Israel
2019

Science and Philosophy of Chiropractic

part 2 of 2

Life Chiropractic College West

Dan Murphy, DC

Effects of Head and Neck Positions on Blood Flow in the Vertebral, Internal Carotid and Intracranial Arteries: A Systematic Review

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Rik Kranenburg PT, Rob Tyer PT, Maarten Schmitt PT, PhD, Gert Jan Luijckx MD-PhD, Cees van der Schans PT, PhD, Nathan Hutting PT, PhD, Roger Kerry PT:
From Hanze University, Groningen, The Netherlands
University of Groningen, The Netherlands
Rotterdam University, Rotterdam, The Netherlands
HAN University of Applied Sciences, Nijmegen, The Netherlands
University of Nottingham, UK

This study cites 59 references.

This study is a systematic review of the literature that initially identified 1,453 studies and used 31 that met their inclusion criteria, with 2,254 participants.

The objective was to investigate the effects of cranio-cervical positions and movements (manual therapy interventions) on hemodynamic changes (blood flow velocity and/or volume) of cervical and cranio cervical arteries. The vertebral, the internal carotid and the basilar artery were eligible for this review.

“The hemodynamic parameters of blood flow volume and velocity are considered as robust proxy measures of mechanical stress on vessels and are commonly used to investigate mechanical stress on arteries.”

The mean age of participants was 55 years ranging from 18 – 98 years.

84% of the studies used a Colour Doppler Sonography device to measure flow velocities and flow volumes.

10% of the studies used Magnetic Resonance Angiography.

6% of the studies used Magnetic Resonance Imaging.

Blood flow was tested in multiple patient positions (supine, sitting, prone), but for the vertebral artery, maximum rotation and the combination of maximum rotation and extension were the positions tested most frequently.

CAD	Cervical Arterial Dysfunction
HVT	High Velocity Thrust

- "An increase of force (such as a cervical manipulation, mobilisation, or repeated active movement) during naturally occurring arterial stresses might act as either a causative or exacerbating factor leading to a central neuro-vascular event (e.g. stroke)."

5) "A commonly described symptom of CAD pathologies is neck or head pain, for which patients may seek assistance from a manipulative therapist for evaluation and treatment for relief of pain and improvement of function."

- "It is plausible that a CAD is not an adverse event of the treatment itself, but exists *in situ* prior to treatment." [Important]

- "It is hypothesised that mechanical stress on cervical arteries during cervical mobilisation or cervical manipulative techniques can cause CAD, especially in patients with pre-existent vascular pathologies." [this review concludes not]

6) Most of the studies in this review "mentioned no significant hemodynamic changes during maximal rotation."

7) "Three studies focused on high velocity thrust positioning and movement, all reported no hemodynamic changes." [Key Point]

- "The synthesized data suggest that in the majority of people most positions and movements of the cranio-cervical region do not have an effect on blood flow." [Key Point]

- "The majority of studies noted no significant hemodynamic changes during maximum rotation."

- "The significant changes that were most commonly identified for the vertebral artery were hemodynamic decrease in maximum rotation and combined movement of maximum extension and maximum rotation."
  [this would suggest that maximum extension-rotation C1-C2 maneuvers should be minimized]

- "A similar pattern was also identified for maximum rotation and combined movement of maximum extension and maximum rotation in relation to the hemodynamics of internal carotid and intracranial arteries."

