translate the results of clinical and epidemiologic studies into meaningful and practical information for clinicians.[43] One such result could be muscle strength impairments as a modifiable risk factor in patients with cranial dysfunctions and headache. The development of clinical prediction rules (clinical examination findings that can predict the presence of a condition and its response to treatment) may link muscle strength impairments in patients with cranial faults and HA as a modifiable risk factor. **(Figure 8)**

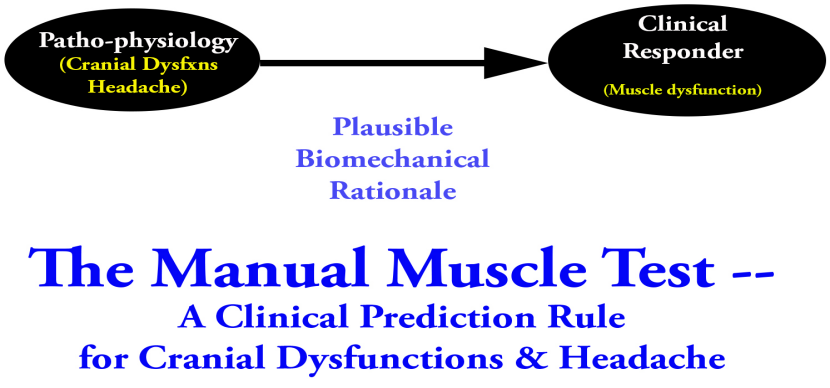


Figure 8. The manual muscle test may be a CPR for cranial dysfunction and HA

The influence on sutural mobility of a malfunctioning sternocleidomastoid or upper trapezius muscle could be significant and sutural disturbances are a definite physiological occurrence.

Philip Greenman notes that: [44]

> "First and foremost the craniosacral mechanism must be viewed within the context of the total musculoskeletal system. Dysfunctions within the craniosacral mechanism may be primary, secondary or of little import. Cranial dysfunction may be the result of alteration elsewhere, and, if that is not addressed, treatment of cranial dysfunction will be less than satisfactory. Conversely, continued attention to dysfunction in the musculoskeletal system elsewhere, without addressing the craniosacral dysfunction, will give less than satisfactory results."

During an examination of cranial dysfunction, it may be of value for the physician to pay careful attention to muscular dysfunctions that cross or impact cranial suture mobility. Any attempt to normalize cranial function without appropriate attention to these muscular influences, acting directly on the sutures and, therefore, on the motion potentials of the cranium, may diminish the overall positive results of cranial manipulative therapy in cases like these.

This study attempts to emulate Flynn and colleagues,[42] who used a single arm design to identify demographic, historical or physical examination factors associated with a favorable clinical outcome among patients with low back pain undergoing treatment consisting of spinal manipulative therapy and range of motion exercises. While this current retrospective study has various limitations (no control, no sham intervention, not being able to rule out regression to the mean or ideomotor effect), there were five identified variables associated with a favorable treatment response:

1. Patients were female
2. Patient's ages were approximately 45 years old +/- 10 years (35-55 years old)
3. Presented with headaches with cranial dysfunction
4. Presented with upper cervical vertebral joint imbalance
5. Manual muscle testing (MMT) revealed muscle inhibition most commonly of the sternocleidomastoid and the deep neck flexor muscles, and to some degree to the anterior scalene and upper trapezius muscles.

The evaluation and treatment of the muscular strength and function in the cranial muscles may become a standard part of evaluation and therapy in headache and neck pain patients. This approach may improve our approach to, concepts behind, and outcomes with cranial therapy. The immediacy with which these muscle inhibitions (associated with headache, neck pain and jaw pain) respond to proper cranial treatment suggests how related these two basic pathophysiological problems are. In cranial treatment of this kind we ask: how is "sacroiliac pain" explained without considering the functional status of muscles that move the hip and

pelvis? Similarly, how is “headache” to be fully understood without considering the muscles that attach to and move the cranium, neck and jaw?

Conclusion:

SOT (like AK, which developed from SOT) suggests that muscle dysfunctions arising from, or that are part of the etiology of cranial dysfunctions, should be recognized and corrected as part of the over-all treatment strategy. This retrospective case study suggested a relationship between muscular imbalance and associated headache pain in a selected group of patients. VAS assessments performed pre- and post-care noted an improvement from the treatment rendered. As with any case series without a control, sham intervention, randomization, or blinded gatherer of date, generalization of these findings has its limitations. Yet even with these limitations further study is indicated to determine if muscular imbalance and headaches represent a subset of patient presentations that would be predictive of having good outcomes to chiropractic care.

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Table 1
Summary of Patient Findings
(n=52) Patients With Headache

SEX AND AGE	Positive MMT (SCM, Anterior Scalene, Deep Neck Flexors, or Upper Trapezius Muscles)	Positive Cranial Challenge = Strengthens Inhibited MMT	Positive Ocular Lock (Opto-Kinetic Reflex) Challenge	Positive Upper Cervical Challenge	Positive TMJ Challenge	Change in HA with TX on VAS
TOTALS						
F: 48 M: 4	SCM = 42 DNF = 33 AS = 24 UT = 24 None = 3	N = 3 Y = 49	N = 28 Y = 24	Y = 52	N = 13 Y = 39	VAS AT INITIAL CONSULTATION average = 6.75 VAS AFTER TREATMENT (1 to 5 sessions) average = 0.49

Table 2
Individual Patient Findings
(n=52) Patients With Headache

SEX AND AGE	Positive MMT (SCM, Anterior Scalene, Deep Neck Flexors, or Upper Trapezius Muscles)	Positive Cranial Challenge = Strengthens Inhibited MMT	Positive Ocular Lock Challenge (Opto-kinetic reflex)	Positive Upper Cervical Challenge	Positive TMJ Challenge	Change in HA with TX on VAS/ # of treatments
1. **(F) 47**	Y SCM, UT	Y	N	Y	Y	8 to 1 4 Txs
2. **(F) 81**	Y SCM, DNF	Y	N	Y	N	6 to 0 3 Txs
3. **(F) 27**	Y SCM, AS	Y	Y	Y	Y	10 to 0 5 Txs
4. **(F) 52**	Y SCM, DNF	Y	N	Y	Y	6 to 2 5 Txs
5. **(F) 57**	Y SCM, DNF	Y	N	Y	N	7 to 0 3 Txs
6. **(F) 47**	Y SCM, DNF	Y	Y	Y	Y	▪ to 0 5 Txs

7 **(F) 44**	Y SCM, DNF, AN, UT	Y	Y	Y	Y	10 to 2 Ongoing tx to reduce intractable migraines
8. **(M) 65**	Y SCM, DNF, UT	Y	N	Y	Y	7 to 1 3 Txs
9. **(F) 54**	Y SCM, AS, DNF	Y	Y	Y	Y	6 to 0 5 Txs
10. **(F) 15**	Y AS, UT	Y	N	Y	Y	6 to 0 3 Txs
11. **(F) 61**	Y SCM, UT	Y	N	Y	Y	7 to 0 5 Txs
12. **(F) 32**	Y SCM, AN, DNF	Y	Y	Y	Y	9 to 0 3 Txs
13. **(F) 50**	Y AS	Y	Y	Y	N	4 to 0 1 Tx
14. **(F) 64**	Y SCM, DNF, UT	Y	Y	Y	Y	7 to 1 4 Txs
15. **(F) 26**	Y SCM, DNF, AS, UT	Y	N	Y	Y	5 to 0 2 Txs

16. **(F) 54**	N	N	N	Y	N	6 to 0 3 Txs to I.C.V.)
17. **(F) 55**	Y AS, UT	Y	N	Y	N	9 to 0 2 Txs
18. **(F) 44**	Y SCM, AS, UT	Y	Y	Y	Y	8 to 0 3 Txs
19. **(F) 55**	Y SCM, DNF	N	N	Y	N	5 to 1 4 Txs
20. **(F) 48**	Y SCM, DNF	Y	Y	Y	N	10 to 0 5 Txs
21. **(F) 55**	Y SCM	Y	Y	Y	Y	6 to 0 4 Txs
22. **(F) 44**	Y SCM, AS, UT	Y	N	Y	Y	9 to 2 Ongoing tx to maintain 2 level HA
23. **(F) 23**	Y SCM, AS, DNF	Y	Y	Y	Y	7 to 0 4 Txs
24. **(F) 43**	Y SCM, AS, DNF	Y	Y	Y	Y	8 to 2 4 Txs
25. **(F) 29**	Y SCM, UT	Y	Y	Y	Y	9 to 0 3 Txs

26. **(F) 26**	Y DNF	Y	N	Y	N	4 to 0 4 Txs
27. **(F) 36**	Y SCM	Y	N	Y	Y	7 to 3 5 Txs
28. **(F) 22**	Y UT	Y	N	Y	Y	8 to 0 4 Txs
29. **(F) 51**	Y SCM	Y	Y	Y	N	5 to 0 4 Txs
30. **(F) 43**	Y SCM, AS, DNF, UT	Y	Y	Y	Y	10 to 1 6 Txs
31. **(F) 49**	Y SCM, AS	Y	N	Y	Y	6 to 0 2 Txs
32. **(F) 58**	Y SCM, UT	Y	Y	Y	Y	7 to 1 6 Txs
33. **(F) 15**	Y DNF	Y	Y	Y	Y	6 to 2 4 Txs
34. **(M) 15**	Y SCM, DNF	Y	N	Y	N	5 to 0 4 Txs
35. **(F) 69**	N	N	N	Y	Y	4 to 0 3 Txs

36. **(F) 30**	Y SCM, AS, UT	Y	N	Y	Y	7 to 1 3 Txs
37. **(F) 44**	Y DNF, SCM	Y	N	Y	Y	7 to 0 5 Txs
38. **(F) 36**	Y DNF, AS, SCM, UT	Y	Y	Y	Y	10 to 2 Ongoing tx to maintain 3 level HA
39. **(F) 41**	Y SCM, AS, DNF	Y	Y	Y	Y	7 to 0 4 Txs
40. **(F) 56**	Y SCM, AS, DNF, UT	Y	Y	Y	Y	9 to 0 3 Txs
41. **(F) 43**	Y SCM, DNF	Y	Y	Y	Y	7 to 0 1 Tx
42. **(M) 56**	Y SCM, DNF, UT	Y	N	Y	N	6 to 0 6 Tx
43. **(F) 65**	N	Y	N	Y	Y	3 to 0 2 Txs
44. **(F) 40**	Y SCM, AS, DNF, UT	Y	Y	Y	Y	10 to 0 5 Txs
45. **(M) 54**	SCM, AS, DNF	Y	N	Y	Y	6 to 0 4 Txs

46. **(F) 51**	Y SCM, DNF	Y	Y	Y	N	7 to 2 5 Txs
47. **(F) 46**	Y SCM, DNF, AS, UT	Y	N	Y	Y	4 to 0 4 Txs
48. **(F) 47**	Y SCM, DNF, UT	Y	N	Y	N	6 to 0 4 Txs
49. **(F) 31**	Y SCM, AS, DNF, UT	Y	Y	Y	Y	5 to 0 5 Txs
50. **(F) 52**	Y SCM, DNF	Y	N	Y	Y	8 to 0 5 Txs
51. **(F) 60**	Y SCM, AS, DNF, UT	Y	N	Y	Y	7 to 2 Ongoing tx to maintain 2 level
▪ **(F) 69**	Y AS, DNF, UT	Y	N	Y	Y	5 to 0 4 Txs
			TOTALS			
F: 48 M: 4	**SCM = 42 DNF = 33 AS = 24 UT = 24 None = 3**	**N = 3 Y = 49**	**N = 28 Y = 24**	**Y = 52**	**N = 13 Y = 39**	**VAS MAX average = 6.75 VAS CHANGE average = .49**

Appendix 1: Visual Analog

Visual Analog Scale of Neck & Associated Pain

Name _____ Date ____/____/____

Please mark on the 1 to 10 scale your involvement with pain to the following locations and situations, from no involvement (0) to maximum involvement (10). Mark the scale with a vertical line like this:

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

1. Do you have any pain in your neck? How severe is it?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

No pain — Intolerable

2. Do you have any pain in the night? How severe is it?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

No pain — Intolerable

3. Does activity give you pain? Yes ____ No ____ If so, how much activity is required to cause you pain?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

A great deal of activity — Almost no activity

4. Do you use pain killers? Yes ____ No ____ If so, how much relief?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Complete relief — No relief

5. Do you have any stiffness in your neck?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

No stiffness — Intolerable stiffness

6. Do you have pain in your shoulder and/or arm? (Mark for right and left.)

Right 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Left 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

None at all — Intolerable

7. Does your pain interfere with the use of your arm and/or hand? (Mark for right and left.)

Right 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Left 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

None at all — Not able to use it at all

8. Do you have numbness or tingling in your arm and/or hand? (Mark for right and left.)

Right 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Left 0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

None at all — Intolerable

(Over, please)

9. Do you have headaches? If so, how severe are they?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

None at all — Intolerable

10. How frequent are your headaches if you have them?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Infrequent — All the time

11. Is your pain worse when riding in a car?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Complete freedom to ride in a car — Such discomfort that I cannot ride in a car at all

12. Do you have pain when lying down in bed?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Complete comfort — No comfort at all

13. What is your overall handicap in your complete life-style because of neck, head, shoulder, and/or arm pain?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

Completely free to perform any task — Totally handicapped

14. To what extent does your pain interfere with your work?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

No interference at all — Totally incapable of work

15. To what extent does your work have to be modified so that you are able to do your job?

0 . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | . . . . | 10

No adjustment to work — So much adjustment that I have had to change jobs

Post-migraine chronic daily headache relieved with coccygeal and sphenoidal manipulation: A case report

Jerry I. Hochman, DC

Introduction

Chronic daily headache, also known as new persistent daily headache, has recently been added to the International Classification of Headache Disorders ICHD-2 [1]. It has been proposed to develop from stress events, medication overuse, and pervious migraine due to overlapping of neural circuits and cellular events, but a definite etiology has thus far elude researchers [2]. There is evidence that migraine headache is sometimes misdiagnosed when it presents as isolated facial pain, unlike classic migraine [3]. In genera, the etiology of migraine headache is often a matter of guesswork, although several factors have been implicated in the literature, including vascular changes, lowered serotonin levels and meningeal stress [4]. Physical stresses are no among the most common of migraine causes.

Coccyx subluxation might exist without pain, but all of the available literature on the coccyx is within the context of pain (coccydynia) [5,6]. Coccyx pain develops most commonly from a fall on the buttocks or from childbirth, and is treated with manipulation, injection, physical modalities, and even removal of the coccyx in extreme non-responsive cases. Manipulative treatment to the coccyx is usually done with an external contact using a cephalad push or pull, in order to decrease the degree of anterior misalignment that usually occurs when the coccyx is traumatized. An intra-rectal adjustment is also sometimes used for a more localized contact on the anterior aspect of the coccyx [7,8].

The term Lovett Brother is defined as the name for a vertebra in the upper of lower spine that moves synchronously with a paired vertebra in the opposite end of the spine to maintain a balanced vertebra posture [9]. Blum has summarized the use of this relationship as it applies to the practice of Applied Kinesiology and Sacro Occipital Technique [10]. No information regarding the developmental origins or neuro-mechanical rational for the Lovett Brother idea can be found in the peer-reviewed medical literature, and scant information is available in the non-peer-reviewed literature. The idea of the relationship between the two ends of the spine may have a basis in propriospinal and vestibulospinal connections between the head and pelvis [11].

Some clinicians consider the Lovett Brother of sacrum to be the occiput, an idea related to the osteopathic concept of sacral and cranial motion first promoted by Sutherland [12]. Anatomically, the coccyx lies inferior to sacrum and the sphenoid lies anterior to occiput. The sacrum is clinically considered to be the Lovett Brother or compensator of the coccyx.

Case Report

A 32 year old male patient complaining of “chronic non stop headache with facial pain” that began in the summer of 2003 referred himself to my office in May 2010. This patient identified the two greater sphenoid wings as the location of the facial pain and reported seeing between 25 to 30 doctors over the past 7 years for treatment of these headaches. He was currently on

Cymbalta 60 mg and hydrocodone 10 mg as needed. Previous treatment included temporalis injections with lidocaine and cortisone, use of a TENS unit, acupuncture, and radiofrequency surgery on the temporalis tendon. Diagnostically he had undergone transesophogeal echocardiography (TEE) and visits to an ENT specialist. A total of 28 medication shad also been tried including Oxycontin and Oxycodone, all with limited or no results. Previous physical therapy and diversified chiropractic adjustment had been unsuccessful with the exception of specific upper cervical care at a local office that resulted in "taking the edge off."

Examination revealed no positive standard orthopedic or neurologic indicators of sacroiliac or cervical dysfunction. TMJ tests were negative, including opening and closing glide, pain on palpatory pressure, or pterygoid palpation pain. Upon testing for coccyx dysfunction by having the patient squeeze the gluteal muscle together (an Activator Methods test), he exhibited immediate functional leg length discrepancy and obvious motor changes in previous strong muscles [13].

Cranial motion examination, as taught and used in the SOT cranial techniques exhibited decreased S-I motion of the left sphenoid wing and an occipital base fixed in right lateral translation. Pelvic examination exhibited chiropractic proprietary indicators of minor left sacroiliac instability as used in the practice of Sacro Occipital Technique [14].

Interventions



Intervention was aimed at reducing the Activator Methods chiropractic indicator of coccyx and sphenoid dysfunction, a functional short leg appearing after contracting of the buttocks muscles. This patient was seen a total of 6 times over the course of a one month period. I administered 3 external coccyx corrections with the help of a drop pelvic mechanism, and 2 sphenoid contacts on the greater wings externally and pterygoid processes intraorally.



The coccyx adjustment is done with a coccyx base contact with the superior hand thumb pad, backed up with the heel of a stabilization hand. The pelvic piece was elevated for easy access to coccyx, and the pelvic piece was se to drop easily during a cephalad thrust. The sphenoid corrections wren performed with a gloved hand contact using a sustained contact in a cephalad direction intraorally, while the greater wing contact to a sustained force in a lateral to medial direction.

Results

After the third coccyx and sphenoid corrections, the patient reported a break in the pain. 2 visits later he reported an 80% decrease in intensity and duration of pain. 3 weeks later he still reported an 80% improvement in pain relieve. At the last visit 2 months after his initial presentation,, he reported no pain at all.

Discussion

This appears to the first report of chronic daily headache with possible coccyx-related etiology. It also appears to be the first report of a possible coccyx-sphenoid relationship in association with migraine or maxillary trigeminal neuralgia. Although anecdotal, this single case was unique in it quick resolution of symptoms that had existed for so long. The use of the Activator Methods coccyx isolation test was definitive in localizing coccyx dysfunction in this case. The author's familiarity with the relationship between the coccyx and sphenoid is believed to have been instrumental in this resolution of this case.

Familiarity with the Lovett Brother relationship between the coccyx and sphenoid was also important, since the greater sphenoidal wings were identified by the patient as the sites of the head pain.

A variety of authors have reported migraine headache with unusual manifestations such as tooth pain [15,16]. This patient's headache was originally classified as migraine. After discussion of the case with Dr. John Romfh, an anatomist, the possibility of maxillary trigeminal neuralgia was discussed as a possible diagnosis [17]. Migraines however, can become what is now classified as chronic daily headache. This transformation is summarized by Meng and Cao, and seems to be related to stress and medication overuse. Changes in neurotransmitter production and pain signaling have been proposed as the causes o chronicity. As previously stated, this patient had been on 28 different medications for several years, including Oxycontin and Oxycondone [2].

Possible Mechanisms of Action

Sutural Motion

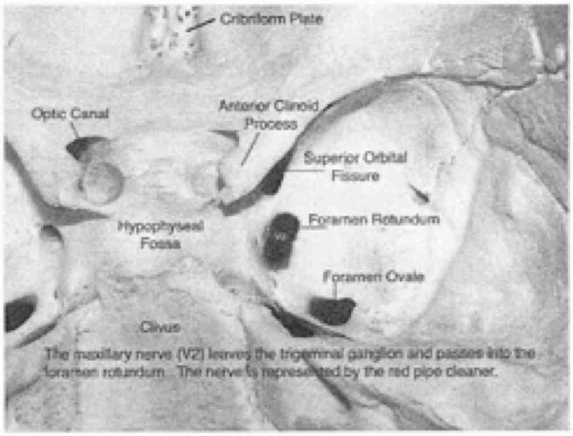
Cranial sutural fusion, other than at the sphenobasilar synchondrosis, is usually not complete until sometime in the 4th decade of life 18. It is possible that some motion was imparted to the sacrum by force through both the greater wings and the pterygoid contacts that affected the anatomical relationship between the trigeminal ganglion, the temporal bone, the sphenoid, and the overlying dura.

The trigeminal ganglion lies in Meckel's Cave , the dura mater covering the trigeminal impression near the apex of the petrous part of the temporal bone [19]. The maxillary branch reaches the trigeminal ganglion through the foramen rotundum located in the anterior medial aspect of the great wing. Cases of congenitally smaller or unusual shaped foramina rotunda have been reported causing trigeminal neuralgia [20]. It may be possible that the sphenoid contacts affected the sensitivity of this ganglion or the maxillary branch within the foramen rotundum to the degree that pain perception changed.

Fascial Connection

The dura mater attaches to the coccyx via the sacrococcygeal ligament, an extension of the filum terminale [21]. The spinal dura is continuous with the sphenoidal dural connections, and, indeed with the entire periosteal dura of the cranium [22].

Several cases of headache have been reported after accidental dual tearing during disc surgery or laminectomy [23,24]. The proposed etiology of the head pain is thickening of the pachymeninges and cranial cerebrospinal fluid hypotension, resulting in cranial venous swelling. Perhaps the coccyx and sphenoid contacts changed tension on the cranial dural attachments near the trigeminal ganglion, although the dural covering over the trigeminal ganglion is extremely tight [25].



Meckel's Cavity
Cleft in the meningeal layer of dura of the middle cranial fossa near the tip of the petrous portion of the temporal bone Encloses the roots of the trigeminal nerve and ganglion. (from skullanatomy.info)

Propriospinal and Vestibulospinal Tracts

It is possible that the coccyx contact created changes in muscle tone of the head and neck via propriospinal and/or vestibulospinal influences. The lateral vestibulospinal tract descends ipsilaterally through the entire spinal cord, and is excitatory to antigravity muscles. Propriospinal neurons evidently make up the preponderance of neurons in the spinal cord [26]. Propriospinal connections between levels of the spinal cord allow coordinated action of the body, even to allow the head to maintain normal position in the presence of pelvic distortion [27]. This may be part of the Lovett Brother relationship in clinical practice. DeJarnette went so far as to use cervical muscle palpation to determine misalignment characteristics of lumbar vertebra. DeCamp has described Lovett-related methods to determine pelvic distortion [14,28].

Conclusion

This case of chronic headache relief raises several questions regarding etiology and reminds the clinician that the cause may indeed be quite far from the location of the pain, and that anatomically-based mechanical factors may play a role. The medical literature is basically non-existent regarding such an unusual case but does support, to a degree some of the possible etiological theories. A collection of similar cases from a multitude of practitioners may shed light on the most likely explanations.

Acknowledgement

Thanks are due to Drs. Leslie Cane and John Romfh for discussing this case with me and leading me in realistic directions, and to Korey Revels for help with research and review.

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Chiropractic as part of an interdisciplinary team for the care of a patient with an orbital pseudotumor: A case report.

