



Introduction to Chiropractic Manipulative Reflex Technique (CMRT) (Chapter 1)

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Chapter 1 Introduction

Originally called '*Bloodless Surgery*', *Chiropractic Manipulative Reflex Technique* (CMRT) encompasses the relationship between somatovisceral and viscerosomatic reflexes and therefore between the somatic and autonomic nervous systems. R. J. Last in his book, *Anatomy: Regional and Applied* points out:

'There is only one nervous system. It supplies the body wall and limbs (somatic) and viscera (autonomic). Its plan is simple. It consists of afferent (sensory) and efferent (motor) pathways, with association and commissural pathways to connect and coordinate the two. There is no more than this, in spite of the many pages devoted to its study.' (1)

Bloodless surgery was historically used in chiropractic as a term describing soft tissue treatment affecting an organ and its related vertebral relationship or viscerosomatic and somatovisceral reflexes. (2, 3) Bloodless surgery was also used to describe methods of manipulating joints and soft tissue without relating to the viscera. (4)

James F McGinnis was a chiropractor who relocated to California in the early 1920's, where he earned a naturopathic doctorate. In the 1930's, he became one of the best known of several chiropractic bloodless surgeons and traveled around the nation teaching his methods. (2) Around this time Major Bertrand DeJarnette DO, DC, developer of *Sacro Occipital Technique* (SOT), was also practicing and teaching extensive methods of bloodless surgery.

DeJarnette published a comprehensive book on the topic entitled, *Technic and Practice of Bloodless Surgery* in 1939, which remains the most complete discussion on the topic to date. (3) DeJarnette continued to teach and practice bloodless surgery through the 1940's and began its modification to use more reflex applications and referred pain indicators as a method of affecting organ symptomatology. In the 1950s, he furthered his investigations into reflexes and their affect

on the viscera and related vertebra. By the early 1960's, DeJarnette modified the nature of SOT's method of bloodless surgery from its 1939 procedures, which might have taken the doctor 2-4 hours of preparation and treatment, to procedures that could be practiced in a span of 15 minutes. (5, 6) For multiple reasons he decided to change the name of his method of affecting referred pain pathways, viscerosomatic/somatovisceral reflexes, and direct organ manipulation, from *Bloodless Surgery* to *Chiropractic Manipulative Reflex Technique* (CMRT).

Essentially evidence-based practice (EBP) is the conscientious and judicious use of current best evidence in conjunction with clinical expertise and patient values to help guide health care decisions.

CMRT is used as a method of treating the spine or vertebral visceral syndromes associated with viscerosomatic or somatovisceral reflexes, (7-11) dysafferentation at the spinal joint complex (12), visceral mimicry type somatic relationships (13), and type 'O' organic disorders. (14) Treatment involves location and analysis of an affected vertebra in a reflex arc by way of occipital fiber muscular palpation, similar to trigger point analysis or Dvorak and Dvorak's spondylogenic reflex syndromes. (15) Once specific vertebra reflex arcs are located, corroborated with referred pain pathways and clinical symptomatology, then the specific vertebra to be treated is isolated by pain provocation, muscle tension, and vasomotor symptomatology. If vertebral dysfunction is chronic or unresponsive to chiropractic spinal manipulation, then a viscerosomatic or somatovisceral component is often suspected. (16) Treatment of the viscerosomatic or somatovisceral component is performed using soft tissue manipulation, myofascial release techniques and reflex balancing methods. (6)

To summarize, bloodless surgery has been used and taught by SOT chiropractors since 1939 and was practiced extensively in the 1930's and 40's. Since 1960 it has been called CMRT, and focuses on the vertebra and viscerosomatic/somatovisceral reflex relationships, organ position, blood and lymphatic circulation, and other nonmusculoskeletal supportive protocols. CMRT is listed as a chiropractic technique throughout the chiropractic literature. (17-21) SOT clinicians have been using these methods of CMRT for decades and are publishing their methods in the literature as a means to develop an evidence base for this method of care.

CMRT, just like all chiropractic and manual healthcare warrants further clinical study. Until chiropractic has the sufficient funds and tools to perform all the necessary research to help substantiate everything done in clinical practice, dismissing or impugning aspects of chiropractic that support its position as being a '*complementary or alternative*' healthcare intervention need to be avoided. Biological plausibility, (22) coupled with clinical experience and expertise, along with positive patient outcomes from care has supported SOT chiropractors' utilization of CMRT for adults and children (23-25) over the years. During the past two decade's, doctors using CMRT began sharing their clinical experience in the form of case reports, (26) to help guide future research investigation.

When there has been only 1-2% of the research performed on most innovative forms of manual medicine, even those practiced for decades, care must be taken to avoid '*throwing out the baby out with the bathwater*' when attempting to strictly define what is '*evidenced based*' and

what is not. Essentially evidence-based practice (EBP) is the conscientious and judicious use of current best evidence in conjunction with clinical expertise and patient values to help guide health care decisions. (27-32) Ideally this will incorporate low risk and biological plausible conservative measures balanced with a doctor's clinical experiences as research is gathered to substantiate or modify a method of care, such as CMRT.

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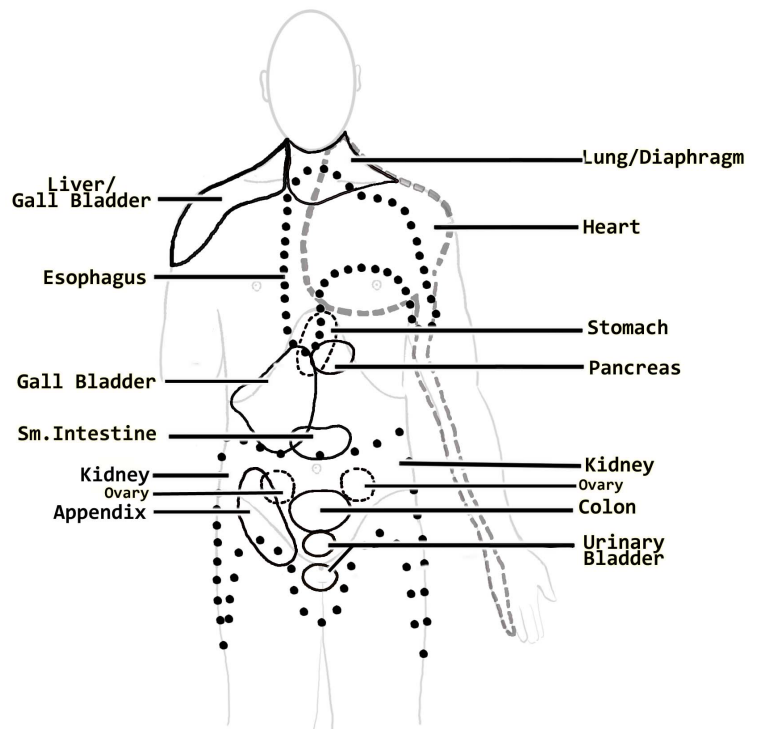
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Chapter 2

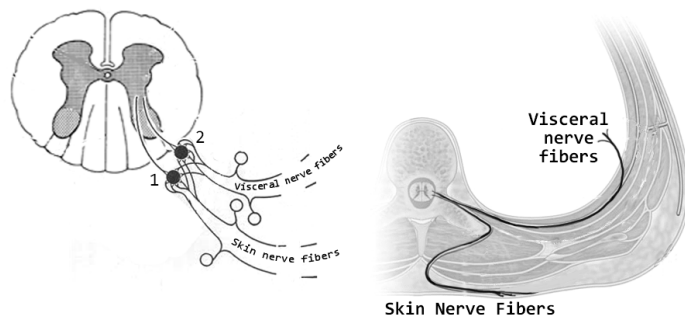
Viscerosomatic, Somatovisceral, and Non-musculoskeletal Relationships and Chiropractic

Within chiropractic research circles there has been significant skepticism concerning chiropractic manipulative care for nonmusculoskeletal conditions. (1) However, a 1998-1999 practice-based survey spanning over twenty years of data provides valuable insight into the potential value of learning these techniques. This study including, 161 chiropractors and 7,651 of their patients, representing varied geographic locations such as the United States, Canada, and Australia, found that nonmusculoskeletal complaints accounted for 10.3% of patient's chief complaints. (2) It is estimated that patients harboring various categories of somatic-related visceral disease is likely greater than 10%, (3) and two studies found a minority of patients with self-reported nonmusculoskeletal symptoms noticed definite improvement following chiropractic care. (4, 5)



Chiropractic treatment of patients with organ related symptomatology is not clearly understood. Theories suggest conditions might be helped due to somatovisceral – viscerosomatic autonomic balancing, (6, 7) decreasing nociceptive activity relating to referred pain reflex patterns, [8-10] balancing a somatically induced visceral mimicry syndrome, (3, 11) or an effect similar to ameliorating aberrant reflexes associated with 'phantom organ pain'. (12, 13, 14)

Rome and Waterhouse (15 - 27) produced an extensive review for the chiropractic profession on the neurodynamics of vertebrogenic somatosensory activation and autonomic reflexes. These articles go into great detail about the biological plausibility of chiropractic's effect on nonmusculoskeletal patient presentations as well as the emerging supporting evidence. Since this evidence is complex and developing, some researchers are suggesting that we may need to also consider 'alternative mechanisms such as somato-humoural pathways'. (29)



There is a faction of the chiropractic community that strongly opposes chiropractic involvement in nonmusculoskeletal care; (30) conversely there are college instructors that have openness to chiropractic treatment of some nonmusculoskeletal disorders. (31) It is interesting to note that not that long ago sentiment regarding a chiropractor's scope seemed to be more holistic. This is based on a survey done over twenty years ago with doctors in clinical practice finding 'more than half of the respondents favored a role for spinal adjustment in the management of patients with visceral conditions'. (32)

Masarsky and Todres-Masarsky note that *'The somatovisceral aspects of the VSC [vertebral subluxation complex] have too often and for too long been given short shrift within the profession, while attention has been lavished on the musculoskeletal aspects. This reflects an artificial division between the neurology of the musculoskeletal system and the neurology of the viscera. Nature does not recognize this sharp division. Instead, the natural world has produced a nervous system that is a wonder of integration. Under the influence of this master integration system, smooth and striated muscle, activity and stillness, thought and emotion all contribute to the texture of life in a whole being.'* (33)

During the 1960s and 1970s, a constellation of pressures moved much of the profession away from discussion of chiropractic's relationship to visceral disorders. Yet, not all of these pressures came from outside the profession. This pressure from our own chiropractic colleagues had much to do with the push for acceptance by government agencies, interdisciplinary academia, and insurance companies.