8) A comparison of the groups with people with vascular pathology and groups of normal patients "shows that there were proportionally no differences." [Important]

9) Only one study reported a pre-manipulative position significantly decreased the velocity and resistance index. However, these authors discount the results as they were found only unilaterally. [Important]

10) "The data synthesized from 31 experimental and quasi-experimental studies suggest that in most people cranio-cervical positions and movements had no effect on blood flow." [Key Point]

- "In a small proportion of the groups 'healthy subjects', 'vascular patients', and 'other patients', blood flow does decrease during some movements, specifically maximal rotation and/or extension." [Important]

11) "The positions and movements utilized in high velocity thrust techniques do not seem to alter blood flow." [Important]

- "A clinical implication from this review is that the relationship between cranio-cervical movement and alterations in blood flow does not seem to be as obvious as previous data suggested." [Important]

12) "Considering blood flow as a robust measure of vessel stress, based on these data it is unlikely that head and neck movement alone, even if forceful, could mechanistically explain the aetiology of adverse events which have conventionally been purported to be related to therapeutic interventions." [Key Point]

- "When a cervical positional change puts stress on a vessel, it should theoretically also change the hemodynamics. Most studies reported no change in hemodynamic parameters during any tested movements and positions, in both healthy and vascular/other groups."

  - "Some studies reported hemodynamic changes during maximal rotation and extension when performed in either isolation or when combined."

13) "Overall, the pattern of hemodynamic responses to cervical position and movement seems to be a naturally occurring phenomenon related to the anatomy of the cervico-cranial region." [Key Point]

14) "Conventional thought within the domain of manual therapy has been that rapid, forceful interventions such as HVT techniques are considered to constitute a higher risk for neuro-vascular events resulting from cervical arterial compromise. However, we found that studies which focussed specially on HVT reported no hemodynamic changes." [Key Point]

- "Our findings are similar to the conclusions of previous reviews on this topic."

15) "Those studies which recorded symptom reproduction (specifically for vertebral artery insufficiency) in patients during the compromising movement were unable to establish an association between flow change and symptoms. This observation would have implications for the validity of testing procedures which rely on this underlying mechanism, e.g. functional positional tests." [Very Important]

- A study from 2013 was “unable to establish a relationship between [vertebral artery] flow changes and symptom reproduction. The aim of these vascular integrity test procedures is to unilaterally compress an artery to test the contralateral blood supply. However, when examining our data, it is plausible that testing based on this mechanism does not appear to be a valid construct. Therefore, the rationale and value of the tests should be questioned.” [Extremely Important]

16) “There appears to be no consistently reported positions which induce greater hemodynamic responses than others.”

- “The two studies that focused on HVT did not find a hemodynamic effect either.” [Important]

17) This study “suggests that adverse events related to cervical spine interventions might be the result of something other than the therapeutic positioning or movement of the head and neck.” [Important]

- “Clinicians should be mindful however that there may be small sub-groups of the population with underlying arterial pathology whereby the small hemodynamic changes may be sufficient to induce or exacerbate serious neuro-vascular compromise.” [Important]

- “Therefore, it might be wise to choose treatment techniques first in positions with less than 45 degrees of cervical rotation.”

- “Although the majority of the included studies found no significant decrease in end range positions, the data is most consistent in positions with less than 45 degrees rotation. Therefore, clinicians should consider treatment techniques at first within this range.”

18) “Conclusion: Our results suggest that in most people, healthy as well as patients with vascular pathologies, cranio-cervical positions do not alter cervical blood flow. This includes vascular test positions, pre-manipulative positions and manipulations.”

19) “A key clinical implication from this review is that the relationship between cranio-cervical movement and blood flow does not seem to be as previously suggested.”

20) “Conclusions: The findings of this systematic review suggest that cranio-cervical positioning may not alter blood flow as much as previously expected.” [Key Point]

COMMENTS FROM DAN MURPHY:

This year alone we have reviewed two prior studies also noting the safety of cervical manipulation/mobilization/motion with respects to the risk of cervical artery dissection:

Article Review 20-19:

A Risk–benefit Assessment Strategy to Exclude Cervical Artery Dissection in Spinal Manual Therapy

Article Review 29-19:

Effect of Cervical Manipulation on Vertebral Artery and Cerebral Haemodynamics in Patients with Chronic Neck Pain

Take home messages from this study suggest that at best the risks of cervical artery injury from cervical adjusting are nonexistent. At worse, the risks have been overstated in prior publications.