Thomas Bloink, DC, Charles L. Blum, DC

Introduction:

Orbital pseudotumor is a clinical entity characterized by features of a space-occupying, non-specific inflammatory condition of the orbit. [1] "Orbital pseudotumor is believed to be a nonspecific, acute or chronic inflammatory process involving the intraorbital soft tissue. Orbital pseudotumor may masquerade as sinusitis with orbital complications or as a severe upper respiratory tract infection." [2]

"Orbital pseudotumor is a benign intraorbital process confined to the orbit but extraorbital involvement can occur." [3] It is among the third most common orbital diseases and accounts for 5-10% of orbital processes. "Clinically, orbital pseudotumor has been categorized as myositis, dacryoadenitis, and an anterior, apical and diffuse process. Patients may present with diplopia, conjunctival chemosis, proptosis or abnormal computed tomography scan (CT scan) findings. Patients may also have associated optic neuropathy [3]."

They are commonly diagnosed through computed tomographic (CT) and/or magnetic resonance imaging (MRI), blood tests, as well as histological differentiation [4-7]. Therapeutic options are steroid therapy, immunotherapy, pulsed chemotherapy, radiotherapy and surgery [8,9].

A 47-year-old female woke up January 15, 2014 with darkness and limited vision in the right eye, which after two hours appeared to resolve itself. After consulting an ophthalmologist she was diagnosed with swelling of the optic nerve in the right eye. An MRI and spinal tap were performed and were negative for pathology. She was diagnosed with an orbital pseudotumor and was unresponsive to treatment with steroidal anti-inflammatories. The ophthalmologist believed that aggressive care was not indicated and when the patient's condition was unresponsive to steroids suggested the patient "watch and wait" for her condition to improve. She attempted to take over the counter pain relievers, which were moderately effective and upset her stomach.

After six months the patient did not note any improvement in her symptoms and presented for chiropractic care July 1, 2015 with a diagnosis of orbital pseudotumor along with increased pressure in her head the prior several days. She reported chronic intermittent headaches in the orbital region usually when awakening, which were characterized as mild migraines occurring one to two times a month and lasting two hours. The headaches would include flashes of light in either her right or left eye affecting her whole vision at onset, then at the center, and then later would become a blind spots of the center of the eye. Following the headaches she would have a dull achy feeling in the frontal area that radiated to bilateral sphenoid wings. She also had a past history of tinnitus for years and began using hearing aids four years before presentation. The patient had a history of bruxism that was controlled with an upper dental appliance.

Methods:

Examination noted obstructive airway compromise with maxillary deficiency, maxillary exostosis, and mandibular tori. Temporomandibular joint (TMJ) dysfunction was noted with evidence of clenching, malocclusion, decreased joint translation, and sensitivity and hypertonicity of the temporalis muscles. Sensitivity to palpation was noted in the craniofacial bones and sutures, as well as hypertonicity of the sub-occipital muscles, which guided cranial manipulative care. She also was treated for a left sacro-iliac (SI) joint instability (sacro occipital technique (SOT) – category two) associated with sensitivity and swelling in the upper aspect of that joint. Care was focused on reducing pain and improving function in the TMJ, craniofacial region, and pelvis.

At the first office visit the patient was told to stop using the upper dental appliance since this could further compromise her airway due to limited tongue space in its physiological rest position (near incisal papillae). With a maxillary exostosis and mandibular tori there is reduced space for the tongue, and an upper appliance further compromises this space leading to posterior tongue positioning and airway compromise. There was some consideration that airway compromise might be contributing to her symptoms due to signs of obstructive sleep apnea and reduced oxygenation when awaking. She was treated for eight visits from July 1 to August 24, 2015.

Results:

After her fourth office visit on July 16, 2015 the patient reported her eyes were doing much better, and she was no longer waking up with the previous visual symptoms, which had persisted since January 2015. She was referred back to her ophthalmologist who determined there was a 65% improvement in her pseudotumor, which had previously been unresponsive to pharmaceutical interventions as well as "watching and waiting." She is currently scheduled for dental co-treatment to better maintain her reduced craniomandibular distortions with a mandibular appliance.

Discussion:

A review of the chiropractic literature (chiroindex.org) found two articles that had key words "pseudotumor cerebri" and related to diagnosis and treatment of a patient presenting with benign intracranial hypertension. [10,11] Other than those two articles this is the first presentation of chiropractic interdisciplinary treatment of a patient presenting with an orbital pseudotumor. Chiropractic care within interdisciplinary and multidisciplinary arenas may offer patients greater options when traditional allopathic methodologies do not suffice. Developing a team of practitioners who better understand each other's place in the care of various conditions can be important for optimal treatment of complex, little understood patient presentations. [12-14] It is possible that a reasonable trial of chiropractic care for patients who have complex unresponsive conditions, such as orbital pseudotumor presentations, might be appropriate within an interdisciplinary arena.

It is unclear what specifically helped this patient, whether it was craniomandibular or TMJ disorders relating to airway compromise, or contributory pelvic imbalance and other conditions that may have affected the patient's orbital symptomatology. It is possible that the patient was misdiagnosed or that the condition would have resolved regardless of treatment. The temporal relationship between the improvement and care rendered was compelling. However, it is very difficult to generalize the patient's response in this case to patients at large, since it represents only one subject.

While unusual, there have been two studies that discus a relationship between TMJ imbalance and orbital pseudotumors. [15,16] "Occasionally the disease may extend into the middle cranial, the pterygopalatine, and the infratemporal fossa through the various foramina of the orbit, although extension into the infratemporal fossa is very rare." [15] It is possible that concomitant stressors relating to posture and TMJ disorders might make chiropractic care an important consideration with subsets of patients that have postural challenges and TMJ dysfunction. [17-21] Differentiating what specific subset of patients presenting with an unresponsive benign orbital pseudotumor that might respond to an interdisciplinary approach of the type used in this case could be an important for patients with a refractory condition.

Conclusion:

A 47-year-old female patient presented at this office with a diagnosis of orbital pseudotumor and concomitant headaches along with unresponsive visual disturbances. When steroidal therapy and "watching and waiting" for over six months yielded no improvements, she sought care at this office in conjunction with ophthalmological and follow-up dental TMJ care. Once SOT and craniomandibular care were instituted she had a lessening of her headaches as well as a 65% improvement in her orbital pseudotumor, according to her ophthalmologist. It is difficult to generalize from case reports; however, the ongoing nature of the patient's condition and the temporal relationship between the care received and his response warrants further study.

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Trauma induced severe refractory motion sickness disorder treated with sacro occipital technique, applied kinesiology, and cranial chiropractic care: A case report.

Vincent Esposito, DC, Sr., Vincent Esposito, Jr., Charles L. Blum, DC

Introduction:

Nausea most commonly evolves slowly over time and, although it is universally experienced, the brain mechanisms underlying this evolution are not well-understood. [1,2] In general, nausea is the characteristic subjective unpleasant sensation that immediately precedes vomiting 3 and can be caused by motion, the ingestion of toxins, adverse drug reactions, and treatments such as radiotherapy. [4,5] The mechanism of nausea is difficult to understand because it is a complex physiological process that involves central (vestibular system, area postrema) and peripheral (abdominal vagal afferents) inputs. [2] "Nausea is associated with significant morbidity, and there is a wide range in the propensity of individuals to experience nausea." [2]

As a means to better understand any relationship between postural motions, nausea, and motion sickness, various studies have investigated the relation between postural control and motion sickness." [6-8] Motion sickness is characterized by a maladaptive response to unusual motion events and, interestingly, "is preceded and predicted by postural instability." [7] The symptoms associated with motion sickness are nonspecific and variable. Although the "postural instability theory of motion sickness" predicted that instability should precede sickness, it did not make any claims regarding the symptoms associated with it. [7]

A 19-year-old male presented to this office with a two-year case of a motion sickness type disorder, where body movements would elicit severe nausea and vomiting. Due to the unresponsive nature of other interventions and the severity of the patient's presentation, it was considered that "chiropractic manipulative treatments for sensory conflict and proprioceptive dysfunctions" associated with the patient's nausea might be indicated. [9] The goal of this case study was to determine if low risk chiropractic interventions might help improve this patient's postural instability and/or sensory conflict related to proprioceptive dysfunction.

Case History:

A 19-year-old male presented with neck pain and severe, trauma-induced refractory motion sickness disorder, where slight movements could cause nausea and vomiting. His condition began after repeatedly swinging a baseball bat in a batting cage. Following this activity he noted an inability to perform any movement within his upper extremities and torso without developing feelings of nausea. Even a simple touch would trigger nausea and, in some cases, vomiting. In the days following the injury the patient needed help with the simplest of daily activities, including getting out of bed, putting on shirts or socks, and showering. He also reported shoulder pain while standing and a limping gait. He lived in a virtual catatonic state, fearing the next flinch would cause him to vomit.

He was seen by a variety of doctors who attempted various medications, prolotherapy, cervical traction, and other procedures – none of which had any affect on his symptoms. Five months

after the initial batting cage injury, he was seen at the neurology center at New York University and the patient was told he likely had a spinal fluid leak. He was referred to a neurosurgeon who suggested he be seen in Los Angeles, California to perform to patch a spinal fluid leak. A CAT scan performed upon arrival in Los Angeles did not indicate a leakage of fluid; however, the patient's neurosurgeon recommended proceeding with the surgery as planned. [10] The patient returned to New York with no observed improvement. After over two years of seeking help from a variety of professionals, including neurologists, neurosurgeons, gastroenterologists, physical therapists, and pain management specialists; the patient decided to see a chiropractor as what he described as "a last resort."

The patient presented at this office with diagnoses of intervertebral disc disorder with myelopathy, cervicobrachial syndrome, brachial neuritis, brachial plexus lesions, displacement of cervical discs without myelopathy, cervicocranial syndrome, and skin sensation disturbances. Based on the patient's presentation it was suspected that his symptoms were complicated by impingements of the phrenic [11] and vagus nerves. [12,13]

Methods/Intervention:

On February 26, 2015, the patient underwent a full examination at this office and presented without a corneal reflex, an abnormal Weber's test, abnormal tongue lateralization, and an inability to frown and smile. The patient also exhibited an abnormal pupillary light reflex and ocular movement, which were limited along with bilateral nystagmus. A slight head rotation along with a bilateral gaze shift would initiate the patient's nausea. There were also abnormalities with function of the masseter muscle, an inability to shrug his shoulders, and abnormal temporal mandibular joint (TMJ) translation with deviations on opening and closing. The patient could not perform any head and neck movements without feelings of nausea arising. Patient presented without deep tendon biceps reflexes, brachioradialis reflexes, and triceps reflexes bilaterally. In a hand-dynanometer test, he was able to apply only 10lbs of force with his left hand, and 15lbs of force with his right.

Patient also presented with a raised left shoulder and left hip, an abnormal Romberg's sign, abnormal Trendelenberg sign, abnormal Kemp's test, and an inability to walk on his toes. Patient only displayed 10° of motion bilaterally in Goldthwait's test, Lasegue's test, and Braggard's test. Fabere-Patrick test revealed 10° of motion as well. Patient displayed abnormal upper and lower abnormal superficial reflexes as well as dermatome hyperesthesia from level T2 through S5.

Muscle testing using applied kinesiology (AK) principles elicited weakness in both the upper and lower extremities. In the supine position, weaknesses were found in the fibularis longus and brevis, rectus femoris, rectus abdominis, and quadratus lumborum. Also bilateral weakness was found opponens digiti minimi, supinator, biceps brachii, rhomboids, pectoralis major (clavicular portion), sternocleidomastoid, and the neck flexors. While prone, bilateral weakness was found in the gastrocnemius and gracilis in the lower extremity. Additionally, gluteus maximus weakness was found on the left side and teres major, and neck extensors were weak on the left side. The patient also demonstrated bilateral weakness in the upper trapezius while sitting.

The motion sickness assessment questionnaire (MSAQ) [14] [Figure 1] at that time was scored at 45.8. The MSAQ is considered a valid instrument for the assessment of motion sickness and may be used to assess motion sickness as a multidimensional rather than unidimensional construct. [14]

Initially, patient was treated with basic sacro occipital technique (SOT) category two [15-17] pelvic block placement for pelvic torsion [18-19] and sacroiliac joint hypermobility syndrome. As he progressed, advanced orthopedic blocking procedures [20,21] were also performed supine, prone and seated. As the patient responded positively and was beginning to be able to move without feelings of nausea, a craniofacial adjusting procedure entitled the "maxillary fruit-jar technique" was performed. SOT cranial adjustments were administered to the sphenoid, maxilla, nasal, parietal and occipital bones. Intra-oral cranial technique was used to treat functional positions of the medial and lateral pterygoids. In the initial weeks of care the patient was treated for two to four hours each office visit using a variety of these methods. [22]

The patient was also assessed functionally with AK testing, which incorporated an activator instrument to help adjust vertebra and extremities in a variety of positions, such as sitting, standing, walking, and particularly in sports-specific stances. Combinations and variations of treatments listed above were performed in subsequent visits determined by the patient's response to care. To supplement the procedures utilized at this office, he was also given home exercises to help re-train his central nervous system and regain lost coordination.

Results:

On May 28, 2015 (three months later), a reexamination was performed and at this time his light reflex and pupillary reflex normalized, ocular movement improved, and there were no signs of nystagmus. Depression of the TMJ had become smoother, with slight deviation while opening. Patient was able to perform tongue lateralization test, smile, and frown normally. He also displayed normal upper trapezius function. Patient could rotate his head 45° to the right and 40° to the left. Biceps reflex improved to +1 bilaterally. Brachioradialis reflex increased to +1 on the right and a normal +2 on the left. Triceps reflex improved to +2 bilaterally. Dynamometer handgrip strength improved to 80lbs of force bilaterally. Shoulder and hip alignment were bilaterally symmetrical.

Significant improvement was noted on all prior abnormal orthopedic testing; however, the patient still felt hyperesthesia from dermatome T2 through S5, but significantly less than before. Muscles tested during the initial examination all appeared normal during the reexamination.

The patient has continued with care and is being seen at 2-4 times per month to maintain stability and attempts to recover full activities of daily living. As his neurological and orthopedic tests are normalizing the care has focused on facilitating his ability to have motion and exertions with less incapacitating nausea. He has shown a slow, steady improvement while under care with brief intermittent flareups necessitating greater care during that time. As of August 2015 his last MSAQ [14] scoring was 18.1, a significant improvement over the initial score of 45.8. [Figure 2]

With each treatment, the patient appeared to regain more range of motion, attain greater activities of daily living, and improve quality of life. He is now able to now perform many daily activities he had not been able to perform since his injury. Following each office visit the patient remarked that he feels less sensitive to touch, and normal touch sensation no longer would make him nauseous. The patient has been given more complex exercises to challenge his ability to move without nausea. While further treatment and analysis still appears to be required, to date the care rendered was the first intervention that appeared to help him with his recovery.

Discussion

With all case reports that represent an n = 1 scenario it is very difficult to make strong statements regarding condition presentation and the care rendered. This is because there are no controls or sham interventions to help rule out confounders such as the placebo or ideomotor effect, regression to the mean, or even just a natural progression of a traumatic condition.

In one study [n=75] investigating nocebo and placebo administration on patients with motion-induced nausea found that "subjective symptoms of motion sickness were significantly lower among negative-expectancy [nocebo-controlled] group participants than positive-expectancy and placebo-control group participants ($p<0.05$)." [23] They concluded that the results of the study, "suggest that patients preparing for difficult medical procedures may benefit most from being provided with detailed information about how unpleasant their condition may become." [23]

What is compelling in this case is that the patient had been seen by many healthcare practitioners over a two-year period and received no improvement from those various interventions. Improvement was noted within a few chiropractic treatments, and the progression of his recovery appears related to the care rendered, with regressions on times when he is delayed or limited from receiving his regular care at this office.

Chiropractic care for non-musculoskeletal conditions can be a challenging endeavor since with patient presentations that have visceral or motion sickness disorders the somatovisceral and viscerosomatic interactions are diffuse and complex. [24] Not all patients with these conditions will necessarily be helped by chiropractic care, so determining what subset of patients that might be responsive is a difficult undertaking. One possible way of looking for a predictor of who might benefit is whether the non-musculoskeletal condition was physical trauma-induced, such as the patient in this case report.

Conclusion:

This case presents a 19-year-old male who for two years was under care for motion-induced nausea with various healthcare practitioners without improvement. As a last resort the patient presented for chiropractic care and received a combination of sacro occipital technique (SOT), cranial care, and applied kinesiology (AK) to assess and treat his previously unremitting condition associated with a movement-induced nausea. After three months of care he had significant improvement in neurological, orthopedic, and other functional tests. His activities of

daily living and quality of life has returned to a level where he can now better function in life. While not completely recovered, the patient has significant hope and anticipates a full recovery based on his current progress. Future research could include helping to determine what subset of patients presenting with motion-induced nausea may be responsive to low risk chiropractic interventions.

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Figure 1. Motion Sickness Assessment Questionnaire

MSAQ QUESTIONNAIRE

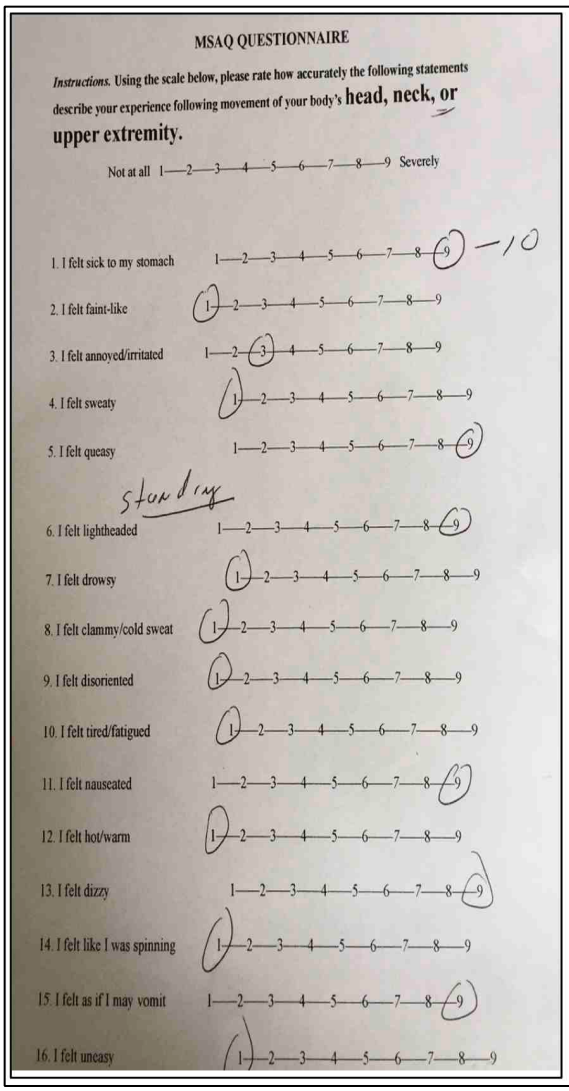
***Instructions*. Using the scale below, please rate how accurately the following statements describe your experience following movement of your body's head, neck, or upper extremity.**

Not at all 1——2——3——4——5——6——7——8——9 Severely

1. I felt sick to my stomach 1——2——3——4——5——6——7——8——9
2. I felt faint-like 1——2——3——4——5——6——7——8——9
3. I felt annoyed/irritated 1——2——3——4——5——6——7——8——9
4. I felt sweaty 1——2——3——4——5——6——7——8——9
5. I felt queasy 1——2——3——4——5——6——7——8——9
6. I felt lightheaded 1——2——3——4——5——6——7——8——9
7. I felt drowsy 1——2——3——4——5——6——7——8——9
8. I felt clammy/cold sweat 1——2——3——4——5——6——7——8——9
9. I felt disoriented 1——2——3——4——5——6——7——8——9
10. I felt tired/fatigued 1——2——3——4——5——6——7——8——9
11. I felt nauseated 1——2——3——4——5——6——7——8——9
12. I felt hot/warm 1——2——3——4——5——6——7——8——9
13. I felt dizzy 1——2——3——4——5——6——7——8——9
14. I felt like I was spinning 1——2——3——4——5——6——7——8——9
15. I felt as if I may vomit 1——2——3——4——5——6——7——8——9
16. I felt uneasy 1——2——3——4——5——6——7——8——9

Figure 2. Pre and Post Motion Sickness Assessment Questionnaires

Feb 2015



MSAQ QUESTIONNAIRE

Instructions. Using the scale below, please rate how accurately the following statements describe your experience following movement of your body's **head, neck, or upper extremity.**

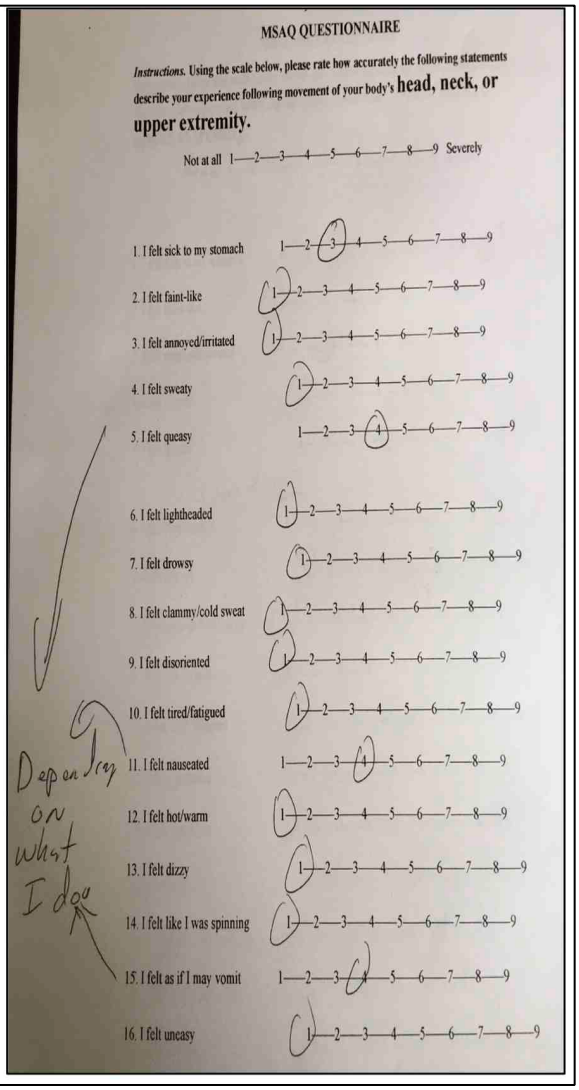
Not at all 1—2—3—4—5—6—7—8—9 Severely

1. I felt sick to my stomach 1—2—3—4—5—6—7—8—(9) −10
2. I felt faint-like (1)—2—3—4—5—6—7—8—9
3. I felt annoyed/irritated 1—2—(3)—4—5—6—7—8—9
4. I felt sweaty (1)—2—3—4—5—6—7—8—9
5. I felt queasy 1—2—3—4—5—6—7—8—(9)

standing

6. I felt lightheaded 1—2—3—4—5—6—7—8—(9)
7. I felt drowsy (1)—2—3—4—5—6—7—8—9
8. I felt clammy/cold sweat (1)—2—3—4—5—6—7—8—9
9. I felt disoriented (1)—2—3—4—5—6—7—8—9
10. I felt tired/fatigued (1)—2—3—4—5—6—7—8—9
11. I felt nauseated 1—2—3—4—5—6—7—8—(9)
12. I felt hot/warm (1)—2—3—4—5—6—7—8—9
13. I felt dizzy 1—2—3—4—5—6—7—8—(9)
14. I felt like I was spinning (1)—2—3—4—5—6—7—8—9
15. I felt as if I may vomit 1—2—3—4—5—6—7—8—(9)
16. I felt uneasy (1)—2—3—4—5—6—7—8—9

Aug 2015



MSAQ QUESTIONNAIRE

Instructions. Using the scale below, please rate how accurately the following statements describe your experience following movement of your body's **head, neck, or upper extremity.**

Not at all 1—2—3—4—5—6—7—8—9 Severely

1. I felt sick to my stomach 1—(2)—3—4—5—6—7—8—9
2. I felt faint-like (1)—2—3—4—5—6—7—8—9
3. I felt annoyed/irritated (1)—2—3—4—5—6—7—8—9
4. I felt sweaty (1)—2—3—4—5—6—7—8—9
5. I felt queasy 1—2—3—(4)—5—6—7—8—9
6. I felt lightheaded (1)—2—3—4—5—6—7—8—9
7. I felt drowsy (1)—2—3—4—5—6—7—8—9
8. I felt clammy/cold sweat (1)—2—3—4—5—6—7—8—9
9. I felt disoriented (1)—2—3—4—5—6—7—8—9
10. I felt tired/fatigued (1)—2—3—4—5—6—7—8—9
11. I felt nauseated 1—2—3—(4)—5—6—7—8—9
12. I felt hot/warm (1)—2—3—4—5—6—7—8—9
13. I felt dizzy (1)—2—3—4—5—6—7—8—9
14. I felt like I was spinning (1)—2—3—4—5—6—7—8—9
15. I felt as if I may vomit 1—2—3—(4)—5—6—7—8—9
16. I felt uneasy (1)—2—3—4—5—6—7—8—9

Depends on what I do

Cranial Treatment for Low Back Pain and Pelvic Dysfunction: A Case Report

G. Dallas Hancock, DC, PhD

Introduction:

Clinically it appears that sacro occipital technique (SOT) procedures, chiropractic manipulative techniques, and various cranial procedures have provided positive clinical outcomes for patients experiencing a range of different conditions. However, in certain cases subjective and objective improvements to skeletal alignment and common patterns of musculoskeletal compensations might return after varying lengths of time. With some cases, SOT Category I (pelvic torsion with hypomobility) and Category II (pelvic torsion with hypermobility) patterns can be resistant to correction.