For example, Herbert Vear (Dean Emeritus at the *Canadian Memorial Chiropractic College*) was one of the chiropractic participants at the February 1975 *Institute of Neurological and Communicative Disorders and Stroke (NINCDS)* Interdisciplinary Conference on the research status of spinal manipulative therapy, held on the *National Institute of Health* campus in Bethesda, Maryland. In an interview 22 years later, Vear clarified the reason why chiropractic may have entertained moving away from its involvement in nonmusculoskeletal care:

'One of the first things to change was a reduced emphasis on visceral clinical problems and an increased focus on pain syndromes, particularly of the lumbo-pelvic area. Literally, we were "throwing out the baby with the bathwater" in our quest for research grants, for which purpose pain syndromes are easier to study and document.' (34)

Later, in the 1990's, the *Association of Chiropractic Colleges (ACC)* appeared to attempt to reestablish a relationship between chiropractic and visceral clinical presentations with a statement still found on their website as of 2023:

'Chiropractic is concerned with the preservation and restoration of health, and focuses particular attention on the subluxation. A subluxation is 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.' (35)

Visceral or Somatic Referred Pain

Referred pain is a term used for pain localized not in the site of its origin but in areas that may be adjacent to or at a distance from such a site, generally having similar embryological origin. (36)

According to Head, at the level of the spinal cord there is a convergence of impulses from visceral organs and from more superficial structures. Increased visceral irritation causes a diminished threshold for the adjacent somatic impulses, which are constantly entering the same segment of the cord. This is how cutaneous hyperalgesia and referred pain are produced in the corresponding segments. (37)

Referred pain is not a focused type of pain, as in the case of an inflamed appendix. Referred pain can be related to sympathetic visceral pain fibers passing into the sympathetic chain and then into the spinal cord at T10. On the other hand, pain impulses, can also originate from the parietal peritoneum where the inflamed appendix touches the abdominal wall and have impulses passing through the spinal nerves into the spinal cord at L1.

Grimm suggested that an interaction between cutaneous and vasomotor sympathetic neurons in response to acute musculoskeletal injury may affect the autonomic nervous system, “reflected as increased afferent input from sensitized nociceptors and other sensory neurons”, resulting in alterations in autonomic function. (38)

Visceral Mimicry Syndromes

In 1996, Nansel and Szlazak (3) challenged chiropractic’s position regarding somatovisceral segmental dysfunction and its affect on organ pathology. They determined that “*somatic dysfunction is notorious in its ability to create overt signs and symptoms that can mimic, or simulate (rather than cause), internal organ disease.*” “*The somatically induced facilitation of central neurons has also been shown to create situations in which normally innocuous visceral afferent signals converging on these same neuronal pools may be perceived as highly unpleasant, thereby further increasing the likelihood of a visceral misdiagnosis.*” (3)

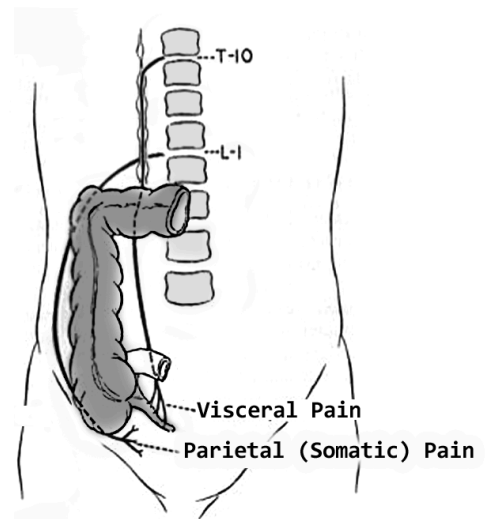
“*Complicating the picture, as the concept of somatic vs. visceral afferent implies, it can also be the case that nociceptive input from dysfunctional somatic structures may act to exacerbate the symptoms of pre-existing visceral disease.*” This could mean that a vertebral subluxation might increase the degree of referred pain elicited by a diseased organ. (3) Seaman and Winterstein also noted that vertebral joint complex dysfunction should be included in the differential diagnosis of pain and visceral symptoms because joint complex dysfunction can often generate symptoms which are similar to those produced by true visceral disease. (11)

A concern for the practitioner is that numerous visceral diseases can masquerade as musculoskeletal pain that can easily be misdiagnosed and mistreated. (39) On the other hand “... *doctors must take care not to confuse somatic problems with true visceral disease because mistakes can be catastrophic for the patient. Adding to this diagnostic conundrum is the fact that musculoskeletal problems can often masquerade as visceral disease.*” (11) Dyck and Embree described that a relationship can exist between spinal manipulation and underlying pathologic conditions; they state that “*practitioners should be alerted to the possibility that manipulation of the spine may mask the pain of an ongoing pathology.*” (40)

What does a chiropractor do with this information?

Dyck and Embree concluded by noting “*it is important to recognize that the reduction of symptoms following manipulative procedure does not necessarily imply the removal of the cause of those symptoms...care must be taken by the practitioner to realize he or she may be masking the symptoms of ongoing pathology.*” (40) Therefore, they suggest it is possible for spinal adjustments to reduce the presentation of referred pain patterns related to visceral pathologic conditions. This is something the chiropractor has to take into account when assessing a case and its progression.

It is important to point out that there is chiropractic clinical literature in which physiological outcomes were reported from chiropractic interventions, not just merely symptoms. For example, Browning reported that correcting lower sacral nerve root irritation improved bowel, bladder, and sexual dysfunction. (40) Bakris and others found upper cervical chiropractic adjustments had



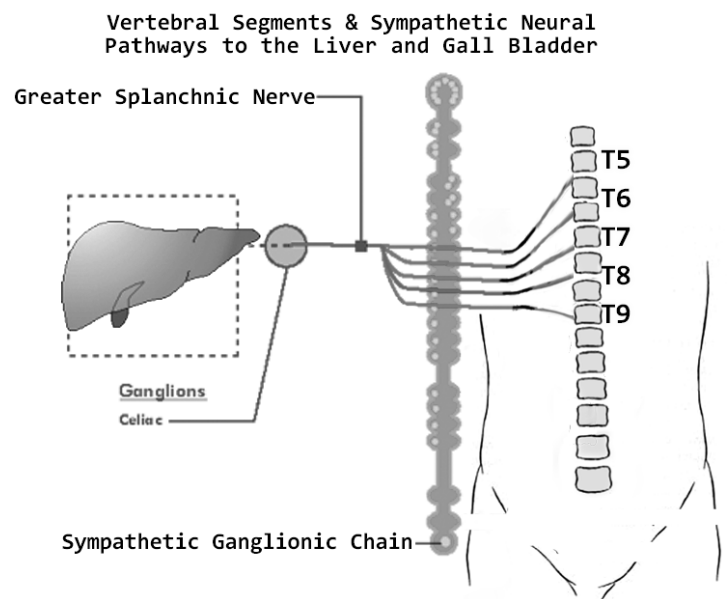
a relationship with the reduction of arterial hypertension. (42) Studies done by Masarsky and Weber (43) as well as Kessinger (44) have demonstrated improvement of forced vital capacity and forced expiratory volume in one second under chiropractic care. These step beyond just subjective reports by patients and appear to demonstrate functional physiological changes.

Persistent Vertebral Subluxations

DeJarnette was concerned with the reoccurring vertebral subluxation that would not resolve with treatment but would continually return. He had various theories such as myofascial postural disturbances, extremity-related dysfunction, and also reflex neural input from the viscera afferents. While he postulated that there was a somatovisceral relationship between the vertebra and viscera, generally the determining factor for treating the organ reflex was recurrent vertebral subluxation and not visceral dysfunction.

DeJarnette's premise of treatment beginning with the occipital fiber neutralization, vertebral adjustment and reflex manipulations was that there was imbalance between the organ, the spine, and within the autonomic nervous system. Spinal postural accommodations were mediated through the visual and vestibular righting reflexes (45) and reflected in related specific suboccipital muscle fiber contracture (occipital fibers).

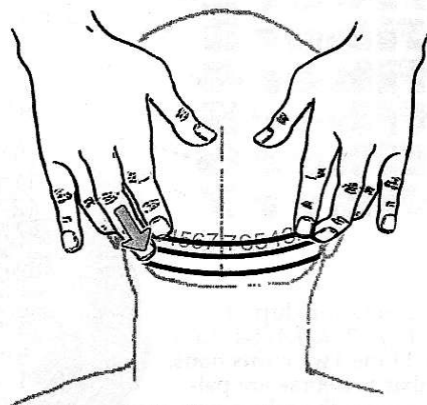
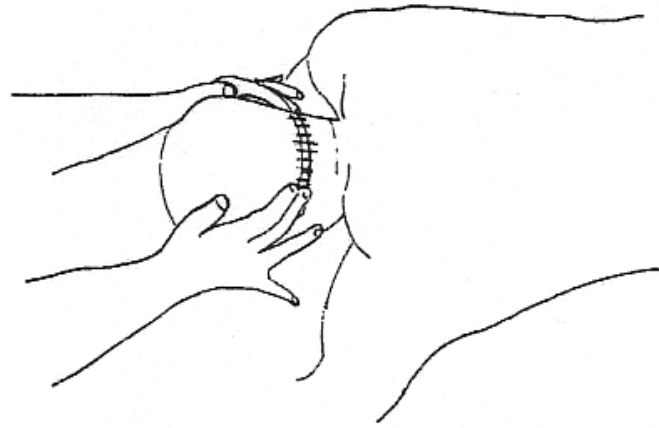
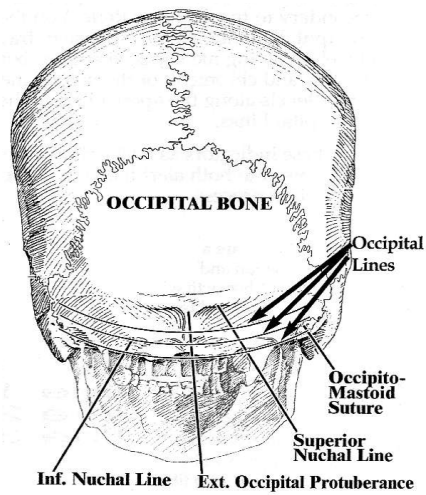
DeJarnette further theorized that the dysfunction within the sympathetic and parasympathetic nervous system could lead to aberrant reflex patterns. These patterns would affect normal functioning of the musculature and related tissue at the vertebra level where the visceral afferents would converge with somatic afferents.