Pre-manipulation positional cervical artery testing are probably not valid.

As a caution, these authors suggest not rotating the head/neck in excess of 45 degrees when manipulating. And it is probably ill advised to combine C1-C2 rotation/extension/thrust manipulation.

Current Concepts in Vertebrobasilar Complications Following Spinal Manipulation

Allen Terrett
2001

"There have been cases of VBS following SMT that were subsequently examined by angiograms, and Doppler sonography in which no evidence of vascular injury could be found." (10 references)

"In these cases it is believed that transient arterial spasm may be the mechanism for the neurological sequelae."

Immediate onset of symptoms is "too quick for clotting to have occurred, and this most likely indicates spasm."

"Spasm would be particularly deleterious in the presence of contralateral hypoplasia of the VA."

"In most cases, this spasm is transient, and if not accompanied by severe arterial damage, or re- traumatized, the patient soon recovers without any deficit."

"When brainstem ischemia results from vasoconstriction, symptoms would be expected immediately; whereas (other than the pain of dissection), those resulting from thrombus and/or embolus formation resulting from a vessel wall dissection and/or vessel occlusion would only become symptomatic after some time."

Symptoms begin:

63%	Immediately, during SMT
6%	Within moments or minutes of SMT
9%	Within one hour of SMT
9%	1-6 hours after SMT
5%	7-24 hours after SMT
8%	24 hours or more after SMT (days, possible weeks)

"Signs and symptoms of vertebrobasilar ischemia (VBI) produced by SMT usually occur in the practitioner's office (69 percent), and should be immediately recognized by the practitioner."

"Dizziness is the most common symptom of VBI and may be unaccompanied by any other symptoms or signs."

"The spine should not be re-manipulated if signs and/or symptoms develop."
[Key Point]

The major signs and symptoms of VBI are the 5 Ds And 3 Ns:

Dizziness/vertigo/giddiness/light headedness

Drop attacks/loss of consciousness

Diplopia (or other visual problems/ amaurosis fugax [a painless temporary loss of vision in one or both eyes])

Dysarthria (speech difficulties)

Dysphagia [discomfort or difficulty in swallowing]

Ataxia of gait (walking difficulties/ incoordination) of the extremities/ ataxia/falling to one side

Nausea (with possible vomiting)

Numbness on one side of the face and/or body

Nystagmus

Informed Consent

Dear Patient:

Every type of health care is associated with some risk of a potential problem. This includes chiropractic health care. We want you to be informed about potential problems associated with chiropractic health care before consenting to treatment. This is a legal requirement in California. This is called informed consent.

Chiropractic adjustments are the moving of bones with the doctor's hands or with the use of a mechanical device or machine. Frequently adjustments create a “pop” or “click” sound/sensation in the area being treated.

In this office we use trained staff personnel to assist the doctor with portions of your consultation, examination, x-ray taking, physical therapy application, traction, massage therapy, exercise instruction, etc. Occasionally when your doctor is unavailable, another clinic doctor will treat you on that day.

Stroke: Stroke means that a portion of the brain or spinal cord does not receive enough oxygen from the blood stream. The results can be temporary or permanent dysfunction of the brain, with a very rare complication of death. The literature is mixed or uncertain as to whether chiropractic adjustments are associated with stroke or not. Recent evidence suggests that it is not (2008, 2015, 2016), although the same evidence suggests that the patient may be entering the chiropractic office for neck pain/headaches or other symptoms that may in fact be a spontaneous dissection of the vertebral artery. If we think this is happening, you will be immediately referred to emergency services.