In a subset of these resistant cases a descending kinematic component was considered. A descending pattern assumes that there is dysfunction stemming from malocclusion, chronic cranial bone, suture, and meningeal (sphenobasilar) patterns of imbalance that are leading to neuromusculoskeletal (NMS) patterns of compensation throughout the rest of the body. Magoun states that "Spinal scoliosis and cranial scoliosis are inseparable. What is not generally realized is that the cranial abnormality precedes and dictates the spinal pattern in a good proportion of the cases, rather than the reverse [1]."

With some patients who were resistant to treatment of ascending kinematic components (lower extremity, pelvis, spine, etc.) it is suggested that specific cranial procedures might be performed to release chronic cranial patterns first. In these cases it is suggested that through the use of these specific cranial procedures, persistently resistant skeletal misalignments and patterns of NMS compensation might be helped.

Common chronic patterns of postural and NMS compensation are frequently identified in the general population. Practitioners of musculoskeletal therapies have long recognized that dysfunctions of the sacroiliac joints and torsion of the pelvis are frequently causative factors underlying other functional disorders and pain; these problems represent an ascending pattern of dysfunction. However, similar NMS compensation patterns can occur in both ascending and descending patterns of postural distortion. For example, pain in the lumbar and lumbosacral regions is widely prevalent, and frequently marked by incidents of acute manifestation. Aside from the pain and suffering of those affected, the number of missed workdays negatively impacts both family incomes and business operations. Some individuals are forced to resort to 'disability' status when back pain or related symptoms impair their ability to function in the workplace.

Since the late 1800s, with the establishment of the osteopathic and chiropractic professions, the observations of researchers and clinicians have resulted in considerable information on posture and NMS compensation. Compensation for sacral tippage and rotation, whether resulting from a sacroiliac dysfunction or an unleveling of the pelvis as a whole, has been described in detail [2-11]. Observations of prevalent patterns of postural and NMS compensations identifiable in the majority of the population have also been documented [2-7,10,11]. These authors attribute most of the common musculoskeletal patterns they have observed to sacroiliac (SI) dysfunctions [2-6],

fascial preferences [7], handedness [10] and cranial patterns [11]. Although the parameters used by these authors to describe the frequently occurring NMS patterns are different, the basic spinal compensatory mechanisms involved are similar.

Achieving SI stability and pelvic alignment is generally seen as an important requirement for relieving pain through improving posture and reducing musculoskeletal compensations. Excluding pharmaceutical interventions, the most common treatment methods for addressing SI joint dysfunctions focus either on soft-tissue therapies to reduce muscle tension in the areas involved, or on re-aligning the SI joints and pelvis using osteopathic and chiropractic strategies. The latter includes manipulative techniques and procedures, which may be assisted by treatment aids such as SOT pelvic blocks, sacroiliac belts, back braces, foot orthotics, and other devices. The literature points to a few critical factors in the diagnosis and treatment of global NMS patterning: the continuity of connective tissues [12], the mobility of the cranial components, and the effects of postural reflex mechanisms on NMS function. However, the continued presence of certain symptoms reveals a gap in knowledge regarding the role of cranial sphenobasilar (SB) distortions in NMS function and compensatory patterns.

The continued presence of common pelvic and SI dysfunctions as well as common NMS patterns – despite treatment by conventional strategies and the use of cranial techniques in some approaches – indicates that these conditions are not being effectively treated by existing procedures. Cranial interventions have been used for decades, but despite their relatively widespread use in complementary healthcare, therapeutic outcomes have not been well documented, particularly relative to NMS function. There is some documentation on the successful use of cranial procedures to treat low back pain [13].

Although the interrelatedness and musculoskeletal continuity of the cranium and the body are without question, there is little knowledge regarding the contiguous relationships between SB patterns and NMS function and the etiology of common patterns of NMS compensation. These relationships are seldom researched and therefore remain poorly understood. An enhanced understanding of these functional relationships and compensations could lead to more effective treatment of posture and NMS function.

This case study is important because the positive result suggests that appropriate cranial procedures can provide long-term changes in SI / pelvic alignment and global NMS function. It evaluates the effectiveness of these cranial procedures on specific common NMS and postural patterns, notes their effect on acute back pain, and demonstrates that the observed changes were maintained through routine ADL.

The purpose of this case report is to document and disseminate the results of using unique cranial procedures to treat NMS compensatory patterns, as well as release restrictions in cranial SB movements. These restricted SB movements appear to be related to specific identified common pattern of chronic NMS dysfunctions. This study responds to Magoun's statement regarding the causative relationship between cranial scoliosis and spinal scoliosis [1], and attempts to provide clinically useful data to support it. The intent is an effort to increase understanding of functional relationships between chronic cranial SB patterns and chronic NMS compensatory patterns (including the pelvic torsion indicators of SOT Category I and Category II).

Case History:

The patient is a 75 year-old Caucasian male who is 5'9", and weighs 190 pounds. His primary occupation is that of a school bus driver. Patient stated that his general health at the time of his visit was "Good". His history includes prostate cancer treatment, double bypass heart surgery, partial left knee replacement, and chronic obstructive pulmonary disease (COPD). He reported a severe head-on MVA in his mid-40s that required eight facial surgeries. His presenting symptoms included severe back pain (unable to stand upright); difficulty in breathing due to acerbation of COPD; and aching left knee (causing limping).

Methods/Interventions:

Prone evaluations
Observation & palpation: Right Achilles tendon tension ('heel-tension'); Right short leg; Right flaccid Gluteus Maximus (SOT '$ sign')
Manual Muscle Tests: (see Table 1.)
Palpation: tenderness identified at: Vertebrae L3, L4, L5, S1; Bilateral low back musculature; Left upper rib cage; Left suboccipital area.

Supine evaluations
Manual Muscle Tests: (see Table 1.)
Upper Cervical ROM: better rotation to the left than to the right
SOT: Right upper fossa, Left lower fossa; Right medial knee tenderness; Left lateral knee tenderness.
Cranial Palpation: SB structural Right Torsion pattern
Mandible Movement Evaluation (see Table 2.)
Eye Movement Evaluation (see Table 2.)

Findings from First Evaluation: Cranial SB patterns: Right Torsion, Right Sidebending, and Left Lateral Strain. (Table 1, Pre-treatment findings). Based on cranial descending patterns it has been found clinically that NMS compensations will commonly have indicators for SOT Category I and Category II (common pattern of inhibited muscles) on the side of SB torsion. Follow-up office visits included the same evaluations repeated at the beginning and end of each treatment, and as part of the follow-up consultation session.

Diagnostic and Assessment Strategies: The manual muscle testing was performed as described in standard texts on Applied Kinesiology. The preferred references for manual muscle testing are Walther [14] and Kendall, McCreary, & Provance [10]. Challenge procedures used in the Mandibular Movement and Eye Movement Evaluations are described by Walther. [14] Observation, palpation, and joint ROM evaluations are standard examination procedures, and accepted as valid sources of diagnostic information regarding NMS dysfunctions. MMT had its origins in the clinical procedures of Robert Lovett, MD, at Harvard medical school in 1912 [15], and it is used by practitioners in chiropractic, osteopathy, physical therapy, neurology and other disciplines. The International College of Applied Kinesiology set forth a protocol for MMT in research and clinical settings [16]. Cuthbert & Goodheart note that when used as an evaluation of

muscular strength (assessment of neuromusculoskeletal function), MMT has been found to be highly reliable and valid, but they also note that the requirements for accurate results and test validity include adequate training and experience using MMT procedures [17].

The reliability and validity of MMT in clinical settings has been extensively researched [18-21]. Various studies have supported MMT techniques as having good convergent and discriminatory validity in clinical settings with upper limb dysfunctions [19,20]. Studies have also described the validity of MMT in cases of patients with low backache [21-23].

Neurological evaluation procedures known in Applied Kinesiology as Therapy Localization and Challenge (static) are used by some practitioners. Although the accuracy and reliability of these techniques have been questioned by some researchers, support of these assessment methods in the literature is growing [18]. Some support for the reliability and validity of MMT evaluation methods was identified in a review of the literature by Cuthbert and Goodheart, but in their summary the authors state that their findings were inconclusive [17]. They recommend further studies with better designs. Walther notes that findings derived from therapy localization and challenge can serve as a complementary evaluative function, reinforcing information gained by other methods or raising doubts about prior findings, indicating that additional evaluations may be needed [14].

Treatment

As previously stated Magoun hypothesized that the common spinal scoliosis with pelvic distortion might be maintained by a cranial scoliosis [1]. With this patient the pattern appeared to be primarily a right torsion. Therefore the treatment objective in this case was to correct the identified right torsion of the occiput and sacrum and release the related musculoskeletal compensations. A protocol of 29 specific cranial techniques was selected to accomplish this goal, over the course of four visits. The second visit was around three weeks after the first, and the rest were around a week apart. (The cranial procedures are listed in Table 3, Primary Cranial Release Protocol [11] at the end of this article.)

Treatment Description

Initial Office Visit 1. The patient presented in obvious pain and unable to stand erect. The evaluation described above was performed. The diagnosis and treatment plan were explained, then the first treatment (Cranial Grouping #1) was performed. It consisted of three techniques:

1. Lambdoidal and Occipitomastoid (OM) Sutural Mobilization
2. Left Torsion with Master Release *
3. Right Torsion with Master Release

*‘Master Release’ is a procedure performed to increase the cranial range of motion for any SB pattern. While the pattern to be increased (the ‘primary pattern’) is held at its ROM barrier with 8 oz. to over a pound of force, each of the other SB patterns (‘secondary patterns’) is carried, one at a time, to its barrier and briefly maintained there

with several ounces of force, which allows the cranial ROM of the 'primary' pattern to increase. The secondary patterns cannot be on the same SB axis as the primary pattern.

The first group of Primary Releases is mainly concerned with releasing the chronic right torsion by increasing cranial mobility into left torsion. This is accomplished using the Left Torsion with Master Release procedure. The Right Torsion with Master Release is also performed to increase mobility into Right Torsion. These procedures eliminate specific 'Indications for Treatment' for these two techniques.

Fronto-occipital Handhold

The fronto-occipital handhold (Fig. 1) is used in mobilizing the cranium in all SB patterns. It provides good control of the frontal bone as well as the occiput and can be used to apply greater force than other vault handholds.

Cranial Grouping #1 Techniques 1, 2, & 3

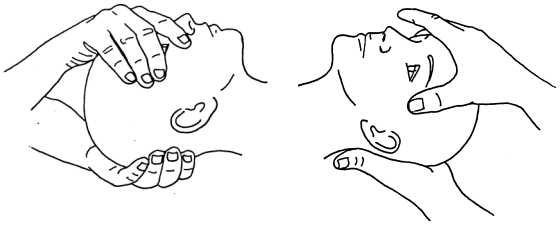
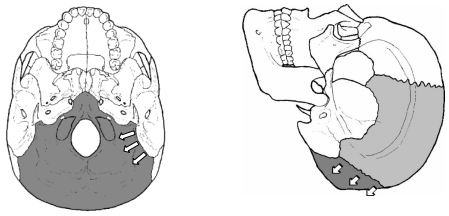
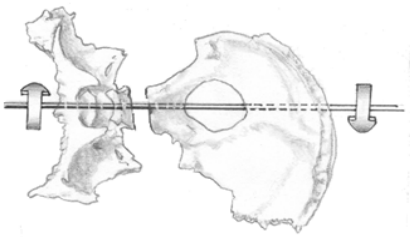


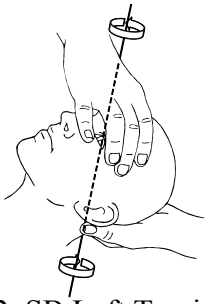
Figure 1. Fronto-Occipital Handhold



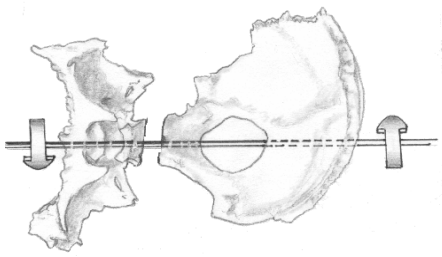
Technique 1. OM and Lambdoidal Suture Releases



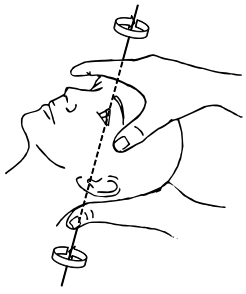
Technique 2. SB Left Torsion



Technique 2. SB Left Torsion with Master Release



Technique 3. SB Right Torsion



Technique 3. SB Right Torsion with Master Release

The first technique in this group increases the mobility of the lambdoidal and OM sutures, bilaterally. This is accomplished by stretching the soft tissue holding elements of the lambdoidal and OM sutures which are restricting sutural mobility. This technique substantially increases the cranial range of motion into left torsion prior to performing the Left Torsion with Master Release procedure.

The second technique, Left Torsion with Master Release, is used to restore and maximize movement of the cranial components into left torsion. This increased movement releases restricted left torsion components of the right torsion pattern and eliminates the Indications for Treatment associated with this technique.

The third technique, Right Torsion with Master Release, is used to maximize movement of the cranial components into right torsion. This increase in movement releases restricted right torsion components of the Primary right torsion pattern and eliminates the Indications for Treatment associated with this technique.

After treatment, while the patient was still supine on the table, the MMT for that pattern were then reassessed. The previously inhibited muscles (indicative of the pattern) tested strong. Afterwards the patient walked around the table twice, and sat and rose from a chair twice. The patient's posture was upright, and he stated with amazement that his back pain was "almost gone!" He then returned to the treatment table for the same MMT to be repeated, to ensure that weight-bearing movement hadn't affected the result. The previously inhibited muscles associated with that pattern (treatment indicators) still tested strong. He was seen again later that afternoon for a brief observation (with no treatment performed), and he stated that his comfort had improved more during the course of the day.

Follow-up Visit 2. Due to illness and travel, the plan for three treatment sessions had to be modified into two treatment sessions, just over three weeks apart, with the fourth visit the following week. The patient's second appointment was 24 days after the first appointment. He reported that he had resumed his work as a school bus driver the day after the first treatment. In addition his back pain had been in virtually full remission for the first four days, and that he experienced only intermittent and mild back pain during the next two weeks. On this date his posture was somewhat flexed, he was breathing with difficulty, and occasionally coughing. (He reported that a lung infection had caused an acute flare-up of his COPD and kept him "basically in bed" for the five days prior to the second appointment.) The muscles associated with the previously-treated cranial torsions were reevaluated in both prone and supine positions, and the strong responses to the MMT demonstrated that the corrections were stable.

Pre-treatment evaluations (palpation and MMT) of the indicators for Cranial Groupings #2 - #5 were conducted. Those findings indicated that multiple dysfunctions were still present in the cranium, NMS function, pelvis, and shoulders. The techniques in Cranial Groupings #2 - #5 (Table 3.) were performed. Reevaluations using the same palpation and MMT were conducted after treatment, both immediately (on the table) and after the patient had been weight bearing and mobile (as in the first visit). The MMT outcome results were strong and treatment indicators were no longer present. The patient's standing posture was improved, and he stated that his breathing was "much more comfortable."

Follow-up Visit 3. The patient returned the next week (4th week) for a follow-up appointment, and previous MMT and challenges were again reevaluated. All demonstrated successful resolution of the identified chronic patterns that had been treated with the cranial protocol. SOT 'arm-fossa' tests and other SOT reevaluations were also conducted at this follow-up session. Treatment indicators for both SOT Category I and Category II were negative, indicating that these resistant patterns of dysfunction had been resolved, and were stable after a week of daily activities.

Results:

A comparison between the pre- and post- treatment findings of muscle function tests (Table 1) documented that neuromuscular function was improved throughout the body and was being maintained. The positive findings on the mandibular and eye movement evaluations were eliminated (Table 2). The SOT arm-fossa tests and other SOT evaluations demonstrated that the indicators for SOT Category I and Category II were also resolved. The overall effectiveness of the structural cranial techniques was supported by documented improvements in posture and NMS function.

Subjective improvements were also reflected through positive changes in the patient's symptoms. He stated that his back pain had not returned, and that he had resumed his bus-driving the day after his first treatment. The acute acerbation of his COPD he had suffered between the first and second visits abated with the second treatment. He stated that his breathing was notably improved after the second visit and he was able to resume work again the next day.

These cranial procedures typically do not result in side effects; however when they do occur, they are brief. They are generally limited to a slight headache or tenderness on the head (which resolves without treatment), changing patterns of tension in the patient's body as muscles adapt to more balanced function, or sutural restrictions that may not have been totally cleared in the preceding treatment session. To avoid residual sutural restrictions these cranial treatment sessions are followed by an extensive 'sutural clearing routine'. Although these cranial procedures have been in use for several decades by practitioners in multiple disciplines, no serious side effects have been reported, and no significant risks are known.

The improvements in skeletal alignment and neuromuscular function throughout the body utilizing these cranial procedures have clinically been found to be long lasting. The continuing presence of the improvements in this patient's follow-up visits suggests this durability. These improvements were verified by observation, palpation, MMT, therapy localization, static challenges, and SOT evaluation procedures.

Discussion:

The results support the hypothesis that specific chronic patterns of NMS compensation – some associated with SOT Category I and Category II – are secondary to, and maintained by, chronic SB patterns (in this case right torsion and left lateral strain, specifically). The observed

dysfunctions in the SI joints, pelvis, and NMS patterns, as well as the chronic cranial patterns that appear to be maintaining them, appeared to resolve using specific cranial procedures. A week after his first treatment, post-treatment evaluations demonstrated functional improvements in pelvic alignment, SI joint stability, cranial mobility, and the musculoskeletal system. These benefits appear to be durable, as they were subsequently maintained through several weeks of typical activities of daily living.

The post-treatment findings suggest that predictable, functional relationships may exist between cranial components and NMS function, and that these connections can be therapeutically engaged to achieve effective treatment outcomes. The results also support the concept that releasing tension and restrictions in the superficial soft-tissues of the cranial vault and face creates greater freedom in sutures throughout the cranium. This in turn permits increased mobility of the osseous cranial components and muscles attached to the cranium that are critical in the head-on-neck righting reflexes (notably sternocleidomastoid, upper trapezius, and the highly innervated muscles of the sub-occipital triangle.)

DeJarnette [6] and others have discussed the relationship between the occiput and the sacrum. Magoun states that if the occiput moves inferior on one side (as in torsion and sidebending) the sacrum will move inferior on the same side, and vice-versa [1]. In the observed right torsion pattern, both the occiput and sacrum had moved inferior on the right. This chronic SB right torsion pattern was corrected by increasing the cranial left torsion ROM, using a firm-handed cranial procedure that required up to several pounds of force. This cranial correction also eliminated the related tippage of the sacrum, confirming that the chronic tippage and rotation of the sacrum was compensatory to the position of the occiput in chronic SB right torsion. The outcome confirmed the structural /functional relationship between the occiput and the sacrum.

The reliance on palpation, MMT, and static challenge could be construed as a weakness of this study due to the minimal amount of of published research on these procedures. The use of quantitative assessment tools would provide additional documentation of the observed changes. Several possibilities for use in pre- and post-treatment evaluations would be: sectional scales to validate changes in weight distribution; photographs of posture against a grid to permit quantifying postural changes; videos of walking to document observed changes in gait pattern; and use of the Functional Movement Screen [24] to assess changes in functional balance and stability in movement.

Performing the diagnostic MMT before and after a typical SOT Category I or Category II blocking procedure, (or another typical chiropractic manipulative technique) then having the patient walk, sit, stand and repeating the MMT, may facilitate developing a differential diagnosis [25]. Theoretically in this cranial SB paradigm of care, if the presenting condition returns when the patient becomes weight bearing, and a lower extremity dysfunction has been ruled out, it may be a chronic cranial pattern requiring cranial correction.

Some practitioners might find the paradigm of pelvic dysfunctions being effectively treated with cranial techniques an intellectual challenge. However, since the only treatment rendered was to the patient's cranium and SB patterns the results and patient's response suggests a possible relationship between the cranium and pelvis.

There are various limitations to any case report since it represents one patient and one practitioner without controls or sham interventions. Due to these limitations it is not possible to rule out effects associated with a placebo or ideomotor associations. Without following the patient pre and post intervention we cannot adequately assess the patient longitudinally over years to rule out possible regression to the mean, though the immediacy of his response from the first office visit suggests otherwise. It is very difficult to definitively rule out examiner bias when performing pre and post assessments and future studies that would utilize objective instrumentation might lead to more compelling findings.

Conclusion:

The purpose of this case study report is to present the therapeutic management of a patient with acute low back pain by the exclusive use of cranial techniques. A secondary objective was to disseminate clinical observations regarding structural relationships between cranial SB patterns and chronic NMS compensatory patterns. There is a clear need for well-designed research to validate these informal findings. A well-designed research project would propose randomizing a series of patients with typical postural difficulties (e.g., pelvic imbalance) into three groups: one to receive typical chiropractic care, one to receive these cranial procedures, and a control group to receive no physical treatment. All three groups would be evaluated by questionnaire, physical examination, and some other objective diagnostic methodology. Practice based studies could compare the results of a series of patients treated by practitioners with these cranial techniques. The providers (e.g., osteopathic or chiropractic physicians trained in these cranial techniques) would utilize assessment tools to collect information about how often patients returned for treatment, the frequency of treatment sessions, doctors' objective findings, patients' subjective measures of change, and patients' satisfaction with outcomes.