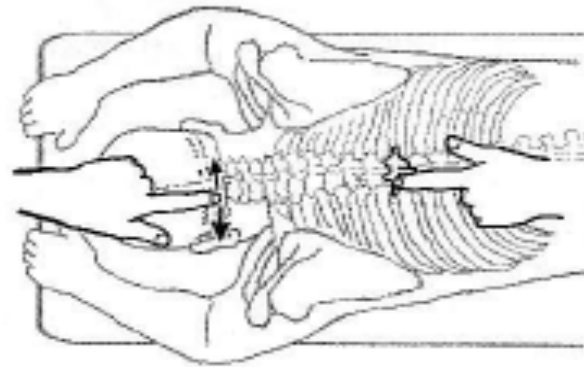
Chiropractic Manipulative Reflex Technique (CMRT): Current Understandings

In cases where referred pain can be resolved with CMRT procedures or SOT chiropractic treatment, caution must be exercised to make sure that any related organ pathology has actually improved. It is possible that raising the threshold of somatic afferents (by reducing muscle tension and joint pain) we might only be limiting presentation of any viscally related referred pain.

Occipital Line 2 Fiber	1	2	3	4	5	6	7
Thoracic Vertebra	1(Lt),2,10	3,11,12	4(Rt),5(Lt)	6	7	8	9
Lumbar Vertebra			1	2	3	4	5
Sacral Segments			1	2		4	



The middle finger slides down (caudally) to palpate Line Two.



Traditionally CMRT was a procedure only used with category one patients who had active occipital fiber and vertebral indicator involvement. However, it can also be used as follows:

1. When an occipital fiber and vertebra in its reflex arc is persistent for at least 2-3 office visits.
2. Non-acute category two patients transitioning towards stability or category two patients with joint hypermobility syndromes, not capable of transitioning to category one treatment.
3. Patients presenting with a visceral primary condition which is determined by patient history, allied healthcare assessments, laboratory findings, and associated referred pain patterns. It is important that these conditions are monitored closely.

For chiropractors, utilizing CMRT assessment and treatment methodologies can increase their scope of practice but at the same time it also increases their responsibilities. CMRT assessment and treatment can vary widely. On one end of the spectrum, CMRT can be used for patients that have recurrent spinal imbalances that may have a viscerosomatic reflex or referred pain pattern, but no detectable visceral or organ disorder or pathology. At the other end of the spectrum, CMRT can be applicable for patients with visceral or organ pathology; in these instances, it is important to co-treat with our allied allopathic colleagues.

Since chiropractors are typically not prescribing medications, when treating patients that have discernable organ imbalance or dysfunction with CMRT procedures caution is required when it comes to medications. However, in many cases, a result might indicate the patient could potentially come off a medication, though that is a decision for the allopathic physician. Consider the following:

1. What if a patient is taking blood pressure medication and after CMRT procedures are used that have a connection to their cardiovascular system, there is a lowering of their blood pressure? (46, 47)
2. What if a patient is taking medication to work with sugar metabolism and T6 CMRT procedures help balance their glucose management? (48, 49)
3. What if a patient is taking medication for gastroesophageal reflux and T5 CMRT procedures allow the patient to have normal gastric acidity? (50, 51)

How would a chiropractor discuss these situations with an allopath and have the medication appropriately modified? How can a team of like-minded healthcare practitioners collaborate so that patients are best protected?

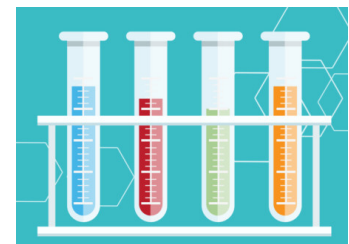
One way to protect your patients and yourself so that you are offering the safest and most optimal care, is to reach out to allopaths in your area ahead of time. You may find it necessary to reach out to an internal medicine allopath that is familiar with various types of presentations or you may choose an allopath that specializes in cardiology, pulmonology, gastrointestinal, nephrology, urology, endocrinology, gynecology, etc.

Sometimes a patient is already co-treating with an allopath and it would be prudent and efficacious to reach out to this allied healthcare practitioner with a phone call, letter, or email. Be prepared to share what your care might involve and any potential concerns or updates in regards to the patient.

Responsibilities and Cautions

In summary when treating patients with CMRT we need to consider the following:

1. Be aware that somatic dysfunction is notorious in its ability to create overt signs and symptoms that can mimic, or simulate (rather than cause), internal organ disease.(3)
2. A concern for the practitioner is that numerous visceral diseases can masquerade as musculoskeletal pain that can easily be misdiagnosed and mistreated. (39)
3. Be cognizant not to over interpret referred pain from a diseased viscera since sometimes a vertebral subluxation might lower the pain threshold and increase the degree of viscerosomatic referred pain. (3)
4. Take care not to confuse somatic problems with true visceral disease because mistakes can be catastrophic for the patient. Be aware that CMRT care will sometimes warrant allopathic co-management. (11)
5. Be aware of the possibility that manipulation of the spine may mask the pain of an ongoing pathology since this may raise the threshold for a viscerosomatic referred pain to present. (40)
6. Ideally based on clinical findings, history, and laboratory testing, in addition to CMRT, patients may need dietary advice, lifestyle modification, and nutritional support.



We are entering an age where chiropractic can have an important place within an interdisciplinary team, with allopaths and other allied healthcare practitioners. (52 - 55) Therefore when performing CMRT it will be important to reach out to a patient's allopath, make sure you have facilities for blood, urine, and other laboratory testing, and have medical and imaging referrals ahead of time so you are prepared when necessary.

Conclusion

Chiropractic care of patients with nonmusculoskeletal care is a controversial topic. There are challenges in research to ascertain the best way to study this phenomenon that rules out

confounders such as placebo or ideomotor effect, regression to the mean, coincidental or casual patient interpretations to treatment response and many others. One interesting consideration is the study of patients with self-reported positive, unexpected nonmusculoskeletal outcomes to chiropractic care, or those patients who are self-referring for chiropractic care for wellness or nonmusculoskeletal care. (56)

Further research could start with a Delphi study, developing a consensus process for a best practice document, a survey of doctors treating patients with nonmusculoskeletal presentations, and the development of a prediction instrument to determine if a subset of nonmusculoskeletal patients responding to chiropractic care might be determined. Clearly more research is needed so that patients treated with CMRT have the best possible outcomes.

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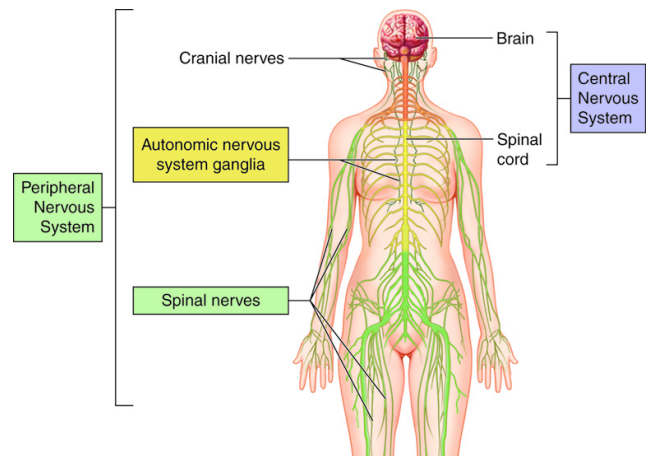
Chapter 3

The Relationship Between the Somatic and Autonomic Nervous Systems

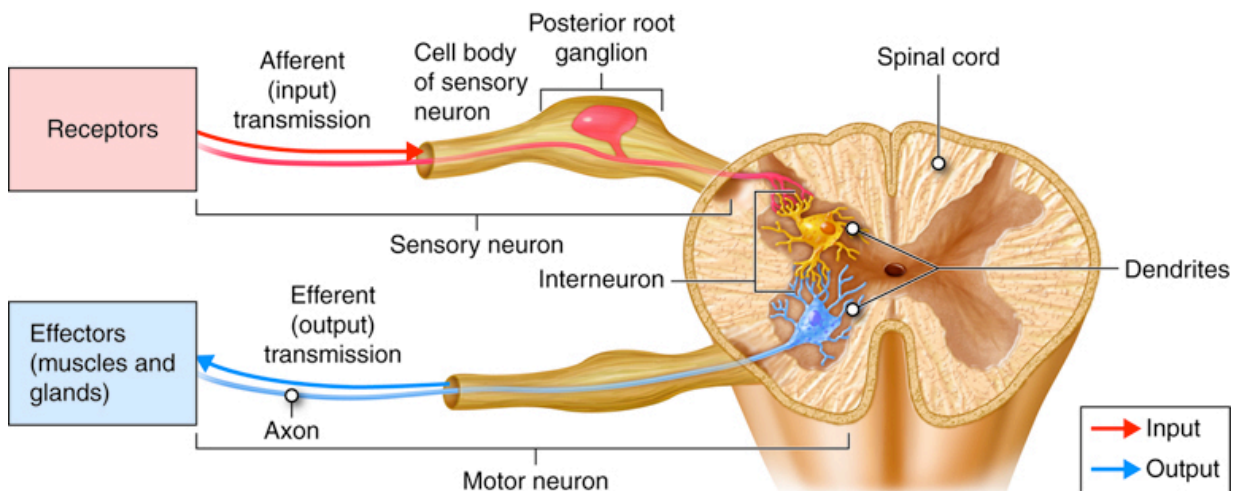
To better understand some of what we are attempting to affect with Chiropractic Manipulative Reflex Technique (CMRT), it is helpful to have a brief overview of the autonomic nervous system.

