Subluxation

1) Unspecialized "loose" connective tissue forms an anatomical network throughout the body.

[This is important for chiropractors because it indicates that the connective tissue through the body is interconnected. Hence, a subluxation creating local biomechanical stress could initiate consequences throughout the body.]

2) Connective tissue functions as a body-wide mechanosensitive signaling network that is separate from the nervous system, yet it also influences and is influenced by the nervous system.

3) Connective tissue signals include electrical, cellular and tissue remodeling. Each of these are responsive to mechanical forces that occur subsequent to changes in movement or posture, and to pathological conditions such as injury or pain.

4) Connective tissue functions as a whole body communication system.

5) Since connective tissue is intimately associated with all other tissues, including the viscera, connective tissue signaling may influence the normal or pathological function of a wide variety of organ systems.

[This is extremely important for chiropractors. Traditional chiropractic teaches, and our research documents, that our mechanical care improves visceral function. This author, from the Department of Neurology, University of Vermont, College of Medicine, is giving us a viable explanation to support chiropractic teachings, research, and clinical observations.]

6) The existence of a connective signaling network may profoundly influence our understanding of health and disease.

7) Dividing the human body into separate systems for research and medical specialization is a mistake because all of the systems are integrated through the nervous system and connective tissue.

8) The musculoskeletal system does not physiologically function in isolation from the rest of the body.

[Key Point]

9) "Unspecialized connective tissue not only forms a continuous network surrounding and infiltrating all muscles, but also permeates all other tissues and organs." **[Very Important]**

10) The connective tissue matrix allows "cells to perceive and interpret mechanical forces."

11) "Since connective tissue plays an intimate role in the function of all other tissues, a complex connective tissue network system integrating whole body mechanical forces may coherently influence the function of all other physiological systems."

[Most Important]

12) Mechanical forces generate electrical signals that propagate through the connective tissue extracellular matrix because proteins, including collagen, have semiconductive, piezoelectric and photoconductive properties.

[The piezoelectric properties explain in part the mechanism by which chiropractic adjustments and postural changes work. Piezoelectric current science is integrated into the academics of various chiropractic techniques, including Chiropractic Biophysics.]

[The photoconductive properties explain in part the mechanism by which low level lasers work].

14) A whole body web of connective tissue is involved in a dynamic, body-wide pattern of cellular activity reflecting all externally and internally generated mechanical forces acting upon the body.

15) Connective tissue plasticity means that connective tissues will change in response to mechanical stress. These changes take place over the course of time following a change in posture or activity.

[This is important because it indicates that the joints and tissues that chiropractors influence with spinal adjustments and modes of rehabilitation will ultimately result in desirable tissue adaptation.]

16) Local connective tissue fibrosis following an injury may affect both electrical conductivity as well as fibroblast-to-fibroblast communication. Therefore, local pathology can affect whole-body connective tissue signaling.

[Important, this suggests that all local injuries have systemic manifestations. Also, because acute inflammation aggressively (i.e. ice, omega-3 fatty acids, etc.). There is evidence that chiropractic adjustments enhance the remodeling of tissue fibrosis, which would indicate that chiropractic adjustments enhance the remodeling of tissue fibrosis, which would indicate that chiropractic adjustments also "affect electrical conductivity and fibroblast-to-fibroblast communication."]

17) There is direct communication between the connective tissues within the matrix, and also indirect communication via the nervous system.

[Very Important]

18) Connective tissue is richly innervated with mechanoreceptors and nociceptors.

19) Sensory information from connective tissue is integrated in the central nervous system.

[Important: this supports that every connective tissue injury or problem and the chiropractic management of the connective tissue injury or problem, will influence the central nervous system.]

20) "Connective tissue bioelectrical, cellular and tissue plasticity responses, as well as their interactions with other tissues, may be key to understanding how pathological changes in one part of the body may cause a cascade of 'remote' effects in seemingly unrelated areas and organ systems." **[Key concept]**

21) Musculoskeletal dysfunction can initiate remote visceral disease. The example used by the author is knee osteoarthritis initiating a flare-up of ulcerative colitis. The author notes: "For example, a patient presenting with a flare-up of ulcerative colitis preceded by a two week exacerbation of knee osteoarthritis would probably be thought to have two distinct problems, one in the gut and one in the knee. Establishing the presence of connective tissue "bridge" between these two medical problems would potentially have important repercussions on both diagnosis and treatment of these conditions."

22) "Connective tissue may be a key missing link needed to improve cross-system integration in both biomedical science and medicine." **[Key Point]**

COMMENT FROM DAN MURPHY

The concept of the connective tissue creating a bioelectric tensegrity matrix that has the ability to alter our genetic expression when we have altered alignment in a gravity environment is not new. It is expertly reviewed in the book *Energy Medicine, The*

Scientific Basis, by James Oschman, Churchill Livingstone, 2000. Chapter 11 on gravity and spinal alignment is particularly applicable to chiropractors.