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Table 1. Pre- and post-treatment findings. Many of the muscles evaluated for the cranial protocol and the SOT Category-I and Category-II indicators are included in this table.

MUSCLES		Pre-Treatment Evaluation			Post-Treatment Evaluation	
PRONE:		Right	Left		Right	Left
Gluteus Maximus - hip extensors		W	S		S	S
Middle Trapezius		S	W		S	S
Lower Trapezius		S	W		S	S
Shoulder Extensors (group)		W	S		S	S
SUPINE: Lower Extremity		Right	Left		Right	Left
Fasciae Latae (TFL)		W	S		S	S
Psoas		S	W		S	S
Quadriceps (straight leg)		S	W		S	S
Hip Abductors (Int. Rotation)		S	W		S	S
Hip Abductors (No rotation)		S	W		S	S
Hip Abductors (Ext. Rotation)		W	W		S	S
Hip Adductors		S	W		S	S
SUPINE: Upper Extremity		Right	Left		Right	Left
Shoulder Flexors (group)		S	W		S	S
Pectoralis Major Clavicular		W	S		S	S
Pectoralis Major Sternal		S	W		S	S
Latissimus Dorsi		S	W		S	S
Anterior Deltoid (Int. Rotation)		S	W		S	S
Middle Deltoid (No rotation)		S	S		S	S
Posterior Deltoid (Ext. Rotation)		W	S		S	S

Legend: S = Strong / Facilitated, W = Weak / Inhibited

Note: In a right torsion the shoulder and hip flexors are strong on the right and inhibited (weak) on the left, and the shoulder and hip extensors are inhibited on the right and strong on the left. After the Cranial Group #1 techniques have been performed, the inhibited muscles (left shoulder and hip flexors, and right shoulder and hip extensors) will test strong.

Table 2. Evaluations of Mandibular and Eye Movements

Kinesiological Evaluations of Mandibular and Eye Movements						
MANDIBULAR MOVEMENTS		Pre-Treatment Evaluation			Post-Treatment Evaluation	
		Positive	Negative		Positive	Negative
Open Mouth (exaggerated)		X				X
Mandible shifted to right		X				X
Mandible shifted to left			X			X
Mandible protruded (jutted)			X			X
Mandible retracted		X				X
EYE MOVEMENTS						
Both eyes looking to right		X				X
Both eyes looking to left			X			X
RIGHT EYE MOVEMENTS (Left eye covered)		Positive	Negative		Positive	Negative
Look to the right		X				X
Look to the left		X				X
Look up (cephalad)		X				X
Look down (caudal)		X				X
LEFT EYE MOVEMENTS (Right eye covered)		Positive	Negative		Positive	Negative
Look to the right		X				X
Look to the left		X				X
Look up (cephalad)		X				X
Look down (caudal)		X				X

* It has been consistently observed in SB right torsion that, if the eyes look to the right or the mandible is shifted to the right, the function of a strong muscle tested during these movements will become inhibited (weak). Similar movements to the left will have no effect. Conversely, in SB left torsion, eye or mandible movements to the left will inhibit the function of a strong muscle, but not movements to the right. The neurological mechanisms involved in these responses are unknown. However, the findings of these evaluation procedures, and the others listed in this table, should be coordinated with the results of the manual muscle testing or other procedures to identify right and left torsion patterns.

Table 3. Primary Cranial Release Protocol

Cranial Grouping #1 (Primary Torsion Releases)	
	Lambdoidal and OM Sutural Mobilization
	Left Torsion with MR
	Right Torsion with MR
Cranial Grouping # 2 (Primary Transverse Axis)	
	Flexion with MR
	Extension with MR
	Superior Vertical Strain with MR
	Inferior Vertical Strain with MR
Cranial Grouping # 3 (Primary Frontomaxillary)	
	Frontomax "Bottle Cork" Release
	Frontomax Left Lateral Strain
	Frontomax A-P Release
	Frontomax Palate Lift - Left
	Frontomax Palate Lift - Right
	Hard Palate Sagittal Plane Oblique Shears
	Maxillary Midline Decompression
	Frontomax (FP) "Bottle Cork" Release
	Frontonasal "Bottle Cork" Release
Cranial Grouping #4 (Primary Misc. Vault Releases)	
	Masseter Vertical Shifts
	Parietotemporal Vertical Shifts
	Left Sidebending Scoop with MR
	Right Sidebending Scoop with MR
	Combination Left Torsion with Strains
	Combination Right Torsion with Strains
	Fronto-Occipital Left Diagonal Counter-Shear
	Fronto-Occipital Right Diagonal Counter-Shear
Cranial Grouping # 5 (Primary Lateral Strain Releases)	
	SB Left Lateral Strain with MR
	SB Right Lateral Strain with MR
	Occipito-Zygomaxillary Right Lateral Strain
	Right Zygomatic Bone Realignment
	Left Zygomatic Bone Realignment
13-Step Sutural Clearing Routine	

Hancock GD. A new diagnostic approach and innovative cranial treatment procedures for chronic neuromusculoskeletal patterns: A manual and contextual essay. [Dissertation]. Cincinnati: Union Institute & University. 2011. [http://gradworks.umi.com/34/67/3467890.html]

Treatment of knee pain in an athlete sprinter with sacro occipital technique and cranial (vector point) techniques: A case report

Jason Scoppa, DC

Introduction:

Although there are numerous conditions that get grouped together when discussing the vague label of knee injuries, the research points to just how common a problem this is. Athletes in particular seem to be most at risk, with young adults incurring the highest rate of injury. Depending on the type of running, as well as the age and level of the runner, van Mechelen notes that the overall yearly incidence rate for running injuries varies between 37 and 56%. Most running injuries are lower extremity injuries, with a predominance for the knee, and about 50 to 75% of all running injuries appear to be overuse injuries due to the constant repetition of the same movement. Recurrence of running injuries is reported in 20 to 70% of the cases. From the epidemiological studies it can be concluded that running injuries lead to a reduction of training or training cessation in about 30 to 90% of all injuries. About 20 to 70% of all injuries lead to medical consultation or medical treatment, and 0 to 5% result in absence from work [1].

According to Gage, et al, the knee is the most commonly injured joint by adolescent athletes with an estimated 2.5 million sports-related injuries presenting to emergency departments (EDs) annually. An estimated 6,664,324 knee injuries presented to U.S. EDs from 1999 through 2008, for a rate of 2.29 knee injuries per 1,000 people. Those 15 to 24 years of age had the highest injury rate (3.83), while children younger than 5 years had the lowest rate (0.55). The most common diagnoses were strains and sprains (42.1%), contusions and abrasions (27.1%), and lacerations and punctures (10.5%). The most common general categories causing injury were sports and recreation (49.3%) [2].

A large study from Scandinavia found that the most common cause of permanent disability following a sports injury was injury to the knee [3]. Intervention depends on correctly diagnosing the problem, however according to Bollen intervention is often applied without a correct diagnosis being made [4]. Also, there doesn't seem to be many researched options available aside from surgical intervention or rehab based therapies. For the patient in this case report surgery wasn't warranted, watching and waiting wasn't an option anymore, and self-care, massage, rest, and rehab-based therapies didn't provide any relief.

Case History:

The patient was an 18-year old African American female, semi-pro sprinter. She started experiencing insidious right lateral knee pain eight months prior to her first visit. She had attempted self-care directed by her coach, and physical therapy that included stretching and rehab based exercises for the knee. Additionally, she had visited a medical doctor who ruled out major structural damage, and had received a series of twelve visits with a Rolfer (deep tissue directed massage) with no change in her symptoms.

Eight months before initiating care at our office her pain began as sharp and infrequent in the

right lateral knee that would only present when sprinting but quickly progressed to the point that walking caused her significant pain. Specific activities that worsened her pain included running and weight lifting (squats specifically). Rest seemed to improve symptoms, though at the time of her first visit she was experiencing constant pain in the right knee. This resulted in her missing important time away from training and competition that impacted her offers for college scholarships, potential endorsement deals and professional contracts. At the time of her initial office visit, according to the visual analog scale (VAS), her pain levels were around a 5/10 at rest (10 being most painful), and would reach 8/10 with activity.

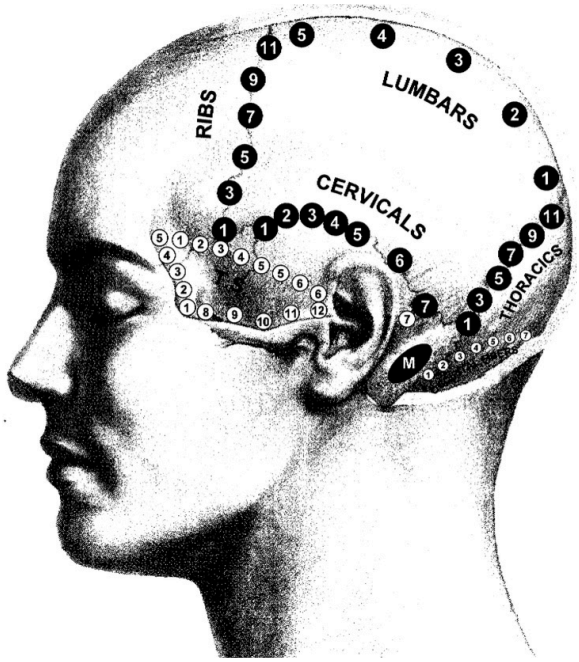
CRANIAL- PELVIC CORRECTION Category 2 Protocol		
1	**Supine Blocking For Category 2** (Sacro-iliac Weightbearing Lesion)	
	INDICATORS	**CRANIAL CONTACT POINTS**
2 (4 SIMULTANEOUS VECTOR POINTS)	**Spinal Cervical 1** (T.P. posterior side)	**Cranial Cervical 1** (posterior side)
	Spinal Cervical 2 (T.P. posterior side)	**Cranial Cervical 2** (posterior side)
	Sacro-iliac lesion (lesion side)	**Mastoid** (lesion side)
	Sacro-iliac lesion (opposite side)	**Occipital 4** (opposite lesion side)
3	**First Rib** (tension side)	**T1 & Rib 1** (all 3 – 1st rib side) **Spinal Cervical 1** (T.P.)
4	**Hiatal Hernia** (left hand indicator)	**Left T4 & Rib 4** **Right Spinal Cervical 3** (T.P.)
5	**Subluxation Indicators** (Lovett-Brother or Organic)	**Major Spinal Subluxation** (present office visit)
6	**Cranial Indicators** (pelvic, foot, leg, visual, T.L.)	**Major Cranial Correction** (present office visit)
Note: Category 1 & 2 should never be done on same office visit. Category 1 must be blocked prone on first office visit pelvis stabilizes & Category 1 test is positive.		

Intervention:

The patient was examined using sacro occipital technique (SOT) category two and SOT extremity technique protocols. The evaluation revealed pelvic torsion with sacroiliac joint instability consistent with a positive arm fossa test [5,6]. Along with sensitivity to palpation in the area of her right lateral knee, motion assessment revealed a posteriorly displaced fibular head.

Weakness of the hip flexors was found using supine active straight leg raise (ASLR) testing [7] and her right tensor fascia lata muscle (iliotibial band) tested weak upon manual muscle testing [8].

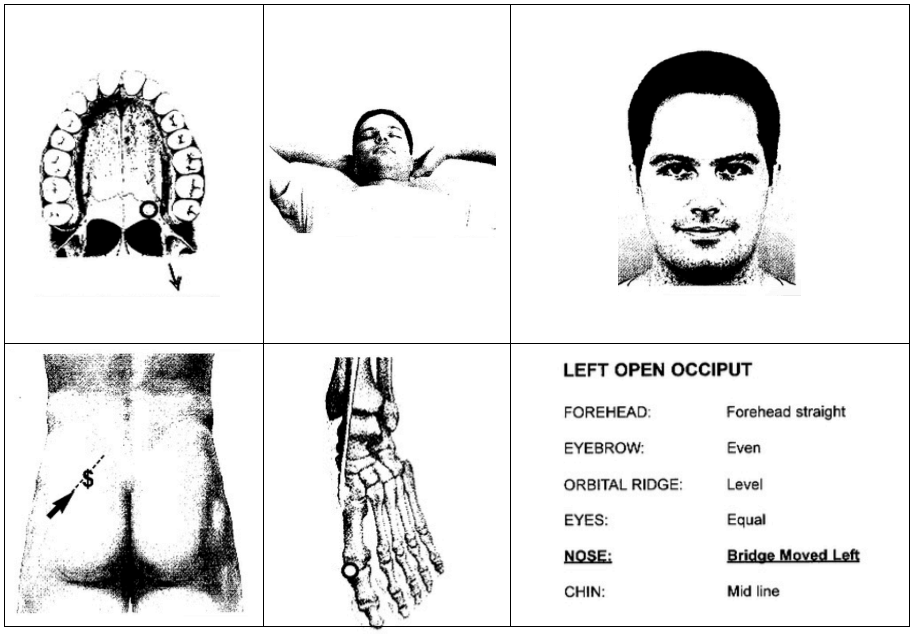
Figure 1: Vector Point Cranial – Cranial Reflex Contact Points



The patient was treated with category two supine pelvic blocking [9-11] and SOT extremity technique for the posterior fibular head. The patient was also assessed for any possible pelvic – cranial relationship between her category two presentation and any related cranial imbalance [12,13]. This relationship was found and treated with Vector Point cranial [Figure 1] to facilitate the category 2 treatment and related spinal imbalance [14] Cranially the patient was examined using Vector Point cranial evaluation and, using the protocols as developed by Denton, was found to have a left "open occipital bone" (left lambdoidal suture restricted in cranial flexion, with an inferior occipital on the left side) [Figure 2]. This included related findings of a left dollar sign (sensitivity at gluteal/piriformis region to palpation), level eyebrows, level orbital ridge, orbits symmetrical, chin pointing towards the midline, and the bridge of her nose having a left inclination [14].

Additionally she was treated utilizing Vector Point cranial therapy for lumbars 3, 4, and 5 (R+C Factors [15]), thoracic segments 11/12 (trapezius fibers [16]) and her right iliotibial band. Treatment concluded with balancing adjustments to cervical segments C1 and C2 utilizing SOT cervical stair step techniques [15].

Figure 2: Vector Point Cranial – Left Open Occiput



Results:

SOT indicators were assessed pre and post treatment. These included psoas/iliopsoas tension and range of motion assessments, supine hip flexor active straight leg raise (ASLR) test, muscle test [7], trapezius fibers [17], sacrospinalis paravertebral muscle tension, arm fossa test [5], motion palpation of the vertebral segments [18,19], and assessing patient's leg lengths in a supine position [20]. Of significance, manual muscle testing of the hip flexors (ASLR test) [21] and right iliotibial band would all test strong post treatment [22].

Following the first office visit the patient left feeling considerably less pain in her right knee. Directly following her first treatment she was asked to walk, and then run in the hallway outside of the office. Walking caused no pain, but running in the hallway still produced minor pain in her right lateral knee. One week later on her follow up visit she reported that she felt a subjective improvement of 60% from the first visit. Similar intervention was given on the second visit, with the exception of the treatment to her iliotibial band, fibular head adjustment, and ASLR adjustment, as they weren't necessary based on the indicators. Instead of Category 2 supine pelvic blocking the patient was blocked prone as indicated with Category 1 blocking technique. On her third visit she reported a 90% improvement of her symptoms (VAS 1-2/10), with only small amounts of tension remaining when she crossed her legs while seated. The same treatment was given in visits two and three. She was able to return to normal activities and training after the third appointment.

Discussion:

A validated instrument, the Visual Analogue Scale (VAS) [23,24] was utilized to measure the patient's self-reported pain or sensitivity levels. The VAS has been used in studies measuring quality of life, [25] pain and trauma, [26] risk assessments regarding risk proneness, [27] and in both young and old patient populations [28]. While the post VAS showed significant improvement what was most important for this patient was that she was able to return to her activities of daily living, which included sprinting without pain.

Evidence based literature discussing chiropractic care for lower extremity dysfunction has been increasing [29,30]. The relationship between lower extremity kinematics and its ascending or descending influences to and from the spine is gradually being better-understood [31]. With social and financial pressures affecting young elite athletes, rest or watching and waiting is not considered a viable option; commonly their next option is the use of NSAIDs. However, NSAIDs have been associated with adverse effects [32] such as renal insufficiency hypersensitivity [33] and gastrointestinal disorders [34].

Therefore finding viable low risk options for treatment of athletes is an important public health issue. A case report by Langer discussed SOT treatment of three elite athletes: a 33-year-old male mountain biker, a 37-year-old female mountain biker, and a 54-year-old male tri-athlete. The three subjects were examined and evaluated using Sacro-Occipital Technique (SOT) procedures, including SOT categorization, testing for symmetry of muscle flexibility, strength and function, sensitivity to palpation of specific muscle~~'s~~ bellies and tendons. Following the SOT blocking procedures, which would vary between category one or two interventions, the patients demonstrated greater muscle strength, more stability where stability was diminished, reduced pain on palpation and absence of cramping on muscle testing [35].

While the finding of this study appear~~ed~~ dramatic, generalizing case reports to the population at large necessitates caution because with "n-of-1" studies there are no controls or comparative subjects receiving sham care. Without a range of patients and assessing interventions it is difficult to rule out placebo or ideomotor effects, regression to the mean, and other confounders commonly found with case reports [36]. It is significant that the patient had the condition for eight months, was under treatment with her coach and physical therapist, received deep tissue massages, and attempted various self-care interventions without any relief. The temporal relationship between her response to three treatments and ability to return to full athletic activities suggests a relationship between the care rendered and patient's response.

Conclusion:

Given how frequently runners experience knee injuries it's important that athletes are aware of the conservative care options available to them. Most studies published concerning knee pain and intervention is focused on physical therapy (exercise based rehab) or surgical interventions. In this case study intervention using SOT pelvic stabilization and extremity technique, and Vector Point cranial technique appeared to produce significant and rapid results (3 office visits) that enabled the athlete to get back to her activities. Greater studies are warranted to determine if this

case could be used as a guide to help other elite sprinters suffering from intractable knee pain limiting their ability to perform.

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Treatment of acute TMJ pain and dysfunction with sacro occipital technique and cranial (vector point) techniques: A case report

Jason Scoppa, DC

Introduction:

Although sources differ slightly, The National Institute of Dental and Craniofacial Research (NIDCR) reports a 5-12% prevalence rate of Temporo-Mandibular Joint Disorder (TMD), with an annual cost of approximately $4 billion to treat the two thirds of that population that seeks treatment [1]. In a study by Di Paolo, "epidemiological evaluation, anamnestic and clinical data collected from a sample of 2,375 patients affected by TMD "'clearly showed that there were large quantities of variables involved in these disorders and which occur with a wide variety of possible clinical signs.' In accordance with the current knowledge…it is not always possible to clarify the etiology of these disorders…" Within this study many of the TMD patients suffered from multiple areas of muscle and spinal pain, as well as experiencing headaches. These tended to occur at a higher frequency on the side of the greatest TMJ dysfunction[2].

More studies are needed on the safety and effectiveness of most treatments for jaw joint and muscle disorders, but the NIDCR[3] strongly recommends using the most conservative, reversible treatments possible. Conservative treatments do not invade the tissues of the face, jaw, or joint, or involve surgery. Reversible treatments do not cause permanent changes in the structure or position of the jaw or teeth. Treatment options listed include self-care and pain medications, and if those do not produce the desired result it is recommended that patients see a dentist for splints, Botox, or surgery.

This case report describes a patient seen for a primary complaint of acute TMJ pain, closed lock without disc recapture, and chronic tinnitus with treatment utilizing primarily Sacro Occipital Technique (SOT) and Vector Point cranial technique.

Case History:

The patient was a 63-year-old, 6'1, 165lb, Caucasian male. He presented as an extremely health conscious gentleman following a mostly plant based diet and exercising regularly. His primary complaint was of acute unremitting left jaw (temporomandibular joint – TMJ) pain that started insidiously a few days prior to his visit. His visual analogue scale (VAS) for his TMJ pain was 4/10 at rest with mostly dull pain, which turned to a sharp pain when he attempted to open his mouth or move his neck. For three days prior to the initial office visit chewing had become impossible for him so he had resorted to following a liquid diet. Additionally he reported experiencing constant ringing in both of his ears (tinnitus) for more than 10 years.

The patient had one other instance of TMD pain prior to this episode. In 1999 he was seen by a dentist for the removal of amalgam fillings. The dentist recommended he also start wearing a maxillary TMJ splint though he had no previous history of TMJ pain or dysfunction. Within a day or so of wearing the splint he started having intense pain in his left jaw. After getting the splint adjusted a few times over the course of a month the pain went away and he had been pain

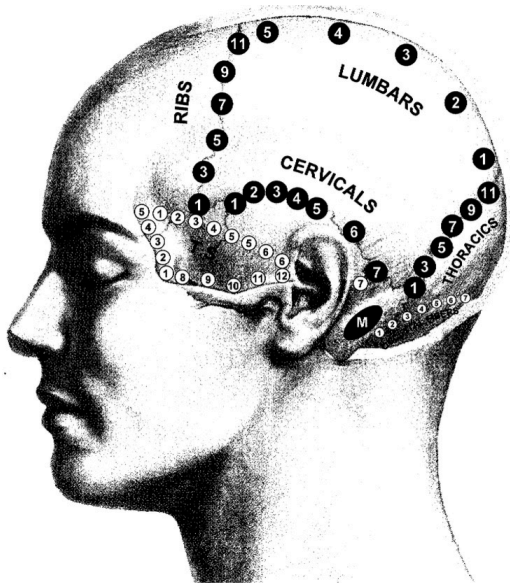
free up until the few days prior to the initial office visit. He stopped wearing the dental splint around five years ago without any noticeable return of TMJ pain or dysfunction.

Prior to the initial office visit the patient had utilized multiple care options to address his TMJ pain and dysfunction, including attempting to rest his jaw by following a liquid diet, performing self-care procedures, and seeing his regular chiropractor that performed neurological based chiropractic care [4]. These prior interventions didn't result in any change in his condition. He was reluctant to return to a dentist and have another splint made because of the cost and potential of getting worse, as he had experienced previously.

Intervention:

Of significance on testing TMJ translation the patient couldn't open his jaw more than two fingers width without intense pain. The patient was examined using sacro occipital technique (SOT) [5,6] and Vector Point[7] cranial analysis protocols [Figure 1]. SOT indicators that were assessed pre and post treatment included psoas/iliopsoas tension assessment, supine hip flexor active straight leg raise (ASLR) test[8], muscle testing of sternocleidomastoid (SCM) muscles[9], trapezius fibers[10], sacrospinalis paravertebral muscle tension, arm fossa test[11,12], motion palpation of the vertebral segments[13,14], cervical stair-step assessments[15], and rechecking of the patient's leg length in a supine position[16].