The autonomic nervous system is considered to be a component of the peripheral nervous system that regulates involuntary physiologic processes such as heart rate, blood pressure, respiration, digestion, and endocrine organ function. It contains three anatomically distinct divisions: sympathetic, parasympathetic, and enteric, though there is some thought that the enteric nervous system may represent its own distinct system.

The sympathetic nervous system is connected to the thoracolumbar part of the spinal cord and the parasympathetic system is connected to certain cranial (III, VII, IX, and X) and sacral/nervi erigentes (S2-4) nerves. In most of the viscera, both parts of the autonomic system give branches of supply and their effects, in such cases, are antagonistic.



This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States. 39. Nervous System Levels of Organization. [https://pressbooks.cconline.org/bio106/chapter/nervous-system-levels-of-organization/]



Neurons can be classified according to their function. This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States. [https://pressbooks.cconline.org/bio106/chapter/nervous-system-levels-of-organization/]

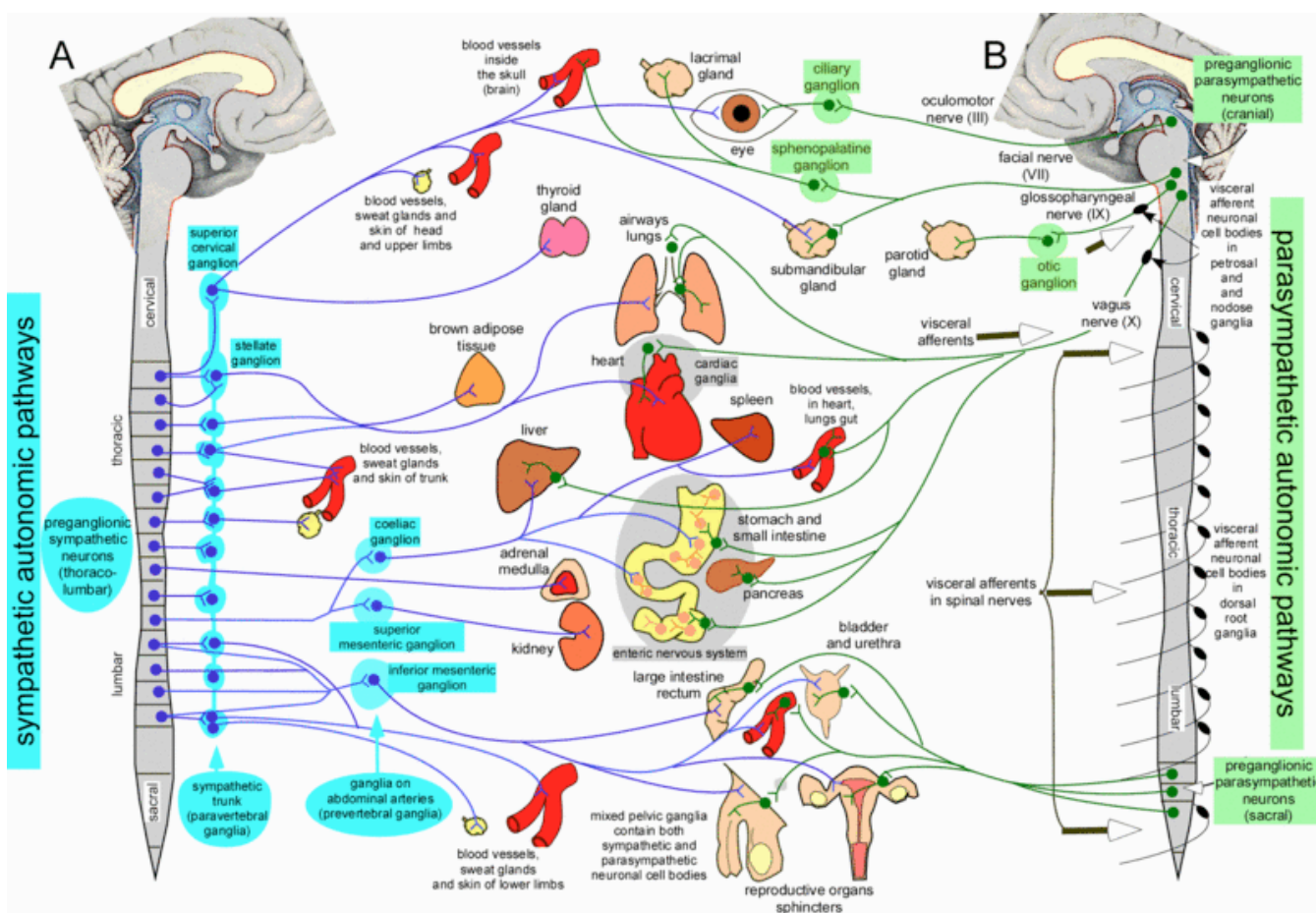
In both systems the motor cells are outside the central nervous system. They are in ganglia associated with the sympathetic trunks in the sympathetic system, while in the parasympathetic system the motor cell-body is usually more peripheral and located near or in the wall of the organ itself. In both systems the fiber of the connector cell passes from the central nervous system to a motor cell body in a ganglion; this is the preganglionic fiber and it is a medullated or white fiber. The fiber of the motor cell leaves the ganglion (postganglionic fiber) as a non-medullated or grey fiber.

The efferent (motor) side of both sympathetic and parasympathetic systems consists of preganglionic (white) fibers of connector cells. The cell bodies of sympathetic preganglionic

neurons are located in the visceral efferent (lateral gray) column of the spinal cord. The cell bodies of parasympathetic preganglionic neurons are located in the motor nuclei of the cranial nerves. (see image next page)

There are three basic groups of ganglia in the autonomic system.

The first group is called the sympathetic trunk and is a series of ganglia that lie in a horizontal row on either side of the vertebral column close to the bodies of the vertebrae. These ganglia are connected to each other by short fibers and look like beads on a chain, with one chain on each side of the spinal column. The sympathetic trunk usually extends downward through the neck, thorax, and abdomen to the coccyx. Generally, there are 22 ganglia in each chain: three cervical, eleven thoracic, four lumbar and four sacral. While the sympathetic ganglia extends the length of the vertebral column they receive preganglionic fibers only from the thoracic and lumbar regions of the spinal cord.



ANS Pathways. This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States. [https://pressbooks.cconline.org/bio106/chapter/nervous-system-levels-of-organization/]

The preganglionic fibers of the sympathetic trunk leave the spinal cord as part of the spinal nerve. Then they branch away from the somatic fibers of the nerve and enter the nearest sympathetic trunk ganglia. The (white) preganglionic axon connects to the spinal cord with the ganglia of the sympathetic trunk. Some synapse in the first ganglia as they enter and others pass through the ganglion to run upwards or downwards and synapse in ganglia above and below. This is how branching and divergent fibers reach the cranium and sacral regions. Some postganglionic fibers leaving the sympathetic trunk ganglia pass directly to the viscera of the head, neck, chest and abdomen.

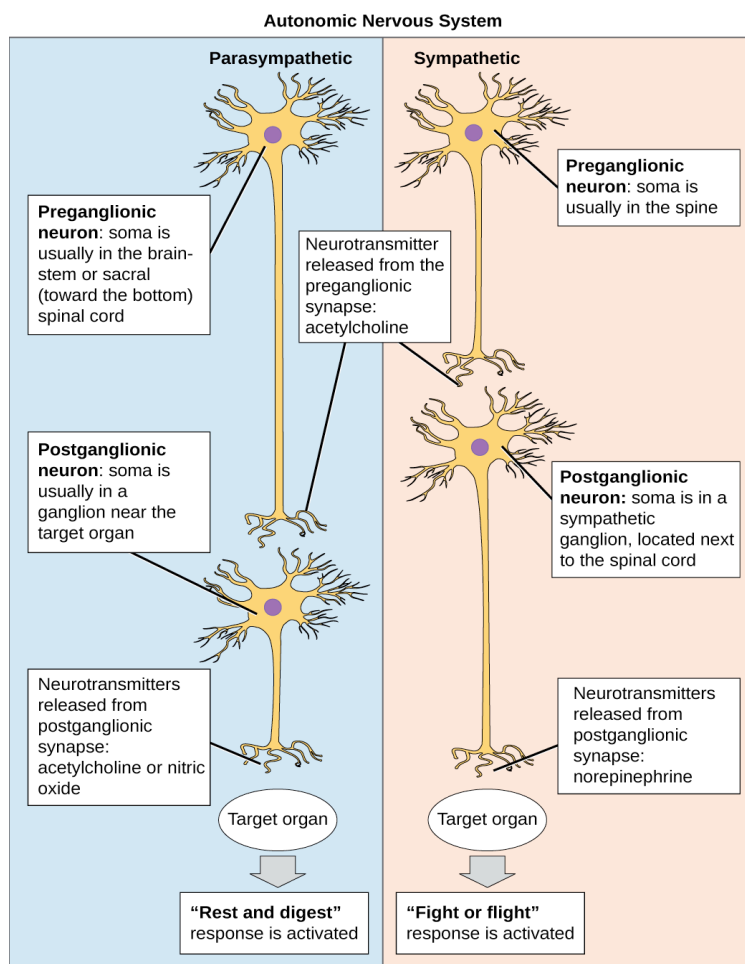
Those fibers that do not go to the viscera will rejoin the spinal nerves and pass to peripheral visceral organs such as sweat glands and the smooth muscles in the blood vessels. The portions of the axons of the postganglionic neurons that run from the ganglia of the sympathetic trunk to the spinal nerves are the grey.

The second type of ganglia is the prevertebral ganglion. They lie anterior to the spinal column and close to the large abdominal arteries from which their names are derived. The celiac ganglion is located below the diaphragm, the superior mesenteric ganglion is in the upper abdomen and the inferior mesenteric ganglion is located in the middle of the abdomen. Like the sympathetic ganglion the prevertebral ganglia receive their preganglionic (white) fibers from the thoracic and lumbar regions of the spinal cord. The preganglionic fibers leave the spinal cord along with a spinal nerve, branch into the sympathetic trunk (after branching into a white ramus) and leave the trunk to enter a prevertebral ganglion. Only in the prevertebral ganglion do they synapse with a postganglionic cell. From there the postganglionic fibers leave the prevertebral ganglia following the course of various arteries to the viscera in the abdomen and pelvis.