Anecdotal stories suggest that chiropractic adjustments may be associated with strokes that arise from the vertebral artery; this is because the vertebral artery is actually located inside the neck vertebrae. The adjustment that is suggested to increase the strain on the vertebral artery is called the “extension-rotation-thrust atlas adjustment.” We do not do this type adjustment on patients. Other types of neck adjustments may also potentially be related to vertebral artery strokes, but no one is certain. It is estimated that the incidence of this type of stroke ranges between 1 per every 400,000-3,000,000 upper neck adjustments. This means that an average chiropractor would have to be in practice for hundreds of years before they would statistically be associated with a single patient stroke.

Two other potential problems that are *not* quantifiable because they are extremely rare and may have no association with chiropractic adjusting are carotid artery injury and spinal dural tear resulting in a leak of cerebral spinal fluid.

Disc Herniations: Disc herniations that create pressure on the spinal nerve or on the spinal cord are frequently successfully treated by chiropractors and chiropractic adjustments, traction, etc. This includes both in the neck and back. Yet, occasionally chiropractic treatment (adjustments, traction, etc.) will aggravate the problem and rarely surgery may become necessary for correction. These problems occur so rarely that there are no available statistics to quantify their incidence.

Cauda Equina Syndrome: Cauda Equina Syndrome occurs when a low back disc problem puts pressure on the nerves that control bowel, bladder, and sexual function. Representative symptoms include leaky bladder, or leaky bowels, or loss of sensation (numbness) around the pelvic sexual organs (the saddle area), or the inability to urinate or to start a bowel movement. Cauda Equina Syndrome is a medical emergency because the nerves that control these functions can permanently die, and those functions may be lost or compromised forever. The standard approach is to surgically decompress the nerves, and the window to do so may be as short as 12-72 hours,

depending. If you have any of these symptoms, tell us immediately, and if we can't be reached, go the emergency department.

Soft Tissue Injury: Soft tissues primarily refer to muscles and ligaments. Muscles move bones and ligaments limit joint movement. Rarely a chiropractic adjustment, traction, massage therapy, etc., may overstretch some muscle or ligament fibers. The result is a temporary increase in pain and necessary treatments for resolution, but there are no long term affects for the patient. These problems occur so rarely that there are no available statistics to quantify their incidence.

Rib and other Fractures: The ribs are found only in the thoracic spine or middle back. They extend from your back to your front chest area. Rarely a chiropractic adjustment will crack a rib bone, and this is referred to as a fracture. This occurs only on patients that have weakened bones from such things as osteoporosis. Osteoporosis can be noted on your x-rays. We adjust all patients very carefully, and especially those who have osteoporosis on their x-rays. These problems occur so rarely that there are no available statistics to quantify their incidence.

Physical Therapy Burns: Some of the machines we use generate heat. We also use both heat and ice, and recommend them for home care on occasion. Everyone's skin has different sensitivity to these modalities, and rarely, both heat or ice can burn or irritate the skin. The result is a temporary increase in pain, and there may even be some blistering of the skin. These problems occur so rarely that there are no available statistics to quantify their incidence. Never put a home ice pack directly on the skin, always have an insulating towel between.

Soreness: It is common for chiropractic adjustments, traction, massage therapy, exercise, etc. to result in a temporary increase in soreness in the region being treated. This is nearly always a temporary symptom that occurs while your body is undergoing therapeutic change. It is not dangerous, but please do tell your doctor about it.