Figure 1: Vector Point Cranial – Cranial Reflex Contact Points

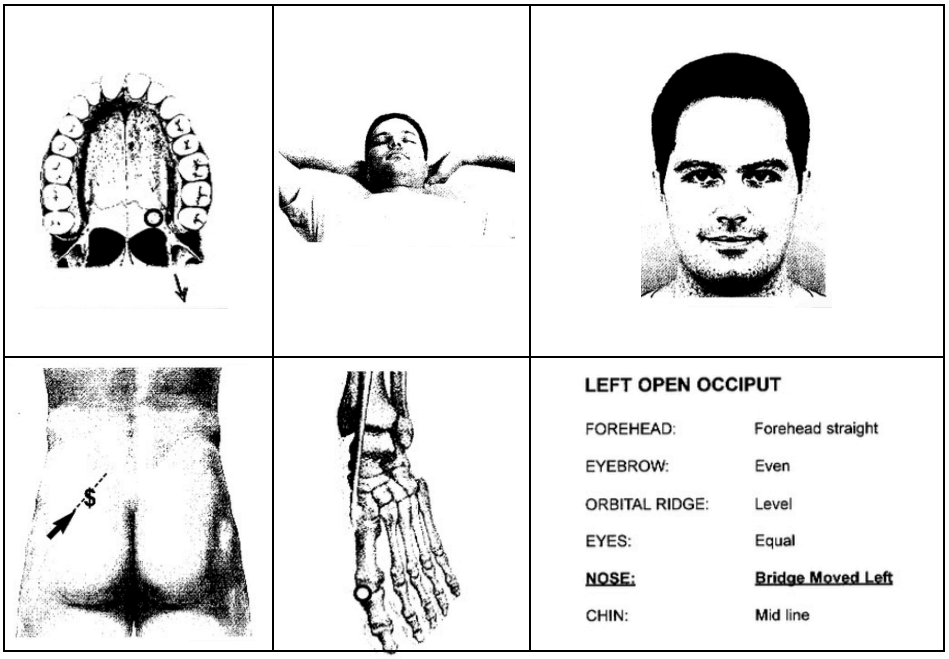


SOT category analysis revealed the patient had pelvic torsion[17,18] and sacroiliac joint (SIJ) hypermobility described as a category two and consistent with a positive arm fossa test [19-21]. He was subsequently treated as a category two with supine pelvic block placement until various active palpatory indicators and arm fossa test were neutralized. Cervical stairstep assessment indicated a dysfunctional C2/C3 articular facet translation, which was treated until normal

motion was restored[15]. SOT cranial intraoral TMJ treatment was performed to release internal and external pterygoids musculature[22], TMJ treatment was performed as outlined in the Sacro Occipital Technique Organization – USA (SOTO-USA) TMJ Manual[23].

Vector Point[7] analysis utilizes muscle strength[9] and spinal motion assessments[13,14].
Right hip flexors and left SCM were found relatively asymmetrically weak to their other side. Motion palpation and stress to the spinal segments found imbalance at – L5, L4, T12 and T7 vertebral levels. Vector Point[7] cranial techniques applied to the cranium involve utilizing sutural points that correlate with different areas of the spine. The hip flexors and SCM muscles as well as the spinal segments were treated by having the patient touch the muscle while the doctor utilized the vector points on the cranium that correlate with the nerve roots that innervate these areas until improvement was noted.

Figure 2: Vector Point Cranial – Left Open Occiput



The Vector Point[7] cranial assessment for this patient revealed a left "open occipital bone" [Figure 2] (left lambdoidal suture restricted in flexion position, with a inferior occipital on the left side) which is associated with left gluteal/piriformis muscle laxity where they cross, level eyebrows and orbital ridge, orbits symmetrical, chin pointing to midline, and the bridge of his nose having a left inclination. Patient was treated to release the lambdoidal suture and lift the occiput on the left side, which as performed simultaneously helped improve SCM and TMJ functioning.

Results:

After the first office visit the patient was able to open and close without pain and stated that only a small amount of tension and soreness remained in his jaw. He returned for a follow up office visit five days later and reported that the soreness in his TMJ was gone. The only symptom that

remained was the tinnitus, which had been present for 10 years. Eight months later he returned for minor neck pain and reported that his TMJ pain had not returned.

TMD Disability Index assessment tool[24] noted prior to treatment he had to alter his activities of daily living related to talking, brushing teeth, eating, chewing, yawning, and opening his mouth, and while he could participate in recreational activities he needed to be cautious. He had tinnitus and could sleep well with the use of over the counter anti-inflammatory pain medication. Following treatment he was able to return to all activities of daily living without any limitations.

TMD Symptom Intensity Scale a type of Visual Analogue Scale (VAS) [25-27] that measures intensity and frequency of pain levels was performed pre and post care. Pre treatment the patient reported pain of 4/10 (10 being most painful) related to jaw pain, painful jaw clicking and jaw locking, with a 2/10 relating to tinnitus symptomatology. Regarding frequency of symptoms, jaw pain, painful jaw clicking, jaw locking, and tinnitus was present 100% of the time. On the follow-up office visit all TMJ symptoms had resolved with his only unresponsive condition, tinnitus still present at a 2/10 level, 100% of the time.

Discussion:

With any conservative intervention the doctor always should weigh risk and benefit as well as the relative costs of the care rendered. Low risk, low cost, and good outcomes ~~is~~ are always the preference for the patient and doctor. Treatment of TMD can be challenging since sometimes symptoms may not actually be an indicator of dental stress to the dentition or gingiva. Clenching and bruxism can sometimes not be noticed by the patient but viewable on examination of the teeth for occlusal wear patterns, abfractions, and/or gum recession. Integrative chiropractic dental care [28,29] is essential since sometimes the first doctor a patient might see for TMD care might be a chiropractor.

With that said, a patient could also have an acute TMD presentation that might be more related to spinopelvic[21,30], cervicocranial[31], and/or stomatognathic[32] imbalance amenable to chiropractic care. If no dental related pathology is noted upon assessment, as was the case with this patient, a trial of chiropractic care for the treatment of TMJ pain and dysfunction would seem reasonable. Tinnitus can be a common finding in patients suffering from TMD [33], and while treatment of tinnitus with SOT and cranial care has been found to be helpful in some subsets of patients[34], in this case the patient's tinnitus was unresponsive to this type of care.

While the findings from this study appear~~ed~~ dramatic, generalizing case reports to the population at large necessitates caution because "n-of-1" studies have no controls or comparative subjects receiving sham care. Without a range of patients and assessing interventions it is difficult to rule out placebo or ideomotor effects, regression to the mean, and other confounders commonly found with case reports. Yet still, Flyvbjerg [35] suggests that there is often value in the case report and points to Campbell[36] who states:

> "After all, man is, in his ordinary way, a very competent knower, and qualitative common-sense knowing is not replaced by quantitative knowing . . . This is not to say

that such common sense naturalistic observation is objective, dependable, or unbiased. But it is all that we have. It is the only route to knowledge--noisy, fallible, and biased though it be[36]. “

With this patient a directly temporal relationship between his presentation and response to care was compelling. His return for follow up care five days and eight months later noted stability in his recovery. The care he received offered him relief of pain and return to his activities of daily living following one office visit. While there may be various reasons why he responded positively one possibility is the care that was rendered to him.

Conclusion:

There seems to be a wide array of options for patients considering care for TMD. Often the first step for patients involves watching and waiting, as well as over the counter anti-inflammatories and pain relievers. If pain and loss of function persists then determining what to do is a challenging endeavor for patients. Ideally conservative care that is low risk and cost effective would be optimal. In this case a patient with acute TMJ pain and dysfunction responded well to one treatment and-eight months later was still stable in this regard. Further research is needed to determine what subset of acute TMJ patients might best respond to SOT and Vector Point care.

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SOT Cranial Therapy with an occlusal splint for the treatment of fibromyalgia and obstructive sleep apnea with blocked sinus.

Rachel Hamel, DC, Mamal Rahimi, DDS, and Charles Blum, DC

Introduction:

Fibromyalgia is a disorder characterized with widespread musculoskeletal pain in specific locations (trigger points), stiffness, cognitive dysfunction, sleeping disturbances and fatigue. It is believed to be a disorder of central pain processing that produces paresthesias such as heightened responses to painful stimuli and pain with non-painful stimuli.[1] The prevalence has been reported to be 3.4 percent in women and 0.5 percent in men, increasing with age to 7.4 percent in women between the ages of 70 and 79 years.[2]

Fibromyalgia is co-morbid with a diversity of medical and psychological conditions such as headaches, chronic fatigue syndrome, irritable bowel syndrome, sleep disturbances, depression and anxiety, obesity and metabolic syndrome, autonomic dysfunction, orthostatic hypotension and postural orthostatic tachycardia syndrome.1 Fibromyalgia can provide substantial disability: difficulty with activities of daily living beyond personal care, increases in unemployment and lost work days, and results in even more healthcare visits than rheumatoid arthritis patients.[2]

Disturbed sleep has been implicated as a key factor for the pathogenesis of fibromyalgia.[3-5] Obstructive sleep apnea (OSA) occurs when there is an obstruction in the airway, characterized by frequent awakenings, disrupted sleep and consequent excessive daytime sleepiness.[6] The severity of the condition ranges from mild vibration of the tissues to death by asphyxiation. It has been shown that there is an association with snoring and OSA in serious medical conditions such as: hypertension, metabolic syndrome, diabetes, heart failure, coronary artery disease, arrhythmias, stroke, gastro esophageal reflux disorder (GERD), pulmonary hypertension, neurocognitive and mood disorders.[6]

There are many complications that can come from daytime sleepiness that arise from the improper sleep wake cycles, which disrupt brain activity and relaxation. Some serious environmental health disasters have been partially attributed to sleep loss and its associated work-related performance failures.[7] Children with obstructive sleep apnea (OSA) often have problems in development, cognition, behavior, and academic performance. Individuals with sleep apnea are at twice the risk of having a traffic accident as unaffected individuals; the higher the apnea-hypopnea index, the higher the risk, and those with OSA are twice as likely to be involved in workplace accidents. Additionally, the annual medical costs resulting from untreated OSA is estimated to be $3.4 billion. [7]

Other than surgery, which is costly, offers risks, and is invasive, the most common intervention for treatment of OSA is continuous positive airway pressure CPAP, which is generally poorly tolerated by patients. It has been estimated that approximately 25% of all patients with OSA discontinue therapy in long-term follow-up. [7] Sleep apnea dental appliances that focus on mandibular advancement have shown promise, [8-10] but can be costly and may affect occlusion and mandibular condyle position, which can produce other secondary issues. [11,12] The following

is a case report of a patient presenting with symptomatology of fibromyalgia, sleep apnea, and sinus restrictions, and discusses an intervention that appeared to facilitate her recovery.

Assessment

A 47-year-old female patient presented for chiropractic care with a thirteen-year history of temporomandibular joint pain (TMJ) rated as a 8/10 (with 10 being most painful), disturbances in vision, deviated septum, restricted left sinus, fibromyalgia, chronic fatigue, excessive daytime sleepiness, "stone-like" muscles, chronic "vice-like" headaches, cognitive impairments, insomnia, chronic myofascial neck and shoulder pain, low back pain with radiation into her right leg, and a burning type pain bilaterally into her legs and feet. She had also been prescribed and utilizing amitriptyline medication for thirteen years, an antidepressant to help with insomnia. She additionally reported that for the past 13 years, most days were spent in bed, with any physical activity disabling her in pain. Prior to care, she began using the guifinocin protocol for fibromyalgia for two months, and reported it decreasing the "trigger point" symptoms from a 10/10 to 9/10.

Methods/Intervention

Examination revealed narrow transverse upper dental arches with an anterior premature contact. Maxillary bone deficiency was found with ridging and exostosis. Decreased anterior translation of the right TMJ with palpatory pain and clicking upon opening was noted along with increased anterior translation of her left TMJ. Pain was elicited with palpation to the masseters, temporalis, suboccipitals and medial and lateral pytergoid muscles. Examination of the teeth showed evidence of clenching and grinding. Cervical spine range of motion was limited and painful. Cervical foraminal compression was positive on the right localizing to the C5 level. Bilateral pain was produced in the posterior sacro-iliac joints with bilateral straight leg lifting at seventy degrees. The left temporal bone was restricted in extension (internal rotation) to palpation and a spheno-maxillary distortion pattern was also determined.

Prior to the examination a sleep study was conducted at Stanford on 2/9/2016. The sleep study revealed a Respiratory Disturbance (RDI) Index of 26 or (5.4/hour) and an Apnea Hypopnea Index (AHI) of 26. Also, it was noted that the oxyhemoglobin saturation (Sp02) was 96% during sleep.

Treatment consisted of eight SOT cranial dental appointments incorporating sacro occipital technique (SOT) intraoral cranial adjustments, sphenomaxillary craniopathy, and neuro emotional technique (NET) for stress related symptoms. Treatments included intraoral maxillary cruciate decompression, restoring bilateral frontal/zygomatic suture movement, releasing zygomatic torsion, opening sphenomaxillary distortions through a "cant hook" maneuver, correcting the primary category temporal bone fixation pattern, category two (supine pelvic block placement) followed by category one (prone pelvic block placement) based on signs and symptoms, and utilizing NET for unresolved emotional issues affecting physical alignment as needed.

Two weeks into treatment she was referred to a dentist who determined her need and fabricated a lower occlusal Gelb mandibular splint for her to use. Instructions were to wear the splint only during sleep hours indefinitely, unless functional orthodontia was followed to correct the severe bite abnormalities. The collaborative chiropractic and dental treatment took place over five weeks.

Results

Following the five weeks of chiropractic and dental care the patient reported an immense reduction in all of her symptoms. Her TMJ pain was mild and she rated it at a 1/10, she was able to sleep without taking amitriptyline, and slept for seven hours with no interruption in sleep. Prior to treatment she had to take multiple naps during the day to function, and usually only slept around 3 hours per night. If she skipped her amitriptyline medication prior, she would have been bedridden for almost two days. At the 8-visit mark she could breathe freely out of both nostrils. Her chronic headaches, neck and low back pain resolved over the five-weeks of care. She was able to hike seven miles and climb 27 floors with no burning in her legs, without the need to take naps to recover. Also her muscles which were chronically tense, started to decrease in hypertonicity. Prior to treatment, she was unable to do any sort of physical activity, and even with low-level increased activity would need to take at least two naps per day to function. Her fibromyalgia type trigger point pain as previously described, also showed a decrease in the severity of her tender points, from a 9/10 to 2/10.

Her cognitive function improved and she reported being able to multitask with mental clarity for the first time in years. Her fatigue decreased, presumably due to being able to get several hours of interrupted sleep and increased oxygenation associated with a decrease in airway compromise. She also reported an increase in her overall well-being. A polysomnogram was performed at the 6-week mark after her initial office visit with the dental mandibular appliance in her mouth to compare to her original sleep study. The results were promising, even though the patient reported having helicobacter pylori the night of the sleep study, which caused her to awake multiple times during the night. Still, her RDI index was 8 as compared to her presenting RDI index of 26 and her AHI was 4 compared to her presenting AHI index of 26. Her oxyhemoglobin saturation SpO2 remained unchanged. [Table 1]

Discussion

Incorporating SOT categorization, SOT cranial, sphenomaxillary craniopathy, NET and a dental mandibular Gelb appliance appeared to have an effect in dramatically decreasing the patient's sleep apnea in addition to significantly decreased and eliminated some of her fibromyalgia type symptoms. This treatment was relatively cost effective, minimally invasive and rendered results in just five weeks time. Hoffman noted that oral appliances in some instances can be helpful and treating mild to moderate OSA, and may offer a viable initial conservative option for severe cases.[13] However, while the appliances may be helpful there is "underuse of dental appliances due to the lack of qualified dentists working in this area, and in part to reimbursement policies."

[13] The majority of government policies cover the cost of a CPAP, but very few cover any of the costs of dental appliances.[13] Therefore, it is surmised that the uninsured cost of dental appliances will often deter individuals from incorporating dental appliances into sleep apnea type care.

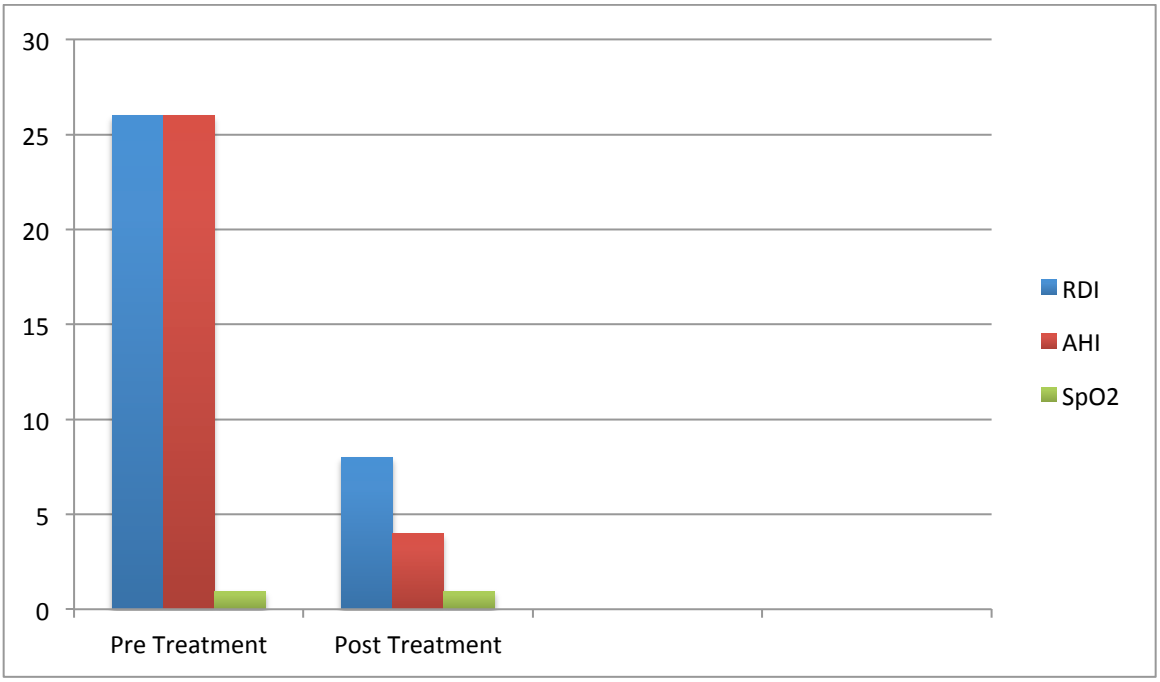


Table 1. Pre and post treatment measuring RDI, AHI, and SpO2

Of interest in this case report was that the patient's OSA relief corresponded with an improvement of her fibromyalgia type symptomatology. There is some research that suggests interesting relationships between OSA and fibromyalgia. One study determined that OSA patients may lack depth of sleep, and this lack of sleep causes fibromyalgia like symptoms in otherwise healthy individuals.[14] Also, it is fairly common that fibromyalgia patients suffer sleep disorders, that are considered similar to those of OSA patients[15] with disorders of sleep patterns being an important feature in the pathogenesis of their fibromyalgia condition.[16] It appears that both OSA and fibromyalgia patients suffer from reaching a deep sleep phase, which limits their rest, ultimately suggesting there may be a relationship between these two conditions.[17]

A recent study attempted to assess this OSA and fibromyalgia relationship and found "that oxidative stress might play a role in the pathophysiology of both diseases, especially if they co-exist in the same patient."[3] Other interesting relationships between these conditions are being discovered, such as that fibromyalgia patients with OSA seem to be responsive to CPAP therapy.[18] Yet in another study found a relationship between fibromyalgia and OSA had a greater prevalence in men as compared to women, and they even concluded that "fibromyalgia may be a marker for occult sleep apnea in males."[19] Another study investigated this relationship, with 31 women diagnosed with sleep apnea and 31 without in respect to pain sensitivity. They concluded that "the differences noted between OSA patients and the control group with respect to myalgic score and the number of tender points suggest that there might be a relation between OSA and pain sensitivity. There might be an association between low oxygen saturation and total myalgic score."[20]

SOT category and cranial therapy has emerging evidence to support its utilization for the collaborative care of patients with TMJ disorders[21-30], OSA[31,32], and fibromalgia[33,34]. With the care of this particular patient it appeared helpful to incorporate a novel treatment focusing on the sphenomaxillary suture as developed by Dr. Buddingh.[35] Buddingh purports that sphenomaxillary suture technique attempts to balance the ptyergoid muscles and surrounding cranial bones to help balance associated dural tension. He contents that "hypertonicity of the pterygoid muscles occurs when the patient's body requires the pterygoid muscle to balance the reciprocation of the anterior falx to the general craniofacial and periosteal dural tensions. Ideally, the hypertonic pterygoid muscles and the concomitant tension into the TMJ is relaxed and balanced via the spheno-maxillary adjustment. Clinical studies have noted that balancing the sphenomaxillary suture causes a reduction of the hypertonicity of the related muscles affecting occlusal relationships." [35]

While the outcome from this case report appears dramatic case reports cannot be generalized to the population at large since they do not have control groups, comparative sham interventions, and are compromised by the placebo and ideomotor effects. This study offers some interesting factors since she had been suffering from OSA and fibromyalgia for years without any improvement. She needed medication, which only minimally improved her pain and function as well as needing frequent naps during the day following any increase in her activities of daily living. The temporal relationship between the care she received and her reduction in RHI and AHI levels, improved sleep, decrease in fibromyalgia trigger points, and other related positive findings is however noteworthy.

Conclusion

As healthcare providers attempt to build an evidence base of information for care of patients suffering from OSA and fibromyalgia the search should focus on low-risk and relatively low-cost options. In this case the patient presented with OSA and fibromyalgia, which after 5-weeks of chiropractic and dental care was found to have significant improvement in her quality of life and activities of daily living. Greater study is needed to identify the subset of OSA patients with concomitant TMD and fibromyalgia symptomatology that could benefit from this approach. Ideally in conditions where a patient does present with OSA and fibromyalgia and is resistant to using a CPAP, the methods utilized in this case may offer another option.

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JAOA EDITORIAL

Cranial Osteopathic Manipulative Medicine's Growing Evidence Base

Hollis H. King, DO, PhD

Two articles on cranial osteopathic manipulative medicine (OMM)[1,2] were published in the December 2011 issue of *JAOA—The Journal of the American Osteopathic Association*, and a review of a clinical study reporting the benefits of cranial manipulation appears in the present issue's installment of "The Somatic Connection."[3] All of these items bring much-needed attention to the discussion on the validity of the concept and clinical benefits of cranial OMM in the practice of health care.

There is arguably as much, if not more, current research attention devoted to cranial OMM as there is to any other single OMM procedure, yet cranial procedures remain the most controversial.[4] Despite the controversy, I believe there is mounting support for virtually all aspects of cranial OMM, including theoretical assumptions (eg, the Primary Respiratory Mechanism elements), clinical benefits, and physiologic mechanisms of action.

As one reads the systematic review by Jäkel and von Hauenschild,[2] it becomes apparent that a number of studies that used cranial OMM were not included because of the strict selection process used by the authors. Their inclusion criteria required that only articles that specifically described cranial manipulation be included. Hence, Jäkel and von Hauenschild have a possibly limited conclusion, as follows: "The currently available evidence on the clinical efficacy of cranial OMM is heterogeneous and insufficient to draw definitive conclusions."[2] They further state the obvious, writing, "further research into this area is needed."[2] This conclusion is appreciated and respected for its scientific purity, and indeed, the article is not yet another anti–cranial OMM screed—far from it. However, their review could have been more comprehensive and still maintained scientific integrity.