The third kind of autonomic ganglion is called a terminal ganglion and is located at the end of the visceral efferent pathway. Terminal ganglia can be located close to the viscera or even in the walls of the viscera themselves. Terminal ganglia receive preganglionic (white) fibers from the cranial and sacral region of the spinal cord and do not pass through the sympathetic ganglia. These are the pathways of the parasympathetic nerve fibers.

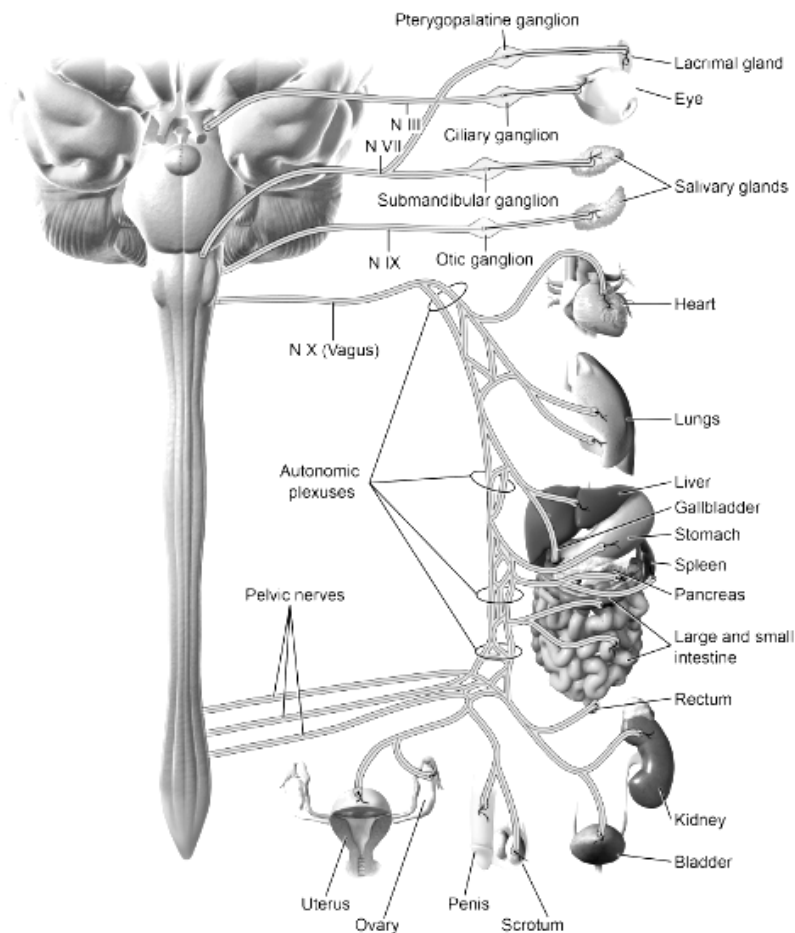
In general the sympathetic nervous system tends to have a widespread (divergent) effect on the viscera since a nerve impulse in a single preganglionic neuron may spread up and down the sympathetic ganglion before traveling to various organs. On the other hand the parasympathetic nerve tends to directly reach the viscera in question (convergent) and its action tends to be more specific.

Of importance, Kiana, et al. note that “chiropractic care and spinal manipulation regulate the autonomic nervous system at peripheral level and its projections to the central nervous system. In particular, they may activate the parasympathetic system to counterbalance the activity of the sympathetic system.” Kiana. et al., also recommend application of vagus stimulation techniques such as the ones shared in this text.



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Parasympathetic Nervous System Innervations



Visceral Disorder	Vertebral Curvatures at Same Sympathetic Segment of Visceral Dysfunction	Sympathetic Nervous System Connection Between Vertebrae and Dysfunctional Organs
Diseased Thymus #2	C7, T1 #1 T-2-3-4 #1	Inferior Cervical Sympathetic Ganglia
Adhered Pleurae #21	Upper Thoracics #19 Lower Thoracics #2	Upper Thoracic Ganglia Lower Thoracic Ganglia
Lung Diseases #26	Upper Thoracics #26	Upper Thoracic Ganglia
Heart & Pericardium Diseases #20	T1-2-3-4-5 #18 C7, T1 #2	Upper Thoracic Ganglia Inferior Cervical Ganglia
Stomach Diseases #9	T5-6-7-8-9 #8 An Adjacent Segment #1	Greater Splanchnic From Thoracics 5-9
Liver Diseases #13	T5-6-7-8-9 #12 An Adjacent Segment #1	Greater Splanchnic From Thoracics 5-9
Gall Bladder Disease #5	T5-6-7-8-9 #5	Greater Splanchnic From Thoracics 5-9
Pancreas Disease #3	T5-6-7-8-9 #3	Greater Splanchnic From Thoracics 5-9
Spleen Diseases #11	T5-6-7-8-9 #10 T10-11-12 #1	Greater Splanchnic From Thoracics 5-9 Lesser Splanchnic Nerves
Inguinal Diseases #2	T12 #2	Ilio-inguinal Nerve
Kidney Disease #17	T10-11-12 #14 T5-6-7-8-9 #1 L1-2 #2	Least, Lesser & Greater Splanchnic Nerves Upper Lumbar Ganglia
Prostate & Bladder Disease #8	L1-2-3 #7 T12 #1	Upper Lumbar Ganglia Last Thoracic Ganglia
Uterus Diseases #2	Lumbar Lordosis #2	Lumbar & Sacral Ganglia
Total Visceral Disorders #139	Vertebral Curve at Same Sympathetic Segment as Disease Site #128	Vertebral Curve at Adjacent Segment #10

From Murphy interpretation of a chart by Winsor H. The Evidences of the Association, in Dissected Cadavers, of Visceral Disease with Vertebral Deformities of the Same Sympathetic Segments. Medical Times. 1921 (Nov):267-271.

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Chapter 4 CMRT – Chiropractic Involvement in Nonmusculoskeletal Treatment

Visceral Segmental Innervation

For many decades and longer there have been charts that attempt to suggest there is a segmental relationship between vertebral dysfunction (subluxation) and visceral disorders. Depending on whomever creates the chart, it is common to see different, specific organ-vertebral interrelationships.

Sato discussed how in animal experimental studies, *“both noxious and innocuous stimulation of somatic afferents have been shown to evoke reflex changes in sympathetic efferent activity,”* ultimately affecting organ function, and *“may exhibit laterality and segmental tendencies.”* (1) In an earlier animal study Sato found *“some [somatovisceral] responses have propriospinal and segmental characteristics, while others have supraspinal and generalized characteristics in their reflex nature.”* (2) Conversely Nansel and Szlazak question any *‘causal segmentally or regionally related “somato-visceral disease” relationship.’* (3)

While traditionally somatic or spinal nerve related radicular pain syndromes were believed to be segmental in nature, these also have been under question. Murphy et al note that, *“In most cases nerve root pain should not be expected to follow along a specific dermatome, and a dermatomal distribution of pain is not a useful historical factor in the diagnosis of radicular pain.”* (4) *‘Unlike radicular pain and neuropathic pain, referred pain is a less studied area,’* [5] and therefore, we also are not seeing this clear spinal segmental relationship as is often discussed and illustrated on many charts and within textbooks.

Gerwin’s study into myofascial and visceral pain syndromes reveal that *“a regional pain referral from a visceral disorder can induce secondary [myofascial pain syndromes]. Visceral disorders induce central sensitization with hypersensitivity and expansion in the number and size of receptive fields. Central sensitization is topographically organized in the spinal cord, being segmentally predominant at the level of the affected viscera.”* (6) In an earlier study by Feinstein et al, they found that *“patterns of deep somatic pain referral were studied with paravertebral injections of six per cent saline solution from the occiput to the sacrum, five subjects being used for each intervertebral level. The distributions were found to approximate a segmental plan, although they overlapped considerably and differed in location from the conventional dermatomes.”* (7)

Over 100 years ago, Winsor (8) performed a series of dissections on cadavers looking for any possible correlation between vertebra, sympathetic nerve segments, and diseased viscera/ organs. Of interest *“... in 50 cadavers with disease in 139 organs, there was found minor curvatures of the spine, belonging to the same sympathetic segments as the diseased organs 128 times, leaving an apparent discrepancy of 10, in which the vertebrae in spinal curvature belonged to an adjacent segment to that which should supply the diseased organs with sympathetic filaments.”* He determined that *“Sympathetic disturbances are just as likely to cause functional or organic disease in viscera, by altering the blood-supply of viscera, through vaso-motor spasm.”* (8)

A review of Winsor’s study by Murphy (9) suggests that:

1. Curvatures of the spine adversely affect the sympathetic nervous system.
2. The sympathetic nervous system controls the blood supply to the viscera, making it thereby related to all manner of visceral diseases and pathology, and specifically, *“the ordinary diseases of adult life.”*
3. Visceral diseases and pathology can be traced back to the segmental levels of sympathetic involvement with nearly 100% correlation. (9)

Are researchers asking the right questions about chiropractic's involvement in nonmusculoskeletal patient presentations?

Much of the research into chiropractic treatment of nonmusculoskeletal conditions tends to focus on non-specific adjustment(s) to the spine somewhere in the region of the viscera being studied. There is a presumption that if chiropractic care will be effective in treatment of nonmusculoskeletal conditions, a non-specific vertebral manipulation should reliably improve visceral function. For instance, Picchiottino et al studied whether a general nonspecific thoracic spinal manipulation would have a reliable effect on cardiovascular autonomic activity by assessing 'heart rate and systolic blood pressure variabilities.' (10) Not surprisingly, no reliable finding of a change in cardiovascular activity was demonstrated with this study.