Pathophysiological Model for Chronic Low Back Pain Integrating Connective Tissue and Nervous System Mechanisms

Medical Hypotheses
January 2007, Volume 68, Issue 1,
Pages 74-80

Helene M. Langevin and
Karen J. Sherman

KEY POINTS FROM DAN MURPHY

1) In chronic low back pain, there is an integration between connective tissue fibrosis and the nervous system perception of pain.

2) Adverse connective tissue fibrosis can be remodeled by applying mechanical forces to soft tissues, including chiropractic spinal adjusting.

[It is important to note that chiropractic adjustments were included as the applying of a mechanical force to reverse adverse connective tissue fibrosis and its influence on the nervous system.]

3) The "association between symptoms and imaging results (X-ray, CT, MRI) has been consistently weak, and up to 85% of patients with low back pain cannot be given a precise pathoanatomical diagnosis using these methods."

4) Neuroimaging has shown that there are distinct "brain networks" involved in acute vs. chronic pain. Chronic pain is specifically related to regions for cognition and emotions.

5) Chronic back pain results in neuronal or glial loss in the prefrontal and thalamic gray matter.

[Brain atrophy]

6) "Increased connective tissue stiffness due to fibrosis is an important link in the pathogenic mechanism leading to chronicity of pain."

[Very Important: There is evidence that this adverse tissue fibrosis can be reversed and remodeled by chiropractic adjusting.]

7) "Abnormal movement patterns can have important influences on the connective tissues that surround infiltrate muscles." **[Very important because the subluxation complex includes abnormal movement patterns.]**

8) "A hallmark of connective tissue is its plasticity or 'remodeling' in response to varying levels of mechanical stress." **[This is important because it implies that spinal adjusting can initiate remodeling of abnormal connective tissues.]**

9) "Both increased stress due to overuse, repetitive movement and/or hypermobility, and decreased stress due to immobilization or hypomobility can cause changes in connective tissue." **[The causes of subluxation. Note: both increased and decreased motion are deleterious.]**

10) A chronic local increase in stress leads to micro-injury and inflammation.

[Subluxation can cause micro-injury and inflammation.]

11) "A consistent absence of stress leads to connective tissue atrophy, architectural disorganization, fibrosis, adhesions and contractures."

[Again, tissue fibrosis]

12) "Fibrosis can be the direct result of hypomobility or the indirect result of hypermobility via injury and inflammation." **[Very Important]**

13) Muscle connective tissue fibrosis promotes hypomobility. "Connective tissue fibrosis is detrimental, as it leads to increased tissue stiffness and further movement impairment."

{Important, fibrosis again]

14) "Tissue microinjury, inflammation and fibrosis not only can change the biomechanics of soft tissue (e.g. increased stiffness) but also can profoundly alter the sensory input arising from the affected tissues."

[Very important: many contend that the tissue changes associated with the subluxation alter the afferent input into the CNS, which is the nerve interference of the subluxation.]

15) "Connective tissue is richly innervated with mechanosensory and nociceptive neurons." **[Very Important]**

16) Activation of nociceptors can contribute to the development or worsening of fibrosis and inflammation, causing even more tissue stiffness and movement impairment. **[Important]**

17) Chronic low back pain may be caused by pathological connective tissue fibrosis, which causes adverse changes in movement. This is well documented in ligaments and joint capsules. **[Very Important]** This pathological connective tissue fibrosis is plastic and can therefore be remodeled. However, the remodeling must take place over time. **[This is very important because it indicates that the basic pathology is fibrosis, and this fibrosis can be remodeled with adjustments over a period of time.]**

18) "In fibrosed connective tissue and muscle, blood and lymphatic flow may be chronically compromised by the disorganized tissue architecture and thus vulnerable to unusual muscle activity (e.g. beginning a new work activity or sport), or to conditions causing further decrease in perfusion such as prolonged sitting.

19) Pain leads to reduced motion, and movement restriction increases fibrosis, "setting the patient up for more painful episodes." **[Very Important, Fibrosis]**

20) "In addition to its role in the pathological consequences of immobility and injury, the dynamic and potentially reversible nature of connective tissue plasticity may be key to the beneficial effects of widely used physical therapy techniques," including chiropractic adjustments.

21) "Manual or movement-based treatments have the advantage of not causing drug-induced side effects (e.g. gastritis, sedation),: but excessive motion may lead to inflammation.

22) A "carefully applied direct tissue stretch may be necessary in cases of long standing hypomobility with pronounced fibrosis and stiffness." **[Very Important, as an adjustment may be considered to be a "carefully applied direct tissue stretch."]**

Cervical spine manipulation alters
Sensorimotor integration: A somatosensory
Evoked potential study

Clinical Neurophysiology
February 2007, Vol. 118, No. 2
Pages 391-402

KEY POINTS FROM DAN MURPHY

1) "Spinal manipulation is a commonly used conservative treatment for neck, back, and pelvic pain."

2) "The effectiveness of spinal manipulation in the treatment of acute and chronic low back and neck pain has been well established by outcome-based research."