While the tenets of modern research would lead us to isolate the specific OMM maneuver that may produce a measurable beneficial outcome, in actual clinical practice multiple OMM maneuvers are usually employed. In any discussion of the effects of cranial OMM, I can think of at least 3 articles in which clinical benefit in the use of cranial OMM was demonstrated but specific descriptions of cranial OMM were lacking[5,6] or cranial OMM descriptions were vaguely referred to.[7] While the articles by Frymann[5,6] may not have specified cranial OMM, anyone remotely familiar with Frymann's work knows she performed cranial OMM on every patient; during a cranial course she was directing about a decade ago, I heard her publicly state that she did. In the study by Mills et al,[7] treatment included "balanced membranous tension (according to the teachings of William Garner Sutherland, DO, and others)," referring to *Osteopathy in the Cranial Field* by Magoun.[8] Clearly, cranial OMM was used in that study.

Two articles published subsequent to the Jäkel and von Hauenschild systematic review[2] specify cranial OMM and report beneficial outcomes.[1,9] In the study by Shi et al,[1] cranial OMM produced measurable physiologic effects that contribute to our understanding of possible mechanisms of action for cranial OMM. In the study by Lopez et al,[9] specific cranial OMM procedures were described in the treatment protocol, and data showed improved balance and equilibrium in healthy elderly adults.

Jäkel and von Hauenschild[2] were justified in their approach, but I would like the osteopathic medical profession and the scientific community at large to know that much more research has been done that suggests benefit for the clinical application of cranial OMM. Perhaps the pieces are now in place for a fuller review and explication of cranial OMM.

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Dr King is a section editor of and regular contributor to "The Somatic Connection" and is a member of the *JAOA* Editorial Board.

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Address correspondence to Hollis H. King, DO, PhD, Program Director/Director of Medical Education, University of Wisconsin Department of Family Medicine, Osteopathic Residency Program, 1100 Delaplaine Ct, Madison, WI 53715-1840.

E-mail: hollis.king@fammed.wisc.edu

SOT Research Conference

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NEW & Noteworthy

UPDATES ON ACTIVITIES IN THE PROFESSION

Osteopathy in the cranial field: Uncovering challenges and potential applications

Osteopathic physicians eagerly anticipate research results that would provide an evidence base for the use of osteopathy in the cranial field (OCF), or cranial osteopathy. Why? Proving the efficacy of OCF will help reduce the controversy surrounding its use and fulfill the evidence-based requirement for continuing medical education courses accredited by the American Academy of Family Physicians (AAFP). The AAFP, which originally described craniosacral manipulation as "dangerous"[1,2] and therefore would not credit continuing medical education courses containing "OCF" in the title, lifted its disapproval of OCF in January 2002. The organization's disapproval was largely a matter of misunderstanding and lack of knowledge about the research underlying OCF.

Collaboration under way between the AAFP Commission of Continuing Medical Education and the AOA, assisted by the American Academy of Osteopathy (AAO), The Cranial Academy, and the Sutherland Cranial Teaching Foundation, will define terms and establish criteria for CME credit involving OCF.

The osteopathic medical profession has long been challenged to prove the efficacy of osteopathic manipulative treatment (OMT). The AOA Bureau of Research has met the challenge, with further research anticipated from the Osteopathic Research Center, whose main sponsors are the AOA, the American Osteopathic Foundation, and the American Association of Colleges of Osteopathic Medicine. The Center is housed at the University of North Texas Health Science Center at Fort Worth, Texas College of Osteopathic Medicine. The ante has been raised in light of the AAFP's initiative to emphasize evidence-based medicine in many CME courses. The possibility of having evidence-based medicine on one's side in the current healthcare climate is a decided advantage, particularly when there are third-party reimbursement issues. With the lifting of the AAFP's disapproval, research currently under way has added momentum.

OCF in the spotlight

The AAO and the AOA worked to ascertain the reasoning behind the AAFP's declaration of disapproval.[2] Eventually, the AOA, through representation by AOA Trustee Amelia G. Tunanidas, DO, laid the groundwork for testimony by E. John Lentini, DO, a member of the AAFP Commission on CME. This resulted in clarification of the issue and the removal of sanctions against CME presentations with OCF in the title. Apparently, the initial action by the AAFP Commission on Continuing Medical Education was based on lack of knowledge of the research underlying OCF, as well as confusion about the difference between physician-administered OCF and craniosacral manipulation involving nonphysician clinicians.

American Osteopathic Association leaders were also concerned that if one type of OMT was declared "dangerous," criticism and banning of other OMT modalities would follow. A prime example of a new possible target was high-velocity, low-amplitude thrust manipulation and association with cerebrovascular ischemia.[3]

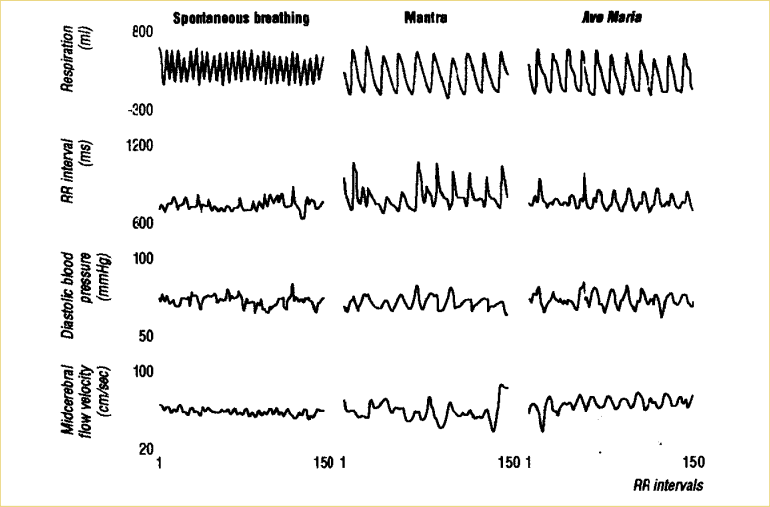
Current directions in research in OCF

Promising research on OCF includes a study that involves measurement of Traube-Hering-Mayer (THM) oscillation.[4,5] Kenneth E. Nelson, DO, and Thomas Glonek, PhD, used a laser-Doppler flowmeter to measure THM oscillation. This oscillation was identified after the invention of the recording

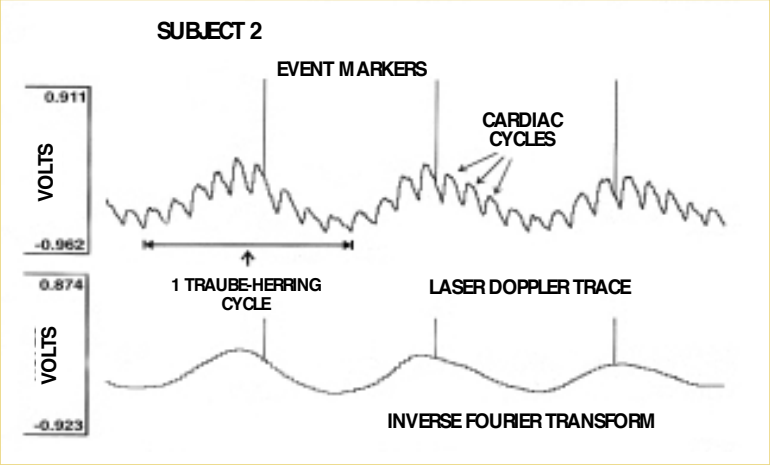


Thomas Glonek, PhD *(left)*, explains a research project on osteopathy in the cranial field to Tara Montgomery, while Jeffrey F. Brookman, DO, listens to a similar explanation from Kenneth E. Nelson, DO. (Photo by Michael Fitzgerald)

New & Noteworthy



Power spectrums of respiration and cardiovascular signals during spontaneous breathing, free talking, and recitation of the "Ave Maria." Note the left shift of the spectrums during vocal sequences, due to slower breathing. Rhythmic recitation (regular oscillations) gives narrower spectral peaks; free talking (irregular oscillations) produces broader peaks. *(The British Medical Journal* grants permission for reproduction of this graph. *BMJ* 2001;323:1446-1449.)



(Below, left) Expanded laser-Doppler flowmeter relative blood velocity record of subject. *Top*—Flowmeter trace, revealing fine structure of the cardiac cycle. The double-headed arrow indicates the wavelength of one Traube-Hering-Mayer cycle. *Bottom*—Traube-Hering-Mayer waveform component only of the top trace. The bottom waveform was created from the top waveform by filtering (removing) the high-frequency cardiac component, leaving only the low-frequency baro and respiratory components. Inverse Fourier transformation of this filtered data generates the bottom trace. Both traces are in register with respect to time, and the event markers indicate the positions of the palpatory findings. (Reprinted from *JAOA*. 2001;101:165.)

manometer and was thought to explain systolic-diastolic variation of blood pressure. Oscillation was attributed to intrathoracic pressure fluctuation of pulmonary respiration and was noted by Ludwig Traube in 1865 to persist after the cessation of respiratory motion. Ekbert Hering independently demonstrated Traube's discovery. Later, Mayer identified an additional, lower-rate oscillation.

Nelson and Glonek described the research on these oscillations, which occur between 6 and 10 cpm. "The THM oscillation has been associated with blood pressure, heart rate, cardiac contractility, pulmonary blood flow, cerebral blood flow and movement of cerebrospinal fluid, and peripheral blood flow, including venous volume and body temperature regulation."[6]

Physiology texts describe THM oscillation as a complex interaction between the sympathetic and parasympathetic components of the autonomic nervous system with renin-angiotensin on the cardiovascular system. Traube-Hering-Mayer oscillation phenomena is an integral aspect of homeostasis. Nelson and Glonek's research demonstrated a statistically significant relationship between a subject's laser-Doppler flowmeter measured THM cycle and an examiner's palpation of the cranial rhythmic impulse (CRI).

Caveat on terminology

Nelson and Glonek's[6] use of the term *cranial rhythmic impulse* in their description of the procedure is a matter of convenience. The term used should actually be *primary respiratory mechanism* (PRM),[7] to describe this phenomena by those who use OCF. Cranial rhythmic impulse is just one aspect of the cranial-motion dynamic. Using this term is discouraged as it is an oversimplification that could lead to misusing the concept. by those unfamiliar with OCF. The term *cranial rhythmic impulse* was never intended to have the same empirical characteristic as measure of blood pressure or heart rate. Nelson and Glonek[6] correctly point out that use of the term has communicative value from its traditional use. Until further research can provide a more detailed operational definition, a caveat is appropriate.

Findings and implications of Traube-Hering-Mayer relationship with primary respiratory mechanism

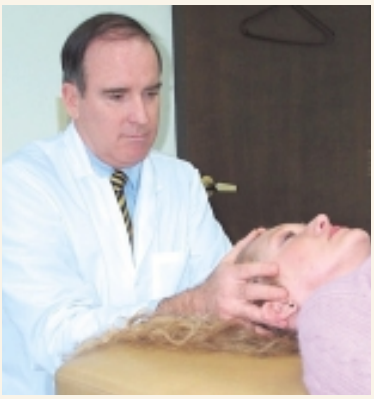
In their subjects, Nelson and Glonek[4] found that the measured frequency of THM oscillation was 6.75 ± 4.50 cpm and that the CRI was 4.54 ± 2.08 cpm. Both figures are consistent with previously determined ranges. The authors wrote that the findings imply that the PRM and the THM oscillations are simultaneous, if not the same phenomenon.[4] Besides establishing a significant relationship of the PRM with other known physiologic phenomena, these findings suggest that measurement of the THM could facilitate development of palpatory skill. That is, feedback on an examinee's THM rate could be correlated with a medical student or physician learning to palpate the PRM.

Nelson and Glonek[6] were even able to ascribe certain aspects of THM oscillations with the so-called fast tide of between 8 and 12 cpm and the slow tide rate of 0.6 cpm. The phenomenon of a still point, a brief cessation in the rhythm of the PRM, was even associated in 79% of cases with a diminished THM amplitude.

Other research on Traube-Hering-Mayer oscillations

At about the same time as Nelson and Glonek's initial publication, research published in the *British Medical Journal* related THM 6-cpm oscillation with enhanced heart-rate variability and baroreflex sensitivity.[8]. This study, conducted by Italian and Polish physicians and researchers, compared the effects of recitating the "Ave Maria" in Latin or recitating of a yoga mantra on breathing rate, spontaneous oscillations in R-R intervals and on blood pressure and cerebral circulation (measured by transcranial Doppler ultrasonography).

These researchers cited literature linking a respiratory rate of 6 cpm with favorable effects on cardiovascular events such as increases in arterial baroreflex, oxygenation of the blood, and exercise tolerance. In chronic heart failure, a respiratory rate of 6 cpm reduces the exaggerated sensitivity of the respiratory chemoreflex and improves irregular breathing.



Cranial vault hold treatment position typical in OCF. (Photo by Hollis H. King, DO, PhD)

The researchers' discussion of the autonomic nervous system components and physiology affected by the repetition of "Ave Maria" and the yoga mantras was similar to Nelson and Glonek's discussion of the relationship between THM oscillation and the PRM phenomenon. There appears to be something efficacious in a rhythmic oscillation of around 6 cpm, manifested by the human nervous and vascular systems.

"Ave Maria" and the yoga mantra produced a similar effect, slowing respiration to approximately 6 cpm. They also produced a marked effect on synchronization and increased variability in all cardiovascular rhythms. In that low heart-rate variability and low baroreflex sensitivity related to the THM oscillation are powerful and independent predictors of poor prognosis in heart disease, this research suggested that 6 cpm of breathing and autonomic activity such as THM may have great benefit. The authors concluded that such prayer and mantra practices are beneficial health practices.

Possible effects of OCF on heart-rate variability

An inexpensive study would be to compare the effects of OCF on cardiac R-R interval variability. The appearance of the Nelson and Glonek and European research with THM oscillations as a key ingredient is almost synchronistic. The nature of THM physiology and its relation to OCF and heart-rate variability is a compelling research relationship. If the effects of OCF on R-R interval variability control are found beneficial, this would constitute the kind of research that supports OCF. This could in turn lead to definitive, evidence-based research of the type needed to establish OCF as a medical modality worthy of consideration in clinical practice.

HOLLIS H. KING, DO, PhD
President
American Academy of Osteopathy

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Treatment of chronic TMJ pain and dysfunction using sacro occipital technique and cranial techniques: A case report

Jason Scoppa, DC

Introduction:

Although sources differ slightly, The National Institute of Dental and Craniofacial Research (NIDCR) reports a 5-12% prevalence rate of Temporo-Mandibular Joint Disorder (TMD), with an annual cost of approximately $4 billion to treat the two thirds of that population that seeks treatment[1]. In a study by Di Paolo, "epidemiological evaluation, anamnestic and clinical data collected from a sample of 2,375 patients affected by TMD clearly showed that there were large quantities of variables involved in these disorders and which occur with a wide variety of possible clinical signs[2]." In accordance with the current knowledge "…it is not always possible to clarify the etiology of these disorders…[2]" Within this study many of the TMD patients suffered from multiple areas of muscle and spinal pain, as well as experiencing headaches. These tended to occur at a higher frequency on the side of the greatest TMJ dysfunction[2].

More studies are needed on the safety and effectiveness of most treatments for jaw joint and muscle disorders, but the NIDCR[3] strongly recommends using the most conservative, reversible treatments possible. Conservative treatments do not invade the tissues of the face, jaw, or joint, or involve surgery. Reversible treatments do not cause permanent changes in the structure or position of the jaw or teeth. Treatment options listed include self-care and pain medications, and if those do not produce the desired result it is recommended that patients see a dentist for splints, Botox, or surgery.

This case report describes a patient seen for a primary complaint of chronic TMJ pain with accompanying closed lock without disc recapture, as well as shoulder tension and right knee pain. Treatment consisted of Sacro Occipital Technique (SOT) and cranial techniques.

Case History:

The patient is a 28-year-old, Caucasian female that presented with a primary complaint of chronic right-sided TMJ pain and dysfunction that had gotten significantly worse as a result of a car accident a few months prior to her appointment. Other complaints included anterior and posterior shoulder tightness bilaterally, as well as right knee pain. She has a stressful job that requires her to travel frequently and go out a lot for dinner, drinks, and entertaining. The TMJ pain and dysfunction was interfering with her work as it was made worse with talking, chewing, and flying, and would temporarily lock in a closed position[4]. Her visual analogue scale (VAS) for her TMJ pain was 7/10 on average, with pain getting as low as a 2/10. The pain was described as mostly dull, which turned to a sharp pain when she spoke too much, ate chewy foods, or traveled. For the last few weeks she's had to restrict her diet to mostly liquids and soft foods, as her symptoms became worse post accident.

Prior to the initial office visit the patient had utilized multiple care options to address her TMJ pain and dysfunction, including attempting to rest her jaw by following a liquid diet, performing

self-care procedures, and seeing a massage therapist. These interventions didn't result in any change in her condition.

Intervention:

Of significance on testing TMJ translation the patient had limited opening capacity and was reluctant to go through too much testing because of pain. The patient was examined using sacro occipital technique (SOT) [5,6] and cranial analysis. SOT indicators that were assessed pre and post treatment included psoas/iliopsoas tension assessment, supine hip flexor active straight leg raise (ASLR) test[8], muscle testing of sternocleidomastoid (SCM) muscles[9], trapezius fibers[10], sacrospinalis paravertebral muscle tension, arm fossa test[11,12], motion palpation of the vertebral segments[13,14], cervical stair-step assessments[15], and rechecking of the patient's leg length in a supine position[16].

SOT category analysis revealed the patient had pelvic torsion[17,18] and sacroiliac joint (SIJ) hypermobility described as a category two and consistent with a positive arm fossa test [19-21]. She was subsequently treated as a category two with supine pelvic block placement until various active palpatory indicators and arm fossa test were neutralized. Her left psoas was examined and treated via SOT protocol until indicators cleared. Cervical stairstep assessment indicated a dysfunctional C1/C2, and C4/5 articular facet translation, which was treated until normal motion was restored[15]. SOT cranial intraoral TMJ treatment was performed to release internal and external pterygoids musculature[22], TMJ treatment was performed as outlined in the Sacro Occipital Technique Organization – USA (SOTO-USA) TMJ Manual[23].

The cranial procedures utilized consisted of analyzing muscle strength[9], spinal, and cranial motion assessments[13,14]. Right hip flexors, right SCM, and left supraspinatus were found relatively asymmetrically weak to their other side. Motion palpation and stress to the spinal segments found imbalance at – L5, L2, and T12 vertebral levels. Cranial techniques applied to the cranium were utilized, which focus on sutural points that correlate with different areas of the spine via their dural connection. The hip flexors, SCM, and supraspinatus muscles as well as the spinal segments were treated by having the patient touch the involved muscle while the doctor held sutural points on the cranium that correlate with the nerve roots that innervate the muscle being touched. Indicators were checked pre and post to ensure improvement.

The cranial assessment for this patient revealed a left "open occipital bone" (left lambdoidal suture restricted in a position of flexion, with an inferior occipital on the left side) which is associated with left gluteal/piriformis muscle laxity where they cross, level eyebrows and orbital ridge, orbits symmetrical, chin pointing to midline, and the bridge of his nose having a left inclination. The patient was treated to release the lambdoidal suture and lift the occiput on the left side, which simultaneously helped improve SCM and TMJ function.

Results:

Immediately after the first office visit the patient felt some relief but was still sore and felt limited in her opening and movement. Two days after her appointment she contacted the office to tell us that her pain had significantly reduced to the point where she was almost pain free. She was still experiencing apporiximately one short twinge of intense pain per day that she put at around 1% of her waking hours, versus feeling intense pain 25% of her waking hours pre-treatment. She had regained the ability to open and close without pain and was able to return to normal activities. She returned for a follow up visit one month later and reported that her jaw and right knee pain were completely resolved, the left shoulder tension was resolved, and the right shoulder tension was much less though not resolved completely. She returned six months later and her jaw and knee pain had not returned.

The TMD Disability Index assessment tool[24] that was filled out by the patient prior to treatment indicated that she had to alter her activities of daily living related to talking, brushing her teeth, eating, chewing, yawning, and opening her mouth, and while she could participate in recreational activities she needed to be cautious. Following treatment she was able to return to all activities of daily living without any limitations.

TMD Symptom Intensity Scale a type of Visual Analogue Scale (VAS)[25-27] that measures intensity and frequency of pain levels was performed pre and post care. Pre treatment the patient reported pain of 7/10 (10 being most painful) related to jaw pain, painful jaw clicking, jaw locking, and shoulder tension, with a 5/10 relating to headaches and dizziness in relation to her TMJ symptoms. Regarding frequency of symptoms, jaw pain and neck tension were present 75% of the time, while clicking and locking were present 60% of the time. On the follow-up office visit one month later, all TMJ symptoms had resolved except for shoulder tightness on the right side (still rated at around a 6/10, 60% of the time).

Discussion:

With any conservative intervention the risk and benefit, as well as the relative costs of the care rendered should be considered. Low risk, low cost, and good outcomes are always the preference for the patient and doctor. Treatment of TMD can be challenging since symptoms may not be an indicator of dental stress to the dentition or gingiva. Clenching and bruxism can sometimes not be noticed by the patient but viewable on examination of the teeth for occlusal wear patterns, abfractions, and/or gum recession. Integrative chiropractic dental care [28,29] is essential since the first doctor a patient might see for TMD care could be a chiropractor. It is important for chiropractors to understand when it's appropriate to work with dentists, and vice versa. This includes both practitioners having at least an elementary understanding of what the other does.

For example, a patient could have an acute TMD presentation that might be more related to spinopelvic[21,30], cervicocranial[31], and/or stomatognathic[32] imbalance amenable to chiropractic care. If no dental related pathology is noted upon assessment, as was the case with this patient, a trial of chiropractic care for the treatment of TMJ pain and dysfunction would seem reasonable.

While the findings from this study appear dramatic, generalizing case reports to the population at large necessitates caution because "n-of-1" studies have no controls or comparative subjects receiving sham care. Without a range of patients and assessing interventions it is difficult to rule out placebo or ideomotor effects, regression to the mean, and other confounders commonly found with case reports. Yet still, Flyvbjerg [33] suggests that there is often value in the case report and points to Campbell[34] who states:

> "After all, man is, in his ordinary way, a very competent knower, and qualitative common-sense knowing is not replaced by quantitative knowing . . . This is not to say that such common sense naturalistic observation is objective, dependable, or unbiased. But it is all that we have. It is the only route to knowledge--noisy, fallible, and biased though it be[36]. "

With this patient a directly temporal relationship between her presentation and response to care was compelling. Her response a few days post-intervention showed a marked improvement in her condition, and it's important to note that the positive result was sustained at one and six month follow up visits, which indicates stability in her recovery. The care she received offered her relief of pain and allowed her to return to her activities of daily living following one office visit. While there may be various reasons why she responded positively one possibility is the care that was rendered to her.

Conclusion:

There is a wide array of options for patients considering care for TMD. Often the first step for patients involves watching and waiting, as well as over the counter anti-inflammatories and pain relievers. If pain and loss of function persist then determining what to do is a challenging endeavor for patients. Ideally conservative care that is low risk and cost effective would be optimal. In this case a patient with chronic TMJ pain and dysfunction responded well to one treatment, and months later was still stable in this regard. Further research is needed to determine what subset of acute TMJ patients might best respond to SOT and cranial care.