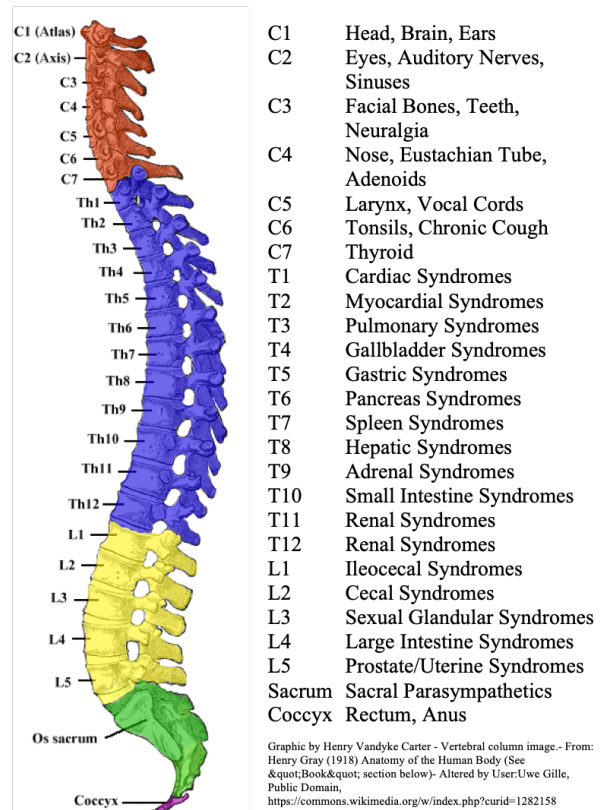
Ideally, for any study we would want to find patients that appear to have a somatovisceral component by determining if they have a history of their cardiovascular system responding positively to a chiropractic adjustment (or something similar). We would want to determine with these patients if a spinal level mattered to the spinal manipulative intervention. The evidence does show that a subset of patients with nonmusculoskeletal presentations may be responsive to chiropractic care. (11-13) We do know that, for the general population, a general thrust to the thoracic spine would not be expected to have a reliable visceral response. This is why differentiating the intervention for this responsive subset of patients in a study is so crucial.

Similarly, Balon concluded in a study on the effect of chiropractic manipulative care on asthma (which, again, predominantly focused on a generalized thrust to the thoracic spine) that "In children with mild or moderate asthma, the addition of chiropractic spinal manipulation to usual medical care provided no benefit." (14) The issue with the current evidence on chiropractic care into nonmusculoskeletal conditions centers around this: what questions are we asking when we are performing research? For example, what issues might we have with the Balon study as we look at its formulation and interpretation of its results? (15)

Rosner disputed Balon's study by noting that the conclusion "is based upon the failure of active intervention and manipulation patient groups in a clinical trial to be differentiated in both measurements of quality of life (including nighttime symptoms) and airway function. However, 17 months earlier the same authors had already concluded that with the chiropractic intervention, nighttime symptoms had improved. There was a significant difference between the same two patient groups at the highly robust null probability level of $p < 0.001$." (16) This discrepancy was not mentioned in Balon's study. (17)

Aside from the issue with the study by Balon (14) ignoring a previous study they performed that showed that chiropractic manipulation "appears to help night-time symptom control . . .", (17) Rosner points out four other questionable aspects of their study: (14)

1. There are questions regarding the sham procedure(s) used in their study. Rosner points out that, "With over 20 commonly used techniques and 100 procedures overall described for chiropractic, there is understandably a great deal of controversy as to what constitutes a



proper sham or mimic treatment” (13). He continues “The problem is compounded by the fact [in the Balon study] that nearly a dozen chiropractors had to be trained to perform” sham procedures “with no indication of standardization. The effect of all this is to minimize or obscure the therapeutic effect that might be observed in an actual adjustment” (15, 18)

2. There were possible masking effects by medication in the study. *“The fact that all patients [had] been medicated may be necessary from an ethical point of view, but it would be expected to mask the beneficial effects that might have been observed from spinal manipulation. The reader must be cognizant of the fact that this trial reports little or no benefits in addition to standard medication.” (15, 18)*
3. Rosner questions, *“how eligible patients as young as seven years of age are to competently answer such questions as those pertaining to ‘feeling at ease, the skill and the ability of the chiropractor, and overall quality of care’ that were administered in the trial?” (15, 18)*
4. Finally, it was clear from the study that, with intervention, there was significant improvement *“as demonstrated by declines at 2 months and 4 months of both daytime symptom scores and the number of puffs per day of a beta-antagonist, in addition to small increases of peak expiratory flow rates and pediatric quality of life scores in both [global and/or manual] groups.” (15, 18) “What is not clear is which form(s) of intervention [global and/or manual] elicited responses. What is not shown by the data is that contact with the chiropractor fails to provide additional benefits in addition to medication in the management of childhood asthma.” (15, 18)*
5. Additionally, the sham procedure used in the Balon study was a generalized massage to the child’s back. Research has repeatedly shown that massage helps childhood asthma, (19) so this intervention would be considered more of a comparative therapy than a placebo. Therefore, it would be inappropriate to say that because a generalized manipulation to the thoracic area was no different than the sham, that the chiropractic intervention was no different than a placebo.

It is important to understand that chiropractic researchers and academics view commonly that chiropractic care for *“MSK (musculoskeletal) and spinal pain, for which some evidence already exists, should be the priority of future research, building on what is known.”* This is a reasonable approach when viewed from the lens of a chiropractic researcher or academic since it makes sense when performing research to limit variables and study phenomena in as reductionistic a manner as possible. In contrast, chiropractic clinical practitioners tend to favor *“that future research should be directed toward expanded areas such as basic science, younger populations, and non-MSK conditions.” (20)*

When we look at a call for practitioner research partnerships, it appears that the researcher only sees a need for the involvement of practitioners in research in order *“to improve their use of research-based interventions, and thus the quality of care and client outcomes.” (21)* What seems to be missing in the practitioner researcher partnership is an understanding of the value of a clinician’s experience and familiarity in treating the various individuality and complexity of the N=1 patient. Chiropractors in practice know that chiropractic is more than spinal manipulation procedures and is rather a profession which operates based on a unique approach to health care, which is encompassed in the “Gestalt” of the chiropractic clinical encounter. (22)

So when we look at studies that attempt to reductionistically determine chiropractic’s reliable affect on nonmusculoskeletal conditions, we need to look at how patients are selected, how the treatment is rendered, and what might be the bias of the researchers?

What do these types of studies have to do with CMRT? The issue is that CMRT uses a series of assessments, starting with occipital fiber/vertebral relationships, visceral referred pain patterns,

clinical history, laboratory analysis, and other factors, to develop a treatment plan. Also, these studies tend to not understand that a non-specific spinal manipulation to the general population of patients would not be expected to yield a specific nonmusculoskeletal effect.

Ideally there is a balance when treating patients with nonmusculoskeletal presentations:

1. Is this patient a good candidate for CMRT? Do they have the various features suggesting that they fit the criteria such as positive occipital fiber vertebral relationship, visceral referred pain patterns, clinical finding congruent with visceral stressors, and any laboratory analysis noting possible visceral compromise?
2. When there is a degree of uncertainty, risk of treatment becomes part of the diagnostic equation. (23) With possible nonmusculoskeletal pathology co-managed care with an allopath will be crucial, however with subclinical visceral dysfunction sometimes treatment with CMRT can be part of the diagnostic process. If the patient shows any sign of improvement (e.g. reduction of symptoms, occipital fiber, vertebral sensitivity, visceral reflexes, etc.) after a reasonable trial of care (e.g., two weeks of treatment, treated twice a week), then this patient may be a good candidate to continue CMRT care.

When performing research, we need to make sure we are asking the correct questions. For instance, when performing a study investigating nonmusculoskeletal chiropractic care, we would want to have specific inclusion and exclusion criteria for the study design. These criteria might include:

- What patients might have some specific occipital fiber/vertebral relationships that are concurrent with their CMRT visceral referred pain patterns?
- What patients might have shown an unsuspected positive visceral response, possibly to a somatic intervention or chiropractic care?
- What patients might notice a worsening of their visceral or organ function with spinal imbalance or vertebral related subluxations?
- What patients might notice a relationship between physical and/or life/emotional stressors and visceral dysfunction?

Important future studies would need to investigate how to create an outcome assessment tool that might facilitate predicting what patients with nonmusculoskeletal presentations might best respond to chiropractic care. Until we start asking the right questions for the right subset of patients, we cannot reasonably expect to have answers for determining what group of patients might be good candidates for chiropractic nonmusculoskeletal care. The proper questions are important if we are ever going to successfully study the effectiveness of CMRT assessment and treatment protocols. At this point in time, given the low-risk nature of the chiropractic encounter, a short trial of CMRT would be appropriate, and if there is any flare up or concern of organ/visceral acute dysfunction or pathology, an immediate allopathic referral would be indicated. (24)

It is encouraging that emerging evidence is beginning to support “*the biological plausibility of complex benefits from chiropractic intervention that is not limited to simple neuromusculoskeletal outcomes and open new avenues for future research, specifically the exploration and mapping of the precise neural pathways and networks influenced by chiropractic adjustment.*” [25]

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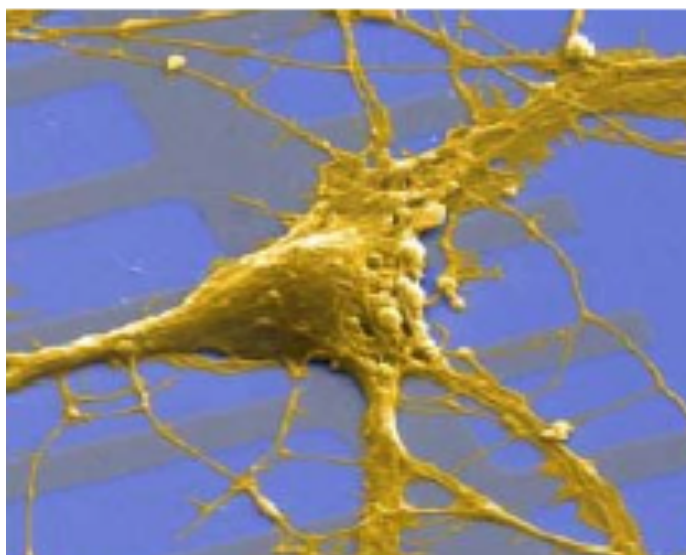
Chapter 5

Non-Synaptic Messaging and Nonmusculoskeletal Conditions

There are many mysteries about chiropractic care for nonmusculoskeletal conditions. While some factions of the chiropractic profession want to eliminate chiropractic care for nonmusculoskeletal conditions, (1) other researchers report, *“the current evidence suggests that more research on nonmusculoskeletal conditions is warranted before any definitive conclusions can be made. Governments, insurers, payers, regulators, educators, and clinicians should avoid using systematic reviews in decisions where the research is insufficient to determine the clinical appropriateness of specific care.”* (2) Besides Goertz, et.al. questioning the over interpretation of limited research data on chiropractic care of nonmusculoskeletal conditions, a number of other renown chiropractic academics are reaching the same conclusion. (3-11)

What is confounding about chiropractic treatment of nonmusculoskeletal conditions is that viscerosomatic and somatovisceral referred pain is very complex and often diffuse. What might cause a presenting symptom with one patient may not be present with another. While we see research demonstrating chiropractic having a positive effect with a patient’s nonmusculoskeletal condition, (12-15) we cannot reliably state that research has figured out what subset of patients with nonmusculoskeletal conditions might best respond to a specific chiropractic intervention. Therefore, greater research is needed to unravel this chiropractic and nonmusculoskeletal clinical tapestry. Hopefully, *Chiropractic Manipulative Reflex Technique* (CMRT) assessment and care will enhance understanding on how to render chiropractic care for patients seeking help for nonmusculoskeletal presentations in a consistent and effective manner.