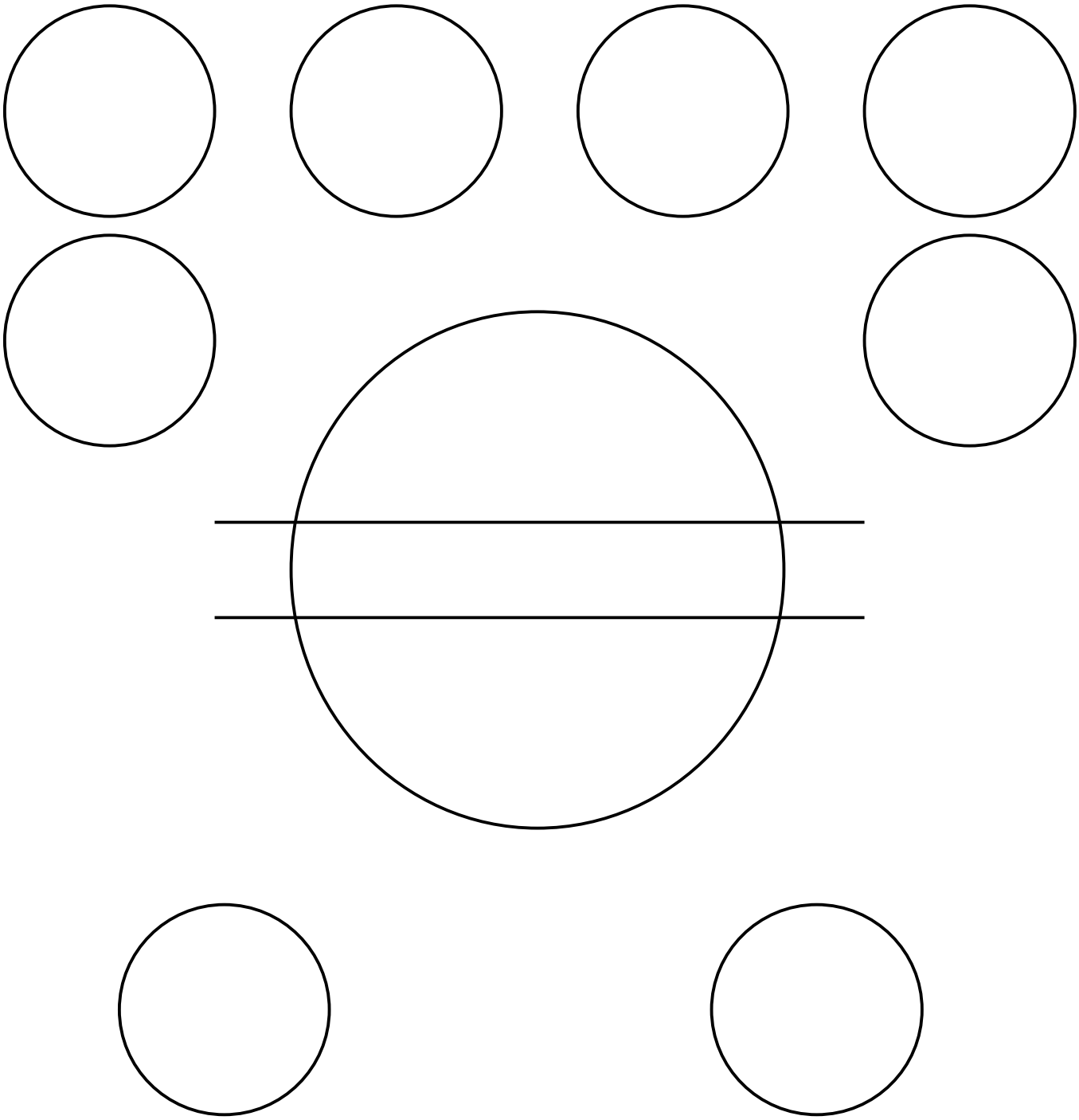
Other Problems: There may be other problems or complications that might arise from chiropractic treatment other than those noted above. These other problems or complications occur so rarely that it is not possible to anticipate and/or explain them all in advance of treatment.

Chiropractic is a system of health care delivery, and, therefore, as with any health care delivery system we cannot promise a cure for any symptom, disease, or condition as a result of treatment in this clinic. We will always give you our best care, and if results are not acceptable, we will refer you to another provider whom we feel will assist your situation.

If you have any questions on the above, please ask your doctor. When you have a full understanding, please sign and date below.