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SOTO-USA Research Update

SOTO-USA is dedicated to bringing you the most updated and comprehensive research relating to Sacro Occipital Technique (SOT). Research is the future of chiropractic and SOT. Publishing this research sets the foundation for the future of SOT and protects its future worldwide. Understanding the published research allows us to grow, learn and modify our technique and diagnostic methods to fit our discoveries and stay current in the scientific community. The research department of SOTO-USA is goal oriented and focuses on action and results. **Please consider a tax-deductible donation to SOT research so SOTO-USA can help us further SOT's prominence in chiropractic healthcare**.

SOTO-USA is an organization dedicated to the advancement of SOT and the work of Major Bertrand DeJarnette, DO, DC. One of the many ways in which we at SOTO-USA contribute to the chiropractic profession is through the publishing of articles, newsletters, compendiums, and manuals relating to the art, science and philosophy of SOT (please visit our website for a complete listing of publications; www.SOTO-USA.org).

Association of Chiropractic Colleges – Research Agenda for Chiropractic (ACC RAC) Conferences
Papers Presented at the 2017 Conference and the 2018 Conferences

The ACC RAC conference is one of the most prestigious chiropractic research conferences regularly attended by college presidents, research and technique chairs, and many other influential doctors and practitioners affecting the future of chiropractic and healthcare. Since SOTO-USA's inception in 1999 we have attended every conference and had a paper accepted at every ACC RAC conference possible. The 2017 marked the first year ever that the Biennial World Federation of Chiropractic Conference took place with the ACC RAC. It was a monumental event for sacro occipital technique, cranial, and chiropractic manipulative reflex technique research, since we had 22 papers presented. This year at the 2018 ACC RAC Conferences we had 17 papers accepted.

This past year we had 22 SOT related papers and a workshop accepted for the 2017 ACC RAC Conference:

Benner CD, Blum CL. CMRT and acupuncture in the treatment of dysmenorrhea (oligomenorhea): A case report. J Chirop Ed. 2017;31(1):49-50.

Bloink T, Blum C. Chiropractic care of a 52-year-old female patient presenting with cervical spine disc replacement surgery with complications: A Case Report. J Chirop Ed. 2017;31(1):30-31.

Bloink T, Blum C. Chiropractic care of a 30-year-old male patient presenting with cervical spine disc replacement surgery with complications: A Case Report. J Chirop Ed. 2017;31(1):50.

Bloink T, Blum C. Chiropractic as part of an interdisciplinary team for the care of a patient with an orbital pseudotumor: A case report. J Chirop Ed. 2017;31(1):50-51.

Blum C. Chiropractic conservative care of a patient presenting with carpal tunnel syndrome: A case report. J Chirop Ed. 2017;31(1):51.

Blum C. B6 hypervitaminosis during pregnancy with neurological symptoms: A case report. J Chirop Ed. 2017;31(1):51.

Boro W. Relief of neurological symptoms secondary to surgical removal of thoracic astrocytoma and laminectomy by category I block placement: a case report. J Chirop Ed. 2017;31(1):51.

Esposito V Sr., Esposito V Jr., Blum C. Trauma induced severe refractory motion sickness disorder treated with sacro occipital technique, applied kinesiology, and cranial chiropractic care: A case report. J Chirop Ed. 2017;31(1):57.

Ferranti M, Anastasio B, Varnum C. Chiropractic management of a 6-month-old male with deformation plagiocephaly facial asymmetry, delayed constriction, and abdominal rigidity. J Chirop Ed. 2017;31(1):57-58.

Getzoff H, Blum C. Anterior Thoracic Adjusting and the Relationship to Cervical Flexion: A Retrospective Case Study of Twenty-Four Patients. J Chirop Ed. 2017;31(1):-60.

Gleberzon B, Blum C, Good C, Roecker C, Cooperstein R. Toward a Standardized Chiropractic Technique Program: Consensus Results of Two Inter-Collegiate Workshops. J Chirop Ed. 2017;31(1):60.

Hagen C. Chest Pain and Posterior Rib Misalignment: A Differential Diagnosis. J Chirop Ed. 2017;31(1):62.

Hamel R, Rahimi M, Blum C. Sacro occipital technique (SOT) cranial therapy with an occlusal splint for the treatment of fibromyalgia and obstructive sleep apnea with blocked sinus. J Chirop Ed. 2017;31(1):62.

Holbeck M. Chiropractic treatment of a post-concussion syndrome secondary to volleyball injury in a 14-year-old female: A case report. J Chirop Ed. 2017;31(1):64.

Klingensmith RD, Blum CL. Chiropractic manipulative reflex technique (CMRT) treatment for GERD of a 3 year old male child: A case report. J Chirop Ed. 2017;31(1):66.

Rosen M, Blum C, Rosen E. Resolution of a left sided 5th phalangeal 2nd inter-phalangeal joint stenosing tenosynovitis (trigger finger) in a 2 1/2 year-old female: A case report. J Chirop Ed. 2017;31(1):74.

Rosen M, Blum C, Rosen E. Chiropractic care of a two year-old diagnosed with gastroesophogeal reflux (GER) and a hiatal hernia (HH): A case report. J Chirop Ed. 2017;31(1):74.

Scoppa J. Treatment of knee pain in an athlete sprinter with sacro occipital technique and cranial techniques. J Chirop Ed. 2017;31(1):74.

Scoppa J. Treatment of acute TMJ pain and dysfunction with sacro occipital technique and cranial techniques. J Chirop Ed. 2017;31(1):74.

Shirazi D, Gerardo R, Blum C. Dental chiropractic interdisciplinary care of three patients with different conditions yet similar symptom presentation: A case series. J Chirop Ed. 2017;31(1):76-77.

Sundy D, Blum C. A Multimodal Approach to the Conservative Management of Meniscus Tear. J Chirop Ed. 2017;31(1):78.

Tuttle D, Hochman J, Sullivan S, Hosek R. Sacro-Occipital Technique care alters frontal, temporal, parietal, and occipital brain electrical activity: A randomized controlled clinical study. J Chirop Ed. 2017;31(1):79.

Woodward-Terranova P. Blum C. Resolution of adult gastroesophageal reflux disorder following chiropractic care: A case series. J Chirop Ed. 2017;31(1):62.

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This year's ACC RAC 2018 Conference we had sixteen papers and one workshop accepted:

Bloink T, Blum CL Chiropractic care for TMJ and extreme tongue fatigue: A case report. J Chirop Ed. 2018;32(1).

Blum CL. A preliminary survey of chiropractic college use of table sanitizers in their clinic: Are there green alternatives? J Chirop Ed. 2018;32(1).

Blum CL. Study on inducing fifth lumbar vertebra malposition by M. B. DeJarnette: Historical development of sacro occipital technique. J Chirop Ed. 2018;32(1).

Blum CL. Benner CM. A survey of sacro occipital technique (SOT) practitioners: Pediatric patients and their presenting symptoms. J Chirop Ed. 2018;32(1).

Blum CL. The polyvagal theory: A rational for psychological and chiropractic interdisciplinary care. J Chirop Ed. 2018;32(1).

Blum CL. Chiropractic care of a rock climber's shoulder with FHP (forward head posture): A case report. J Chirop Ed. 2018;32(1).

Blum CL. Sacroiliac joint hypermobility syndrome and a chiropractic: A preliminary survey. J Chirop Ed. 2018;32(1).

Boro WJ. Intervention in tachycardia through chiropractic adjustment, sacro occipital

technique's chiropractic manipulative reflex technique: a case report. J Chirop Ed. 2018;32(1).
Boro WJ. Intervention in gall bladder dysfunction through chiropractic adjustment and nutritional therapy: a case report. J Chirop Ed. 2018;32(1).

Shirazi D, Del Torto A, Blum CL. Dental chiropractic non-surgical interdisciplinary care of a 48-year-old male patient with a deviated septum, headaches, and TMJ dysfunction: A case report. J Chirop Ed. 2018;32(1).

Edwards J, Ohm J, Blum CL. Frequency of SOT Category II indicators among pregnant and postpartum women, and potential implications for Webster Technique. J Chirop Ed. 2018;32(1).

Hamel R. SOT cranial therapy for the treatment of abnormal sensations of the tongue, tinnitus, TMD and neck pain. J Chirop Ed. 2018;32(1).

Hamel R. SOT cranial therapy with an occlusal splint for the treatment of low back, leg and neuropathic pain: A chiropractic dental co-treatment case report. J Chirop Ed. 2018;32(1).

Mersky JA, Blum CL. Dizziness in a patient with airway compromise and TMD: A case report. J Chirop Ed. 2018;32(1).

Perry K. Unresponsiveness to sacro occipital technique (SOT) procedures suggested possible pathological contribution to patient presentation: A case report. J Chirop Ed. 2018;32(1).

Serola R. Blum CL. Sacroiliac joint myoligamentous interrelationships: Implications of sacral nutation dysfunction on whole body kinematics. J Chirop Ed. 2018;32(1).

Gleberzon B, Roecker C, Blum CL, Good C, Cooperstein R. Toward the Development of a Standardized Chiropractic Technique Program. J Chirop Ed. 2018;32(1).

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European Chiropractic Union Convention 2017 research presentations. Limassol, Cyprus. 25-27 May 2017

Serola R. The central role of the sacroiliac joint in musculoskeletal dysfunctions. ECU convention 2017 research presentations. Limassol, Cyprus. 25-27 May 2017. Chiropractic & Manual Therapies. 2017;25(Suppl 1):36.

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3rd International Conference on Neurological Disorders and Brain Injury. April 18-19, 2017 London, UK

Remeta EM. Chiropractic cranial treatment protocol increases successful outcome of the multidisciplinary care model for traumatic brain injury (TBI) patients: A case series. 3rd

International Conference on Neurological Disorders and Brain Injury. April 18-19, 2017 London, UK.

Remeta EM. Chiropractic sacro occipital technique (SOT) and cranial treatment model for traumatic brain injury along with monitoring and supplementing for neurotransmitter balance: A case report. 3rd International Conference on Neurological Disorders and Brain Injury. April 18-19, 2017 London, UK.

Remeta EM. hiropractic cranial treatment model and neuroplasticity in a post stroke 72-year-old male: A case report. 3rd International Conference on Neurological Disorders and Brain Injury. April 18-19, 2017 London, UK.

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Brain Injury Across the Age Spectrum: Improving Outcomes for Children and Adults. North American Brain Injury Society Conference: Houston, Texas. March 14-17, 2018

Remeta EM. A Case Series Investigating the Effect of Chiropractic Sacro Occipital Technique (SOT) and SOT Cranial Techniques Along with Neurotransmitter Enhancing Supplementation on Traumatic Brain Injury (TBI) Prognosis for Five Patients. Brain Injury Across the Age Spectrum: Improving Outcomes for Children and Adults. North American Brain Injury Society Conference: Houston, Texas. March 14-17, 2018: 116.

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The **SOT Research Conference Proceedings** (Now fully indexed and searchable!)

All of the SOT Research Conferences have now been published in the Annals of Vertebral Subluxation Research and is available for searching through MANTIS (a major alternative healthcare search engine) and chiroindex.org (a major chiropractic search engine). All abstracts from the conferences will be published in the Quinquennial SOT Compendium of Peer Reviewed Research and full conference proceedings are offered free to every chiropractic college library nationally and internationally.

1st Annual Sacro Occipital Technique Research Conference Proceedings. Las Vegas, Nevada October 22, 2009. Annals of Vertebral Subluxation Research ~ Sept 29, 2011 ~ Pages 104-132.

2nd Annual Sacro Occipital Technique Research Conference Proceedings. New Orleans, Louisiana 2010. Annals of Vertebral Subluxation Research ~ October 17, 2011 ~ Pages 133-164.

3rd Annual Sacro Occipital Technique Research Conference Proceedings. Nashville, Tennessee May 19, 2011. Annals of Vertebral Subluxation Research ~ Nov 10, 2011 ~ Pages 165-182.

4th Annual Sacro Occipital Technique Research Conference Proceedings. Atlanta, GA May 3, 2012. Annals of Vertebral Subluxation Research ~ May 24, 2012 ~ Pages 41-59.

5th Annual Sacro Occipital Technique Research Conference Proceedings. Atlanta, GA May 2, 2013. Annals of Vertebral Subluxation Research ~ March 27, 2014~ Pages 22-48.

6th Annual Sacro Occipital Technique Research Conference Proceedings. Redondo Beach, CA May 15, 2014. Annals of Vertebral Subluxation Research ~ July 14, 2014 ~ Pages 129-144.

7th Annual Sacro Occipital Technique Research Conference, New Orleans, LA May 7, 2015. Annals of Vertebral Subluxation Research ~ June 8, 2015 ~ Pages 135-145.

8th Annual Sacro Occipital Technique Research Conference, New Orleans, LA May 7, 2015. Annals of Vertebral Subluxation Research ~ November 23, 2017 ~ Pages 254-274.

9th Annual Sacro Occipital Technique Research Conference, New Orleans, LA May 12-13, 2017. Annals of Vertebral Subluxation Research ~ November 23, 2017 ~ Pages 275-286.

Many thanks go to the editors of the Annals of Vertebral Subluxation Research, Drs. Pamela Stone and Matthew McCoy. Their continued support of chiropractic clinical research and of SOT is greatly appreciated.

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At the inaugural 2009 Sacro Occipital Research Conference, Las Vegas, Nevada we had 28 abstracts accepted. At subsequent Sacro Occipital Research Conferences many of the submissions have led to paper submissions to various other research conferences and peer review journals. All SOT practitioners and allied healthcare partners are encouraged to be a part of our next research conference that will occur in 2019. Check the SOTO-USA website for the call for papers: www.SOTO-USA.org

Our ongoing commitment continues into the future with papers submitted to chiropractic and allied healthcare conferences and journals. One of the easiest ways research can be facilitated by a doctor in clinical practice is through the publishing of individual research papers and case histories. These lay the groundwork for future research directions and projects. If the need arises, we will be happy to assist the doctor in writing the paper or case history in order to get it submitted for publishing.

Please take a moment to review our landmark SOT and cranial research texts, which will eternally preserve SOT, related published research, which will have updated volumes every 5 years. These can all be purchased online at www.soto-usa.org or by calling (336) 793-6524.

1st Sacro Occipital Technique Research Conference Proceedings: 2009.

2nd Sacro Occipital Technique Research Conference Proceedings: 2010.

3rd Sacro Occipital Technique Research Conference Proceedings: 2011.

4th Sacro Occipital Technique Research Conference Proceedings: 2012.

5th Sacro Occipital Technique Research Conference Proceedings: 2013.

6th Sacro Occipital Technique Research Conference Proceedings: 2014.

7th Sacro Occipital Technique Research Conference Proceedings: 2015.

8th Sacro Occipital Technique Research Conference Proceedings: 2015.

9th Sacro Occipital Technique Research Conference Proceedings: 2015.

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Soon in Print - The Compendium of Sacro Occipital Technique: *Peer-Reviewed Literature 2005-2010.*

Soon in Print - The Making of a Chiropractor: The Biography of Major Bertrand DeJarnette by Ken Wheat

In Print:

The Compendium of Sacro Occipital Technique**: *Peer-Reviewed Literature 2000-2005.***

The Compendium of Sacro Occipital Technique**: *Peer-Reviewed Literature 1984-2000.***

The SOT Collection: *To the Year 2000.*

The SOT Collection: Supplement: *To the Year 2000.*

Sacro Occipital Technique
Research Updates Fifth Edition

By Charles L. Blum, DC

This is the fifth in a series of articles that will share various concepts of research with doctors in clinical practice. This one relates to chiropractic and dental interdisciplinary care as it relates to temporomandibular joint disorders (TMD).

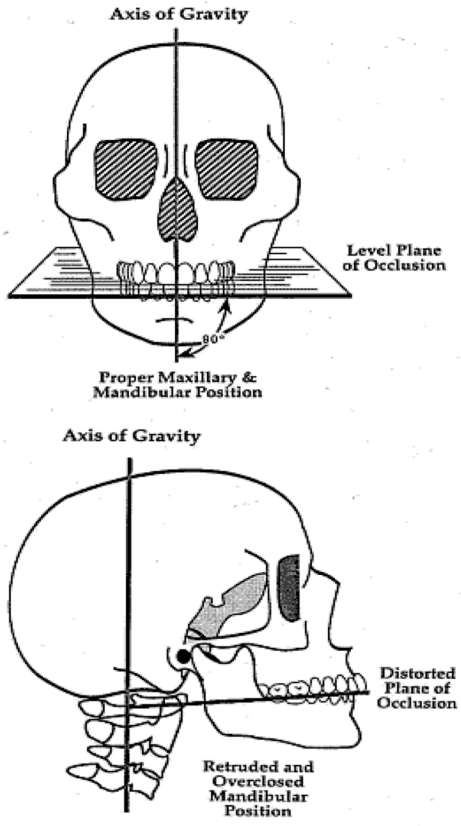
To better understand how chiropractic and dentistry often can function in an integral manner to treat patients presenting with TMD, it is important to grasp the dynamic nature of how body posture affects dental occlusion, condylar position, and airway space, and likewise how dental occlusion, condylar position, and airway space affects body posture. A couple of recent studies exemplified this relationship by showing how placing a heel lift under one shoe to affect pelvic torsion caused the teeth to contact primarily on the side of the heel lift. Likewise, changing dental occlusion had an effect on the stability of a patient's posture.[1,2]

The interrelationship between head and neck position and body posture is affected to some degree by the visual and vestibular righting mechanisms. What goes on below the head and neck will cause the head and neck to accommodate like a gyroscope in order to maintain a horizontal-level position to the horizon for the eyes and ears. If the head and neck are compromised and cannot properly accommodate, then the pelvis and lower spine will be compelled to modify their positions.[3]

Therefore, it is not unreasonable to find intertwining of body relationships with the body's kinematic chain from distally, such as between the feet or knees to the craniofacial regions.[4-6] Also of importance, the pelvis, spine, and TMJ have also demonstrated functional interrelationships.[1,2,7] An association has been found between sleep apnea, airway space, and forward head posture (FHP) that will allow dental chiropractic co-treatment to be viewed from beyond just a pain relief aspect.

While the effect of sleep apnea on public health is becoming well known[8], what is not readily understood is the effect of airway space or apnea on head and neck position.[9]

Studies are finding that the position of the mandible[10] affects airway space, tongue position, and can lead to FHP. So, before chiropractors attempt to treat a patient's FHP, we may need to factor in the question: "Does this patient have TMD-related issues that might be compromising his or her airway space?"[11]



> "Studies are finding that the position of the mandible affects airway space, tongue position, and can lead to FHP."

The following are some studies from the SOT Research Conferences that help illustrate how chiropractic and dental co-treatment might play an effective part of interdisciplinary care of TMD patient presentations.

SOT Cranial and TMJ therapy for unresolved BPPV[12]

Introduction: Vertigo accounts for about six million clinic visits in the US every year, and 17 to 42% of these patients eventually are diagnosed with benign paroxysmal positional vertigo (BPPV).

Case History: A 37-year-old female was seen for BPPV, referred by her allopathic physician for chiropractic care. The patient had two to three months of constant vertigo, unresponsive to medications, and it prohibited her from driving or walking without difficulty.

Methods/Results: Evaluation determined a sacroiliac joint hypermobility syndrome (category two), right temporal bone restricted in external rotation, and significant malocclusion with clenching. Category two protocols for the pelvis were applied along with cranial and TMJ therapies. Dental co-treatment was necessary to sustain the cranial and TMJ corrections. By the seventh office visit (three to four weeks of care), the patient's vertigo had resolved, her category two stabilized, and TMJ translation had improved without pain.

Implications: Since it is not uncommon for cranial trauma to affect cranial nerve function, it is possible that low-level sustained cranial stress or trauma could contribute to clinical presentations such as BPPV. The patient's rapid response to chiropractic and dental care suggests further investigation is warranted into this method of treatment for a subset of patients presenting with BPPV or unresponsive vertigo.

TMD – Chiropractic and Dental Cross-Referrals[13]

Case Report: In conditions where a chiropractor or dentist has reached a therapeutic impasse with a patient's temporomandibular/craniomandibular disorders (TMD/CMD), co-treatment may be indicated. These two cases discuss two patients with sacroiliac joint hypermobility syndrome (category two) and cervical intersegmental restricted motion that necessitated craniomandibular balancing therapeutic interventions and dental appliance therapy. One initially was treated by the chiropractor and referred to the dentist for co-treatment, and the other initially was treated by the dentist and referred to the chiropractor for co-treatment.

> "The patient's rapid response to chiropractic and dental care suggests further investigation is warranted into this method of treatment"

Methods/Results: With SOT and craniomandibular therapies, along with dental appliance therapy, both cases showed a reduction of pain and improvement of TMJ function and/or symmetrical joint translation without crepitus. General relaxation in cervicocranial and craniomandibular musculature was noted by the patient, chiropractor, and dentist.

Implications: A main obstacle for chiropractic/dental co-treatment is the lack of awareness and knowledge of each other's professional treatment and diagnostic focus, as well as terminology. This case report illustrated a relationship between ascending/descending postural dysfunctions and TMD. It appeared that with these cases optimal outcomes appeared contingent upon chiropractic and dental co-treatment.

> "A main obstacle for chiropractic/dental co-treatment is the lack of awareness and knowledge of each other profession's terminology and treatment"

Complex Patient Presentations and Chiropractic Dental Co-Treatment[14]

Case History: A 42-year-old female presented with an unsteady Parkinsonian-type of gait diagnosed as psychogenically driven. She also was diagnosed with an atypical version of a complex regional pain syndrome called "complex pain syndrome" due to its whole body generalization as well as her history of migraines.

Methods/Results: Initially the patient was co-treated with a dental night- and day-time appliance, sacrotrochanter belt, and treated with SOT category two protocols, sutural cranial/temporomandibular joint (TMJ) interventions, T8 chiropractic manipulative reflex technique (CMRT), and supportive nutritional modifications to support liver function and reduce inflammation. At the first office visit with the dental appliance, trochanter belt, and category two treatment, all of her shaking stopped when standing and her pain was significantly reduced. This allowed for the patient's medications to be notably decreased.

Implications: It is interesting that a relationship appears to have been found with this patient's severe tremors, migratory joint pain, and migraines that appeared to be associated with her pelvis and TMJ function. The patient's tremors could be eliminated by having a trochanter belt placed around her pelvis and they would return when the belt was removed. The future challenge is developing a predictive group of tests to determine what subset of patient with severe tremors, fibromyalgia, and migraines would be responsive to this type of chiropractic and dental co-treatment.

There is much to learn about interdisciplinary care and how chiropractic and dentistry can function as partners in optimizing patient outcomes. Developing relationships of trust between our professions and knowing when referrals to one another are necessary will be an important first step.[15,16]



Learning each other's terminology and how we each view relationships between the stomatognathic system and body posture, as well as the far-reaching implications of sleep apnea on our patient's health, will assist chiropractors to better help patient outcomes in the future.

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Charles L. Blum, DC is in private practice Santa Monica, California, director of research for Sacro Occipital Technique Organization – USA, adjunct research faculty at Cleveland Chiropractic College and teaches the Sacro Occipital Technique (SOT) elective class at Palmer College of Chiropractic - West and Southern California University of Health Sciences.

SACRO OCCIPITAL TECHNIQUE

Its Past, Present and Future

By Charles L. Blum, DC

Sacro Occipital Technique (SOT) is an assessment and treatment method of chiropractic developed by Major Bertrand DeJarnette, DO, DC in the late 1920s. Prior to beginning a career in chiropractic, a nineteen-year-old DeJarnette embarked on a career as an engineer within a group of elite engineering students hired by the Ford Foundry for research and development. One day not long after beginning his employment at the foundry, he was walking up the steps to his work when an explosion occured in the building. He was thrown nearly 30 feet and barely survived his injuries, everyone else was killed.