3) Spinal dysfunction will alter afferent input to the central nervous system.

4) Altered afferent input to the central nervous system leads to plastic changes in the central nervous system. **[Very Important]**

5) "Neural plastic changes take place both following increased and decreased afferent input." **[Extremely Important]**

6) Both painful and painless joint dysfunction will inhibit surrounding muscles.

7) Joint dysfunction causes afferent driven increases in neural excitability (facilitation) to muscles that can persist even after the initiating afferent abnormality is corrected. **[This suggests that a muscle afferent problem can persist even after the joint component of the subluxation is corrected. The chronic component of the subluxation may be plastic changes that cause long-term alteration of muscle afferentation.]** This article clearly supports that the joint component, the muscle component, and the neurological component of the subluxation complex are influenced by traditional joint-cavitation spinal adjusting.

8) The altered neural processing that occurs as a consequence of joint dysfunction provides a "rationale for the effects of spinal manipulation on neural processing that have been described in the literature." **[Very Important]**

9) Spinal dysfunction alters the "balance of afferent input to the central nervous system" and this altered afferent input may lead to "maladaptive neural plastic changes in the central nervous system,: and "spinal manipulation can effect this." **[Very Important]**

10) The clinical evidence for joint dysfunction that requires manipulation includes:

A) Tenderness on joint palpation.

B) Restricted intersegmental range of motion.

C) Palpable asymmetry of intervertebral muscle tension.

D) Abnormal or blocked joint play and end-feel.

E) Sensorimotor changes in the upper extremity.

[I recall the teachings of Richard Stonebrink, DC, in the orthopedic diplomate program 25 years ago, the importance of "always documenting (in our daily records) the evidence that the patient had a manipulatable spinal lesion (subluxation)." His evidence was identical to these. Dr. Stonebrink would stress that such documentation would "always make the case unique to chiropractic" and consequently make the chiropractor the only expert in the case.]

11) High velocity, low amplitude thrust spinal manipulation with the head held in lateral flexion, with slight rotation and slight extension "is a standard manipulative technique used by manipulative physicians, physiotherapists and chiropractors." **[This is important because this is the type of spinal adjusting that many chiropractors perform on cervical vertebrae. This article indicates such adjustments are "standard."]**

12) High-velocity manipulation causes significant cortical SEP amplitude attenuation in at least the frontal and parietal cortexes.

13) Passive head movements do not cause changes in cortical firing.

14) "A single session of spinal manipulation of dysfunctional joints resulted in attenuated cortical (parietal and frontal) evoked responses." These changes "most likely reflect central changes." **[Very Important]**

15) The cortical function of different individuals responded differently to spinal adjusting. **[This indicates that variables other than the adjustment itself can influence the cortical responses in a given individual]**

16) The significantly decreased somatosensory cortical SEP occurred in **all** post-manipulation measurements, indicating "enhanced active inhibition" because the "cervical manipulations could have altered the afferent information originating from the cervical spine (from joints, muscles, etc.)"

17) "The passive head movement SEP experiment demonstrated that no significant changes occurred following a simple movement of the subject's head. Our results are therefore not simply due to altered input form vestibular, muscle or cutaneous afferents as a result of the chiropractor's touch or due to the actual movement of the subjects head. This therefore suggests that the results in this study are specific to the delivery of the high-velocity, low-amplitude thrust to dysfunctional joints." **[Extremely Important]**

18) "Displacement of vertebrae is signaled to the central nervous system by afferent nerves arising from deep intervertebral muscles," and this is improved with adjusting the adjacent dysfunctional joint.

19) "Joint dysfunction leads to bombardment of the central nervous system with Ia afferent signaling from surrounding intervertebral muscles." Spinal manipulation reduces excessive afferent signals from adjacent intervertebral muscles which improves altered afferent input to the central nervous system. This changes the way the central nervous system "responds to any subsequent input."

20) Episodes of acute pain following injury induce plastic changes in the sensorimotor system, prolonging the episode of pain and playing a roll in establishing chronic neck pain conditions. **[Very Important]** "The reduced cortical SEP amplitudes observed in this study following spinal manipulation may reflect a normalization of such injury/pain-induced central plastic changes, which may reflect one mechanism for the improvement of functional ability reported following spinal manipulation." **[Extremely Important]**

21) "Spinal manipulation of dysfunctional joints may modify transmission of neuronal circuitries not only at a spinal level but at a cortical level, and possibly also deeper brain structures such as the basal ganglia." **[Very Important]**

22) Cervical spine manipulation alters cortical [brain] somatosensory processing and sensorimotor integration.

23) These findings may help to elucidate the mechanisms responsible for the effective relief of pain and restoration of functional ability documented following spinal manipulation treatment.

COMMENT BY DAN MURPHY

One of the central themes of the neurology diplomate program taught by Ted Carrick DC is that chiropractic spinal adjusting influences the cortical brain, creating plastic changes. This article very much supports that perspective.