Some chiropractic techniques systems have sought to better understand chiropractic’s effect on nonmusculoskeletal conditions and often looked to autonomic nervous system imbalance as well as viscerosomatic and somatovisceral referred pain and/or reflex altered activity. Another possible relationship not commonly discussed regarding a relationship between nonmusculoskeletal care and chiropractic might involve non-synaptic messaging. (16)



Communication within the nervous system is commonly accepted to take place at a synapse, which is the junction where two or more nerves come into proximity of one another. The region of a synapse communication between nerves is usually maintained by the exchange of neurotransmitters or electrical charges. *“The discovery of nonsynaptic communication in the 1960s and 1970s was an important milestone in investigating the function of the nervous system, and it revolutionized our view about information transmission between neurons. In addition, nonsynaptic communication has a practical importance not only within the nervous system, but in the communication between the peripheral nervous system and other organ systems.”* (17)

Viscerosomatic, somato-somatic, and sclerotomal reflexes have pain patterns that are generally of a diffuse nature and can possibly be attributed to a form of nonsynaptic messaging. Since chiropractors are often treating pain syndromes of a diffuse nature, the relationship of non-

synaptic messaging to manipulation may be of value. There are various classes of nonsynaptic interactions that include but are not limited to:

- Electrotonic (and Chemical) Coupling Through Gap Junctions
- Ephaptic Transmissions
- Field Effect Interactions
- Fluctuations In Extracellular Ions
- Glial Cell Messaging and CSF
- Piezoelectric/Mechanoelectric Effect
- Low Level Electromagnetic Fields and Neuromelanin
- Quantum Tunneling

Gap junctions are specialized areas of the cell membranes that connect neighboring cells. *"They are organized collections of protein channels that allow ions and small molecules (below 1000 daltons molecular weight) to traverse between the connected cells in a passive fashion."* (18)

Ephaptic transmission is mediated by electrical coupling between specific neuronal elements in the absence of specialized neuronal contacts such as synapses. The original use of *"ephaptic"* referred to two axons or other neuronal processes so close together that the current produced by one has a major effect on the adjacent one; the location of this close proximity could then be called an *"ephapse"* (a similar concept to the *"synapse"* where close proximity allows neurotransmitters to diffuse from the presynaptic neuron to the postsynaptic neuron). *"Field effects are diffuse and rely more on the common orientation of a neuronal population causing the current density and field strength to build up sufficiently to have an impact on neuronal function."* (19)

Field effect interactions are mediated by large extracellular currents and potential fields generated by cortical structures. Endogenous and applied electric fields interactions can alter neuronal excitability at field strengths over a few millivolts per millimeter. (19)

Fluctuations in extracellular ions such as K⁺ are released during neuronal activity and these extracellular fluctuations can alter neuronal excitability. [1] Clinically, *"field effects and ion fluctuations probably have modest effects during physiological activity but have a significant impact [for instance] on epileptic seizures, and can sustain them in the absence of synaptic transmission."* (19)

Glial Cell Messaging and CSF

In the chiropractic and osteopathic fields, practitioners utilizing cranial manipulative therapies discuss a concept entitled the *"Primary Respiratory Mechanism."* (20, 21) This mechanism postulates that neural tissue rhythmic pulsation is independent of cardiac or respiratory influences. It is possible that this neural rhythmic pulsation may be a type of nonsynaptic messaging. (22, 23)

A 2004 study found that a *"system of cerebrospinal fluid (CSF)-contacting neurons seems to have a special role in taking up, transforming and emitting nonsynaptic signals mediated by the internal and external CSF and intercellular fluid of the brain."* (24) Coupled with the possible nonsynaptic activity within the CSF, glial cells have also been found to be associated with nonsynaptic activity and glutamate production. Other than in the CSF, there is evidence that nonsynaptic glutamate exists within the extracellular fluid, released from glial cells, which may act on extrasynaptic glutamate receptors of cells located far from the position where it is released. (25)

Piezoelectric/Mechanoelectric Effect

Is there a relationship between the nonsynaptic field effects and mechanoelectric properties of stressed osseous structures? It does appear that stressed connective tissue responds with mechanoelectric activity, often considered related to a piezoelectric effect. (26, 27)

Bassett performed an extensive review of the biological significance of piezoelectricity, noted that, "*major emphasis has been placed on the origin and possible effects of piezoelectric phenomena in bones. It is evident, however, that piezoelectricity is present in many, if not all, biologic systems.*" (28)

Bassett continues, "*Mechanical energy expended in these structures can produce electric potentials of sufficient magnitude to exert a wide range of effects in living systems. These include, theoretically, control of cell nutrition, local pH control and enzyme activation or suppression, orientation of intra- and extra-cellular macromolecules, migratory and proliferative activity of cells, synthetic capability and specialized function of cells, contractility and permeability of cell membranes and energy transfer.*" (28)

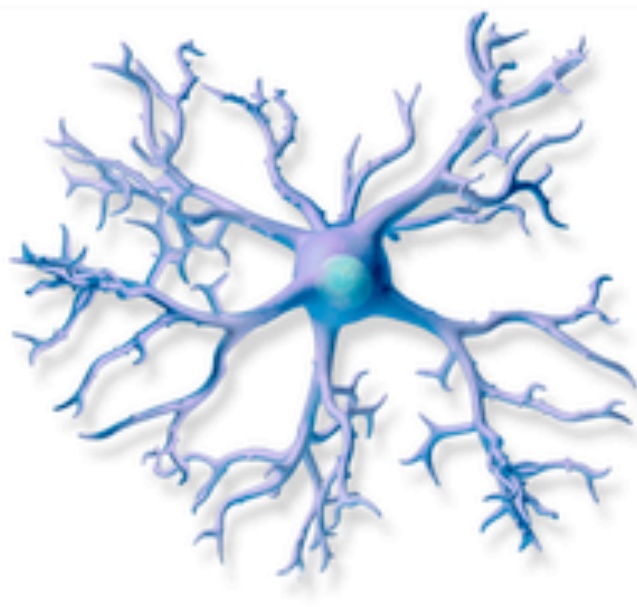
Low Level Electromagnetic Fields and Neuromelanin

In a book edited by Adey and Lawrence entitled *Nonlinear Electrodynamics in Biological Systems*, extensive information is shared on low-level electromagnetic fields and their effect on living tissues, as well as their bioelectric and electrochemical behavior. (29) The research presented in this book is derived from the proceedings of a 1983 international conference on "*Nonlinear Electrodynamics in Biological Systems,*" held in Loma Linda, California. Presentations at this conference by many independent researchers demonstrated that low-level electromagnetic fields have a profound effect on biological systems.

While nonsynaptic messaging was not discussed at the conference, in a parallel study Adey found that "*an intercellular communication based on low frequency oscillation is a clear possibility. The extra-cellular medium is an efficient conductor at low frequencies and may behave in a frequency dependent manner in the counterion layer adjoining the membrane surface. Leakage of low frequency membrane potential oscillations into the extra-cellular space has been extensively described and plays a prime role in brain tissue in the genesis of the EEG.*" (30) Adey noted that the piezoelectric activity occurring in stressed connective tissue is approximately a thousand times stronger than that of the electromagnetic fields studied at the conference in Loma Linda, California. (31)

This mechanoelectric activity takes on a greater significance when relating it to Barr's work with neuromelanin. (32 - 33) Barr has determined that "*melanin transduces both acoustic and electric energy fields and it can generate enough heat to affect metabolic processes.*" (32) He noted that in vitro studies have shown that melanin functions as an amorphous semiconductor within physiological ranges of neuronal electrical potentials. (32)

Barr proposed that "*a direct current system (probably produced by the glial perineural network and other strategic melanin loci) regulates the development and growth of embryological and adult tissues, tissue repair and regeneration, and numerous other organizational mechanisms.*" (32) Barr suggested that there is a relationship between this direct current system and the



electroencephalogram (EEG). He stated, *"The production of the spontaneous electrical activity of the EEG is due to cortical dendritic graded processes and/or glial-generated sustained current."* (33)

The key issue with regards to Barr's work and nonsynaptic messaging is that melanin is richly invested in all the neuroglial tissues and is called neuromelanin. The glial cells surrounding neurons and nerve fibers can be generating an electric field at low levels similar to those found in biologic systems by Adey. These electric fields can then permit communication within the body that would not have to pass directly within the nerve tissue or solely at synaptic junctions.