During that era in American history, anyone involved in an explosion was considered "bad luck" by potential employers and society at large. He felt despondent about his future engineering career, confused as to why he alone survived, and in excruciating pain due to the injuries he sustained. Contemplating suicide while standing on the highest bridge in town, he felt something touch him and tell him that he had important things yet to accomplish. At the time he was not an especially spiritual person, but he was shaken enough by the experience to get down to the bridge. He walked around aimlessly until he collapsed in front of a house, exhausted. In the morning the homeowner, who fortuitously happened to be an osteopath, discovered the young DeJarnette asleep on his front steps and offered to help him[1].

When the osteopath realized how injured DeJarnette was, he suggested that he attend an osteopathic college where he could learn and continue to receive care. After graduating with an osteopathic degree, he later attended chiropractic college. Upon graduating, he established his chiropractic practice in Nebraska City, Nebraska. He always felt there was a reason why he survived, and that he had a duty to make his life meaningful by improving the welfare of others[1,2].

DeJarnette had a photographic memory and could read a full page, rather than a single word, at a time. His abilities likely led to why he was able to write over 140 books and articles. For DeJarnette, research was an essential part of being a chiropractor, and essential to the future of the chiropractic profession. As early as July 1935, he was a featured speaker at the 40th Anniversary Convention 1895-1935 of the National Chiropractic Association, presenting clinical research. Always,



Photo: ***Major Bertrand DeJarnette, DO, DC***

research was his passion. In an interview in 1982 DeJarnette reiterated, "As far back as chiropractic college, I saw the need for a more scientific basis for chiropractic theory. My own personal physical problems had not been solved by medicine, osteopathy, or chiropractic; so I began experimenting on myself. I'm still at it, and I can see no end of the need for continuous research in chiropractic[3]."

When Dr. DeJarnette began to study the treatments he rendered, he realized that if any meaningful information was to evolve from his experience, he would have to resolve it himself. He realized that explaining how his discoveries evolved was more difficult than the process of developing new diagnostic and therapeutic interventions[4].

"Research is a study of what you have, and what you need to make it better, and how to make it better is the final research step[5]." "Research in Chiropractic must go on forever. Someone must do this type work, for it simply will not take care of itself.

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A profession cannot stand still. Momentum must constantly be generated. Chiropractic research needs many things it does not now have[6]."

Three Novel Concepts[1,7]

DeJarnette utilized concepts of evaluating the body's presentation as a three dimensional holograph which is affected by a matrix of integrative activities. He investigated how sustained stressors to the body create distinct retained patterns of distortion in the neuromusculoskeletal system. He ultimately used his experiences to develop methods of categorizing three specific primary body distortion patterns.

1. He factored Osteopathic principlies relating to cerebrospinal fluid (CSF) circulation, dural membranous tensions, and cranial bone dynamics into chiropractic analysis and treatment.
2. He determined that there are two parts to the sacroiliac (SI) joint, a posterior weightbearing supportive hyaline structure and an anterior synovial membranous joint that allows for joint nutation.
3. From an engineering standpoint he realized that the majority of the weight or stress from structures above the SI joint rests upon the posterior SI joint, whereas inferior to the SI joint the stress is spread 50% to each hip joint.

DeJarnette's three novel concepts led to the development of three specific categories of analysis:

Category One: relates to the anterior synovial SI joint's nutation and its relationship to dural tension and CSF circulation.

Category Two: relates to the posterior SI weightbearing joint.

Category Three: relates to the body's adaptation to the inability to distribute weight through the posterior SI joint and its subsequent transmission (via iliolumbar ligaments and sacrospinalis muscles) to the lumbar discs and spine.

Integrating Viscerosomatics and Cranial Biodynamics into SOT

Utilizing the categories of analysis and treatment, DeJarnette found specific ways of incorporating treatment relating to viscerosomatic and somatovisceral reflexes, and specific organ manipulation into an indicator based system of care entitled Chiropractic Manipulative Reflex Technique (CMRT)[8].

Incorporating cranial, meningeal, and CSF analysis and treatment[9] into a systematized methodology of care was also integrated into his category system. This allowed the doctor to use pre- and post-adjustment indicators to assess when and where care is needed and whether the care rendered was successful. His cranial system of analysis involved palpation for pain, functional assessments, and palpation of cranial compliance[9]. This allowed for a generalization of patient presentations into a system of analysis and care that followed a logical and reproducible progression[7].

With persistent extremity imbalance due to trauma, asymmetrical function, and various other possibilities, DeJarnette developed a system of extremity analysis and treatment relating to the feet, ankle, knees, and hips as well as from the scapula, shoulder, and elbow. Since imbalanced function can be specific to a joint or factors, distal or proximal, the whole kinematic chain of influence is considered with SOT extremity analysis and treatment[7].

Therefore while SOT is considered a chiropractic technique, it is more an inclusive paradigm of health that attempts to integrate whole body function, nonmusculoskeletal interrelationships, and preventative care.

Sacro Occipital Technique Organization (SOTO) – USA was formed in 1999 to disseminate the teachings of DeJarnette, and bring SOT into the evidence based chiropractic community. That involves responsibly performing research to support the findings of SOT doctors, being circumspect about our claims, and modifying SOT to fit the current research. SOTO-USA has been able to teach SOT according to DeJarnette's completed works, while bringing his work into 21st century language.

SOTO-USA focuses continuing its SOT certification program, with systematized syllabi, books, lesson plans, and certified instructors, along with written and practical SOT and cranial certification examinations. One aspect that SOTO-USA believes is important for the future of SOT is researching its clinical outcomes as well as its reliability and validity. Another crucial aspect for the future of SOT is interdisciplinary care.

Certification Program

In 2014-15 SOTO-USA is presenting SOT and Cranial Certification Programs at the University of Western States, Palmer College of Chiropractic Davenport, Palmer College

> DeJarnette analysis and techniques helped establish chiropractic as more than just a spinal based therapy but a wholistic method of spinal care incorporating cranial bone, viscera, meningeal, and extremity interrelationships.

of Chiropractic Florida, Southern California University of Health Sciences, and in Northern California. Our annual SOT and Cranial Certification examinations will be given this year at the SOTO-USA Clinical Symposium May 7-10, 2015 in New Orleans.

Research

SOTO-USA has a three-pronged focus with regard to research publication: (1) regularly presenting research at chiropractic (ACC/RAC[10], WFC[11], ECU[12], IRAPS[13] COCA[14], and ACH[15]) and interdisciplinary research conferences, (2) having annual SOT Research Conferences[16] (May 7, 2015 will be the 7th) that give doctors the ability to become familiar with submitting, preparing and presenting SOT related research in a professional and collegial manner, and (3) submitting research for publication in peer review journals.

Interdisciplinary Relationships

Pioneering dental/chiropractic co-treatment of temporomandibular joint disorders (TMDs), SOTO-USA is a member of the Alliance of TMD Organizations[17], a group of predominately dental based groups totaling 14,000 members that specialize in treatment of temporomandibular joint disorders. SOTO-USA has regularly been presenting research at the Interdisciplinary World Congress on Low Back and Pelvic Girdle Pain18, at the North American Brain Injury Conferences and John Hopkin's Integration of Complementary and Alternative Medicine into Clinical Practice Conference. Multiple papers have been presented at many chiropractic research conferences sharing how SOT care can integrate with various interdisciplinary fields such as dentistry, medicine (e.g., cardiology, neurology, gastrointestinal, gynecology, etc.), osteopathy, optometry, acupuncture, ayurveda, pediatrics, and pregnancy.

At this time, SOTO-USA is not just about furthering the work of DeJarnette, but about helping chiropractic and chiropractors move forward. This is accomplished by aiding doctors in clinical practice to share their findings in the research community, as well as sharing up to date findings from the research community with doctors in practice. Developing an understanding of chiropractic's role in nonmusculoskeletal therapies and how to integrate with allied healthcare providers, will ultimately offer patients improved therapeutic low risk options. Expanding chiropractic's role in healthcare delivery through education of our allied healthcare partners will also facilitate care of patients with secondary head, neck and back pain conditions associated with oncology, menstrual syndromes, pregnancy, brain trauma, TMD, and other conditions/syndromes.

SOT is an inclusive chiropractic paradigm of care that easily integrates various adjusting methods and methodologies. DeJarnette's life's work offers chiropractic an indicator based system of analysis and treatment to expand and enhance any chiropractors current practice. Please consider becoming a member of SOTO-USA, attending an SOT certification series or our annual symposium May 7-10, 2015, or simply becoming more familiar with SOT by visiting the SOTO-USA website at www.SOTO-USA.org.



Charles L. Blum, DC is in private practice Santa Monica, California, director of research for Sacro Occipital Technique Organization – USA, adjunct research faculty at Cleveland Chiropractic College and teaches the Sacro Occipital Technique (SOT) elective class at Palmer College of Chiropractic - West and Southern California University of Health Sciences.

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Effective Scientific Posters: Quick Reference

George R. Hess
[http://www.ncsu.edu/project/posters/NewSite/documents/QuickReferenceV2.pdf]

A poster is a visual communication tool.

An effective poster will help you …
… engage colleagues in conversation.
… get your main points across to as many people as possible.

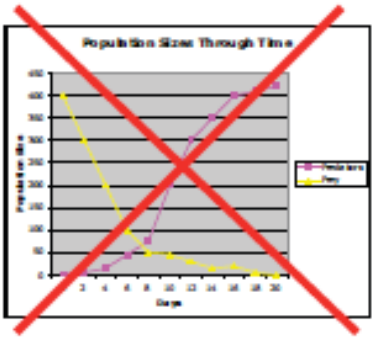
Posters serve as …
» a source of information
» a conversation starter
» a summary of your work
» an advertisement of your work



Tips for Effective Poster Presentations

- Get your message across with effective visual displays of data and small blocks of supporting text. Think of your poster as an illustrated abstract.
- Tell readers why your work matters, what you did, what you found, and what you recommend. Avoid excessive focus on methods – it's the results and implications that count!
- Overall appearance. Use a pleasing arrangement of graphics, text, and colors. Your poster should be neat and uncluttered – use white space to help organize sections. Balance the placement of text and figures.
- Organization. Use headings to help readers find what they're looking for: objective, results, conclusions, etc. A columnar format helps traffic flow in a crowded poster session.
- Minimize text – use graphics. Keep text in blocks of no more than 50-75 words – don't create large, monolithic paragraphs of prose.
- Text size. All text should be large enough to read from 1-2 meters, including the text in figures. Title should be larger, to attract attention from far away.
- Use color cautiously. Dark letters on light background are easiest to read. Stick to a theme of 2-3 colors. Avoid overly bright colors – they attract attention but wear out reader's eyes.
- Don't fight reader gravity, which pulls the eyes from top to bottom (first), and left to right.
- Include full contact information. You want to be found – the reader should not have to look up anything to find you.

Clean graphs show data clearly!



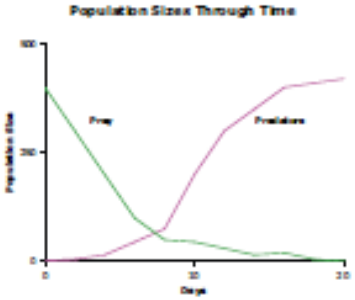
Desired message: Prey decreased as predators increased. Focus on relationships – exact values are usually not important.

Eliminate "chart junk" to keep focus on data. Grid lines, detailed ticks on axes, data markers, and grey backgrounds are not needed.

Label data directly, when possible.

Legends force reader to look back and forth to decode graph.

Message is now loud and clear!



Sample Case Report Poster Presentation

Names of Authors and Affiliations

INTRODUCTION

In the introduction section you describe the purpose of your poster presentation. Describe the importance of the topic, why the reader should bother to read this poster, and briefly summarize the poster's focus.

CASE REPORT INFORMATION

This is the place where you share the patient's gender, age, and any pertinent information. Why did they come to you for treatment, is there any unusual information about this patient, and any prior or current treatment they received?

INTERVENTION/TREATMENT

What treatment did the patient receive at your clinic? How long and how many treatments were rendered? Were any unusual tests performed and did they guide treatment?

RESULTS

What was the patient's response to your treatment? Can you objectively quantify their response with outcome assessment pre and post forms? Were there pre and post laboratory, imaging, or other type of findings?



A brief caption under a picture is helpful.

DISCUSSION

Can you give a research or "evidence" basis for why you think your treatment had the purported effect on the patient discussed in this poster?

DISCUSSION (Continued)

Why do you think that the patient would not have gotten better on their own without treatment or that some other treatment they received was not the reason for their response to care? What are the limitations to your study?

CONCLUSION

Summarize your whole poster in a sentence. How could future studies be improved and how is this one a call for further research?

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To Be Announced – 2019

Call for Scientific Submissions
Sacro Occipital Technique Organization - USA
11th SOT Research Conference

This call for scientific submissions invites the submission of original research that will promote the dissemination and discussion of new information. The categories for the 2019 conference are:

1. **Research (Integration)** integrated/integrative healthcare, integration related research topics (e.g., policy, healthcare programs, quantitative/qualitative research, etc.)

2. **Research (Basic Science)** (e.g., experimental trials, quantitative basic science research, etc.)

3. **Research (Clinical/Health Care Systems)** (e.g., experimental clinical trials, quantitative clinical research, case reports, qualitative clinical research, public health, etc.)

4. **Research (Innovative)** (e.g., experimental sacro occipital technique or cranial integrative methods assessed with reliable and valid assessment tools, etc.)

Submission Requirements

1. **Blinded submission for peer review - due electronically October 31, 2018**

a. The submission must be a completed study. Incomplete work (e.g., concept proposal, a proposed idea for a research project that has not begun yet, a project has started but no data) will not be considered. If you are uncertain or have any questions about this, please contact the Peer Review Chair prior to the submission deadline.

b. Word limit: submission may be up to approximately **2000 words** (but may be shorter). The 2000 word count allows authors to demonstrate the data/results of their findings and the scholarship quality of their completed work. One file in Word or rich text format (RTF), 12-point type font, double-spaced, maximum 2MB.

c. Do not include author names or institutional affiliations anywhere in title or text.

d. The submission must include appropriate sections such as: Title, Introduction (e.g. Background, Objectives, Purpose), Methods, Results, Discussion, Conclusion, and References sections. References are expected, but are not included in the word count.

e. Due to file size limitations, it is preferred that you submit up to 2 of any combination of the following embedded in the Word/RTF document: diagrams, figures, pictures

(JPEG, TIFF or BMP), graphs or tables (e.g. one graph and one table.) Only submit these if they are essential for the peer reviewers to evaluate the proposal. Do not submit tables, graphs or pictures as separate files. Do not submit other visual aids (no videos or power point).

f. Your accepted paper will be published in the Sacro Occipital Technique Research Conference Proceedings 2019 but you will not sign over copyright to this conference and reserve the right to publish your article at another research conference or journal.

2. **Abstract for proceedings if accepted and author information - due October 31, 2018**

a. The abstract should be a structured abstract and include appropriate sections such as: Introduction (e.g. Background, Objectives, Purpose), Methods, Results, Discussion and Conclusion sections.

b. Word limit: **200 words maximum**. No pictures, tables, figures, or references are included in the abstract.

c. Do not include author information or institutional affiliations in the abstract.

d. The abstract will be published on the *SOTO-USA.org* website and within the SOT *Compendium of Peer Reviewed Literature 2010-2015* if submission is accepted.

3. **Signatures of all authors - due postmarked or faxed by October 31, 2018**

a. Signatures of all authors shall be submitted on the authorship statement form

b. Presentations of accepted works are expected. Presenting author(s) must register and attend the conference to present. Only authors may present the study. All presenters must register for the conference. We strongly recommend that funding is secured or confirmed in advance of submission. Submission is a commitment for presenting authors of accepted submissions to attend the conference and be present at the scheduled session.

4. **For studies involving human subjects – a copy of IRB/Ethics approval, expedited, or exemption letter – due postmarked or faxed by October 31, 2018**

a. All studies involving human subjects must go through appropriate IRB/ethics review and state these processes in both the blinded submission and abstract. Case reports are exempt. Any questions should be directed to your institution's IRB or Ethics Committee.

b. For studies involving human subjects research, provide a photocopy of the approval, expedited review or exemption to the peer review chair. For studies not involving human subjects, this document is not required.

Submissions that do not meet the above requirements will be returned to the submitter.

Submission Information

All paper submissions shall be submitted electronically via email to Dr. Charles L. Blum – drcblum@aol.com. A website link relating to the SOT Research Conference and registration for this conference will be posted on the website www.soto-usa.org. The primary author is responsible for proper submission of all items. Non-authors (e.g., staff) are not allowed to submit or query about submissions.

Important Information:

1. If the submission does not meet the submission requirements (e.g., not a completed research study, missing items), the SOT Research Conference Peer Review Chair will contact the authors. If however the paper cannot be accepted for this conference then notification will be sent to the submitting author. Concept proposals and incomplete works will be returned to the authors and those authors can contact Dr. Blum at drcblum@aol.com for further information.

2. It is the responsibility of the primary author to ensure that all requirements are met. The primary author will be the contact person responsible for submission of all required materials and all correspondence. Do not send communications through a third party, staff member, or co-author.

3. If the Peer Review Board confirms that there is an inappropriate submission, it will be disqualified. Examples of inappropriate submissions include but are not limited to: one that has been presented before at this conference, incomplete submissions, concept proposals, duplicate submissions, no human subjects/ethics review when one was necessary (includes expedited review), non-authors listed as authors, plagiarized work, etc.

4. Only electronic submissions will be considered. No faxed or mailed submissions will be considered.

5. Presentations of accepted works are expected. Authors must register and attend the conference to present. An author who does not register and present an accepted work will be disqualified from submitting/presenting for the following 2 years. It is the author's responsibility to find funding to register and attend the conference. We strongly recommend that funding is secured or confirmed in advance of submission. Presenter information and registration for the conference is required or the invitation to present will be revoked. Only authors may present their work at the conference.

6. Due to time and space limitations, and ability to cover poster presentations, there may be a limitation for the number of poster presentations per primary author/presenter.

All submissions will be evaluated for completeness, strength of contribution to the profession and relevance to the SOT research conference. Submissions will be reviewed by the peer review committee based upon the following criteria:

1. Practical significance
2. Originality
3. Theoretical/conceptual framework
4. Quality of experimental or descriptive design
5. Discussion/findings/results - clarity of presentation of findings
6. Conclusions, interpretation of results, implications for chiropractic education, theory, research, or practice
7. Citation of appropriate literature
8. Applicability for: the chiropractic profession, classroom use, further research, current/critical concerns, etc.
9. Completed study
10. Overall rating of the paper.

Notification: Primary/corresponding authors will be notified of peer review results by November 2018. If accepted, an acceptance communication and other information of the presenting author must be returned to the peer review committee. For submissions that are accepted, an author is required to register and present the work at the conference. If you have any questions or would like to request forms please contact the Peer Review Chair: Dr. Charles L. Blum at drcblum@aol.com

OTHER INFORMATION:

If accepted, the **200 word** maximum *abstract* will be printed on the SOTO-USA.org website and within the *Sacro Occipital Technique Compendium 2015-2020. The paper will be published within the proceedings of the* SOT Research Conference 2019. This will still allow you to publish your completed paper in any journal you wish.

Email a pdf or jpeg scan to drcblum@aol.com by **October 31, 2018** to:

SOT Peer Review Committee 2019
Attn: Charles L. Blum, DC Peer Review Chair
Email: drcblum@aol.com
Multiple authors involved with one submission may send their forms in separately

The following two submission forms can all be found on the SOTO-USA website by going to www.SOTO-USA.org and clicking on SOT Research Conference Proceedings Submission box.

Authorship Signatures Form

Sacro Occipital Technique Research Conference XI

2019

INSTRUCTIONS: This form must be completed, signed, and submitted by **October 31, 2018**
Submission title (print):

_____

By signing this form:
1. I/We confirm that each of us qualify as an author of this submission, am/are responsible for all of its content, and give permission for: 1) its presentation if accepted to the SOT 2013 research conference, 2) the publication of the *abstract on the SOTO-USA.org* website and within the SOT *Compendium of Peer Reviewed Literature 2010-2015*, 3) your accepted paper to be published in the Sacro Occipital Technique Research Conference Proceedings 2019 but you will not sign over copyright to this conference and will retain the right to publish your article at another research conference or journal, and 4) am/are capable of presenting/defending all of its content (for information about authorship visit www.icmje.org)

2. If accepted, I/we understand that registration and presentation of this work at the conference is required and that funding should be secured or confirmed in advance of submission. Submission is a commitment for presenting. Authors of accepted submissions must attend the conference and be present at the scheduled session. I/We understand that withdrawing after acceptance may prevent us from submitting to future SOT Research Conferences.

For studies involving human subjects – a copy of IRB/Ethics approval, expedited, or exemption letter – due postmarked or send to drcblum@aol.com by October 31, 2018.
Evidence of IRB or ethics review approval/exemption is required for all research studies involving human subjects. It is recognized that projects that use human subjects are expected to follow appropriate human subjects review procedures depending on the type and nature of the research (more information about human subjects review/ethics review/IRB can be found at http://cme.cancer.gov/c01 and http://ohrp.osophs.dhhs.gov/irb/irb_guidebook.htm).

Primary Author Print name Email address Signature Date
Other Authors Print name Email address Signature Date

_____

_____

_____

If more authors, please sign and date on an additional form. If multiple authors, each may send in their completed forms separately (need not be on the same form).

Patient Case Report Consent for Publication and Presentation

Title of case study/series: _____

Author(s) names:_____

As the patient in this case study/series, I hereby give my consent for clinical information relating to my case to be reported at a scientific conference, in a conference proceedings, and/or published in a scientific journal.

I understand that my name, initials, and/or any protected health information such as my identification number, billing information, address, etc. will not be published and that efforts will be made to conceal my identity, but that anonymity cannot be guaranteed.

I understand that the material may be published in a journal, a website of a journal, and/or in products derived from the publication. As a result, I understand that the material may be seen by the general public.

_____ _____

Name of patient (print) Date

_____

Signature of patient (or signature of the person giving consent on behalf of the patient if patient is a minor or deceased)

If you are not the patient, what is your relationship to him or her? (The person giving consent should be a substitute decision maker or legal guardian or should hold power of attorney for the patient.)

_____

Why is the patient not able to give consent? (e.g., is the patient a minor, incapacitated, or deceased?)

_____

If images of the patient's face or distinctive body markings are to be published, the following section must also be signed in addition to the section above:

As the patient stated above, I give permission for images of my face or distinctive body markings to be published and recognize that I might therefore be identifiable even though my name and initials will not be published.

_____ _____

Signature of patient (or signature of the person giving consent on behalf of the patient) Date

Please keep a copy of this completed form for your records.

Championing Chiropractic Education and Research



Commitment to Research

NCMIC and the NCMIC Foundation continually invest in the chiropractic profession's growth and advancement.

Since 1995, more than $13 million has been contributed to chiropractic research, education and foundations for such important projects as the International Bone and Joint Decade.*

For more information and highlights of past NCMIC foundation-funded projects, go to www.ncmicfoundation.org.

NCMIC Foundation

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*"A Best Evidence Synthesis on Neck Pain: Findings from the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and its Associated Disorders"