Consistent with Barr and Adey, a 2018 study found that highly pervasive electromagnetic frequency (EMF) *"fluctuations may play an important role in the global integrative actions of the brain; hence, EMF signaling may transcend classical connectionist models of brain function."* (34) Agnati et al, call this new concept *"broadcasted neuroconnectomics"* and purport that it transcends the current connectomics view of the brain. [34]

Quantum Tunneling

Quantum Tunneling is the *"crossing of a membrane by electrons, which can interact and stimulate cellular adaptations without prior excitation of the receptors."* (35) Every time electrons move and the cell becomes excited, a magnetic field is generated; the change in position or number of electrons generates an electric field, generating an electromagnetic field (36). *"The electromagnetic field expands and moves (electromagnetic wave or electromagnetic frequency/oscillation/vibration) and invades the surrounding area, involving other cells in a cascade, putting the whole body in communication."* (36, 37) Bordini and Simonelli note that due to the human body's fluid environment *"the greater the synchronicity of this phenomenon, the greater the cellular functionality; the speed of information transmission is faster than the electrical neural speed."* (38)

Nonsynaptic Transmission and the Autonomic Nervous System

Nonsynaptic transmission may be affecting autonomic nervous system activity since it is characteristic of autonomic neuroeffector junctions. *"The essential features are that: the terminal portions of autonomic nerve fibers are varicose and mobile, transmitters being released 'en passage' from varying distances from the effector cells; while there is no structural post-junctional specialization on effector cells, receptors for neurotransmitters accumulate on cell membranes at close junctions; muscle effectors are bundles rather than single smooth muscle cells, that are connected by gap junctions which allow electrotonic spread of activity between cells. A multiplicity of transmitters are utilized by autonomic nerves, and cotransmission occurs often involving synergistic actions of the cotransmitters, although pre- and post-junctional neuromodulation of neurotransmitter release also take place."* (39)

While synaptic transmission of neural impulses is the most commonly accepted form of communication within the nervous system, nonsynaptic transmission might offer another path for neural messaging. *"The fact that transmitters can even be released from nonsynaptic varicosities without being coupled to frequency-coded neuronal activity and they are able to diffuse over large distances indicates that there is a complementary mechanism of interneuronal communication to classical synaptic transmission."* (40)

Vizi noted that axons are found in both the CNS and autonomic nervous system forming varicose (*boutons-en-passant*) branches. Varicose axon terminals, which in the overwhelming majority do not make synaptic contacts, are the main targets of presynaptic modulation. (41) Vizi followed up the previous study and discovered that neurotransmitters *"released from axon terminals without synaptic contact play an important role in the fine tuning of communication between neurons within a neuronal circuit."* (42)

Vertebra (43) and even cranial bones (44) under stress exhibiting piezoelectric activity might have an affect on local bioelectrodynamics and neurological function. Similar to the way myelin functions to facilitate some nerve transmission, (40) the neuromelanin in the neuroglial tissues might be functioning to facilitate a gross communication neurologically. Piezoelectric or bioelectrodynamics has entered a realm, which to some may seem paranormal. However according to Adey, non-synaptic type activity can be affected *“by highly nonlinear, nonequilibrium processes at critical steps in signal coupling across cell membranes. There is increasing evidence that these events relate to quantum states and resonant responses in biomolecular systems.”* (45) This bioelectrical activity is apparently commonplace in human physiological processes at the biomolecular level.

These low level electrodynamic nonsynaptic activities, according to Lawrence and Adey, do not necessarily have to be short-acting neural activities (46). They found that, *“interactions of phonons [a quantum of acoustic energy] and excitons [an elementary excitation of a solid] along linear molecules may produce nonlinear molecular vibrations in the form of soliton waves.”* (46) *“Solitons are a quantum of energy or quasiparticle that can be propagated as a traveling wave in nonlinear systems and is neither preceded nor followed by another such disturbance; does not obey the superposition principle and does not dissipate.”* (47)

“Molecules tend to be located within a coordinate frame of their own, their position and orientation are specified by reference to some previously defined coordinate frame.” (46) When molecules are excited in a manner so that they vibrate outside their coordinate frame, they can form solitons, which exist in a minimal energy state and are extremely long-lived in comparison to linear oscillations. *“Solitons may convey energy released by chemical reactions from one site to another in enzymes of other long-chain proteins. These nonlinear waves may also couple reaction-diffusion processes in the intracellular and extracellular domains.”* (46) These low-level electrodynamic activities can have long-term function exceeding their initial propagation and affecting nonsynaptic neural communication.

Future Study

With further investigation into non-synaptic activity, a rationale for energetic practices used in various chiropractic methods and other healing disciplines might be uncovered.

Somatovisceral relationships, diffuse neurological syndromes and reflex points on the body unrelated to direct neurological synaptic connections may have some explanation based on the theories presented. Vizi points out that nonsynaptic interneuronal communication *“would be a transitional form between the classical neurotransmission and the broadcasting of neuroendocrine secretion.”* (48)

However, at this time nothing conclusive can be drawn from the field effect associated with nonsynaptic messaging. Therefore, practitioners using chiropractic methods such as CMRT, must continue greater investigative study as a means to build understandings about these complex reflex and referred pain relationships.

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Chapter 6 Benign Joint Hypermobility Syndrome and CMRT

Benign joint hypermobility syndrome (BJHS) was initially defined as the occurrence of musculoskeletal symptoms in the presence of joint laxity and hypermobility in otherwise healthy individuals.

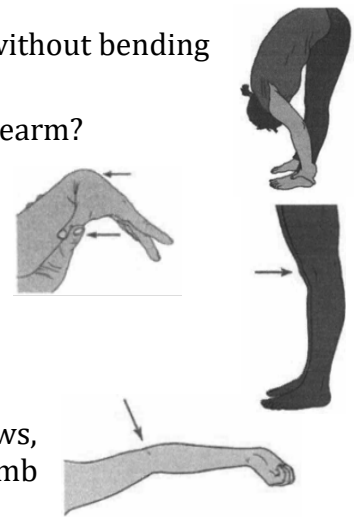
It is now perceived as a commonly overlooked, under-diagnosed, multifaceted, and multi-systemic heritable disorder of connective tissue (HDCT), which shares many of the phenotypic features of other HDCTs such as *Marfan syndrome* and *Ehlers-Danlos syndrome*. (1)

Extra articular manifestations of the BJHS may include the peripheral nervous system. One study found that autonomic nervous system - related symptoms of BJHS patients have a pathophysiological basis, which suggests that dysautonomia is also an extra-articular manifestation in the joint hypermobility syndrome. (2)

The following is a questionnaire for self-testing to identify hypermobility. It is a 5-part questionnaire to determine BJS and has been found to be 84% accurate in identifying hypermobility. It is considered positive for hypermobility syndrome if the patient answers in the affirmative for two out of the five questions. (3)

BJHS Questionnaire

- Can you now [or could you ever] place your hands flat on the floor without bending your knees?
- Can you now [or could you ever] bend your thumb to touch your forearm?
- As a child, did you amuse your friends by contorting your body into strange shapes or could you do the splits?
- As a child or teenager, did your kneecap or shoulder dislocate on more than one occasion?
- Do you consider your self “*double jointed*” (3)



BJHS is characterized by increased joint ranges of motion that is commonly seen with patients that can hyperextend their knees and elbows, touch their palms to the floor when bending over, and touching their thumb to their forearm. An assessment tool, the *Beighton Score* (BS), is a set of maneuvers in a nine-point scoring system, used as the standard method of assessment for BJHS and is being used “*as a clinical tool for diagnostic purposes.*” (4 - 6)

Chiropractic manipulative reflex technique (CMRT) practitioners need to consider how a patient presenting with joint hypermobility (BJHS) might affect their clinical decision-making options. This might range from autonomic nervous system imbalanced function to how joint instability might affect the treatments that need to be rendered. Therefore, it is an important consideration that “*genetic factors have a substantial contribution to joint hypermobility in the adult female population.*” (7)

Patients with BJHS may often have sensitivities related to autonomic nervous system imbalance (dysautonomia) which will generally adversely affect their visceral function. This would affect the incidence of the need for CMRT in the BJHS population as well as the complex nature of how these patients might respond to CMRT care. While some BJHS patients may respond quickly and well to CMRT others might need more ongoing care, nutritional and dietary support, and possibly integrative functional medical collaboration.

Beighton Scale

	Left	Right
1. Passive dorsiflexion and hyperextension of the fifth MCP joint beyond 90°	1	1
2. Passive apposition of the thumb to the flexor aspect of the forearm	1	1
3. Passive hyperextension of the elbow beyond 10°	1	1
4. Passive hyperextension of the knee beyond 10°	1	1
5. Active forward flexion of the trunk with the knees fully extended so that the palms of the hands rest flat on the floor		1

The first four elements of the *Beighton scale* can be given a maximum score of 2, because these are performed bilateral. The last element is scored with 0 or 1. The maximum score for ligament laxity is 9. A score of 9 means hyperlax, whereas a score of zero would mean the patient joints would be considered to be highly restricted. In general a score of 0-3 is considered normal and a score of 4-9 would represent ligamentous laxity. (4 - 6)

The dysautonomia associated with BJHS patients can have affects on the viscera and organ function, for conditions such as:

- Postural Orthostatic Tachycardia (POTS) (8)
- Lower Urinary Tract Symptoms In Women (9, 10)
- Cardiac (Myocardial Cytoskeleton and Extracellular Matrix) Function (11)
- Pelvic Organ Prolapse and Sexual Dysfunction in Women (12)

It is also important to note that patients with BJHS will often have higher levels of sensory processing sensitivity (highly sensitive person character type) which may make this subset of patients sensitive to emotional, psychological, and physical responses associated with CMRT touch and reflex balancing procedures. (13 - 15)

While traditionally CMRT patients either presented as a category one (pelvic torsion with sacral nutation imbalance) or a healing category two (pelvic torsion with sacroiliac joint instability), patients with BJHS will most commonly have chronic category two presentations. BJHS patients with a category two presentation have the following cautions as pertaining to CMRT diagnosis and treatment:

- These patients may or may not have fully developed occipital fiber line one or two presentations, so greater care may be needed to assess their clinical history, clinical presentation, and any visceral reflex patterns.
- With chronic sacroiliac joint instability this will modify the type of *iliopsoas* corrections needed in T2 Myocardial and T11/12 Kidney Syndromes. With both of these CMRT related treatments care is directed to the diaphragm tension patterns. Since commonly the focus in this subset of patients is with joint instability, we will usually be considering the category two, the *iliacus* portion of the iliopsoas muscle for treatment.

- Generally the fascia of patients with BJHS will allow for deeper penetration into regions such as behind the clavicle, under the rib cage, and within the abdominal cavity, so we need to be cautious with our palpation and therapeutic applications of CMRT.

While gender and age play a role in the incidence of BJHS, an approximate range of BJHS patients in the general population is between 10-30%, with 20% as a reasonable estimate. (16 - 18) Though 20% may seem like a “small” percentage, if we consider that one in out of every five patients may have BJHS, it should help us understand the need for clinical awareness with this subset of patients.

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