Patient's Name Printed	Today's Date
Patient's Signature	Parent or Guardian Signature For Minor

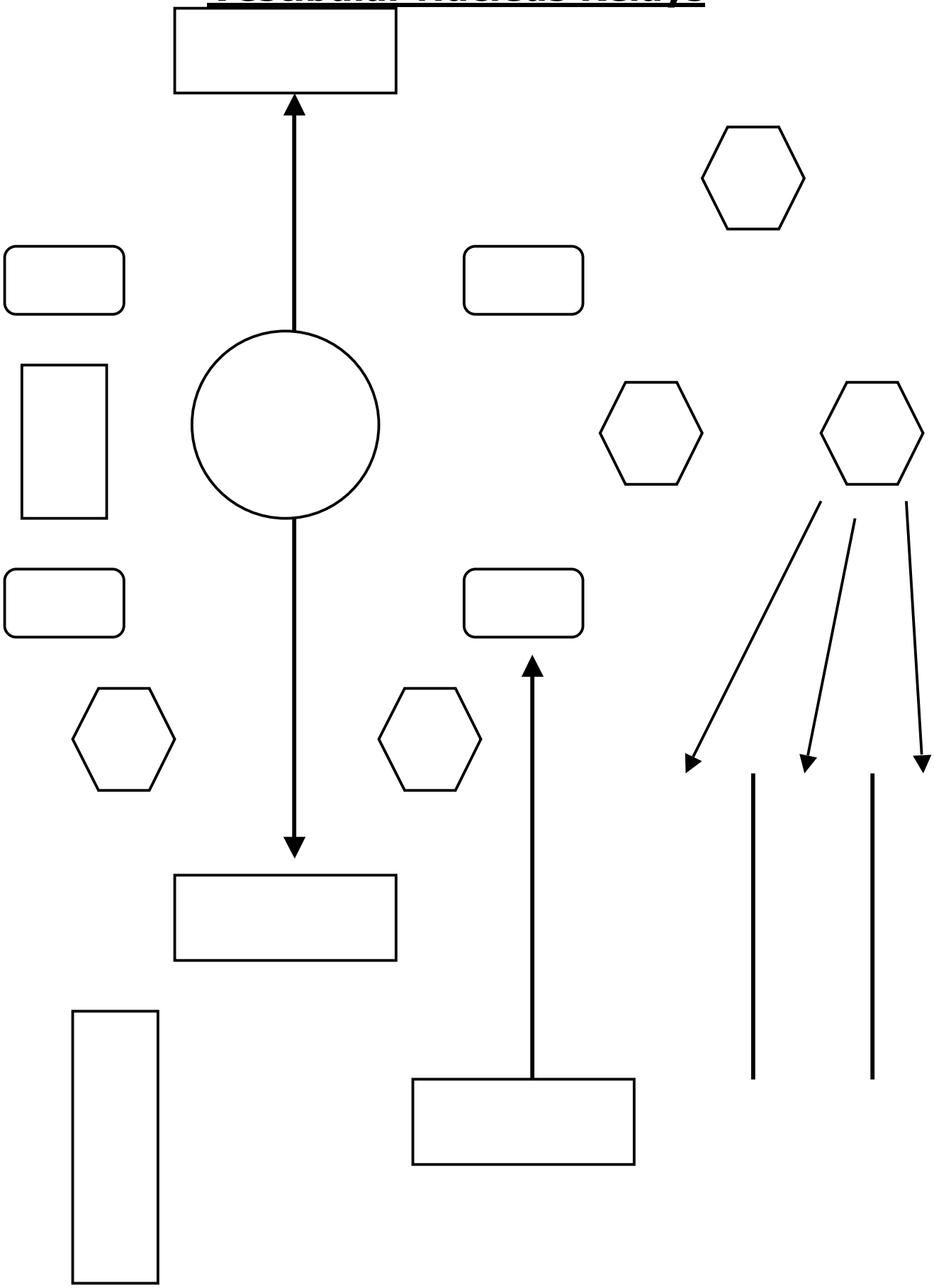
MECHANICAL VISCERAL REFLEX

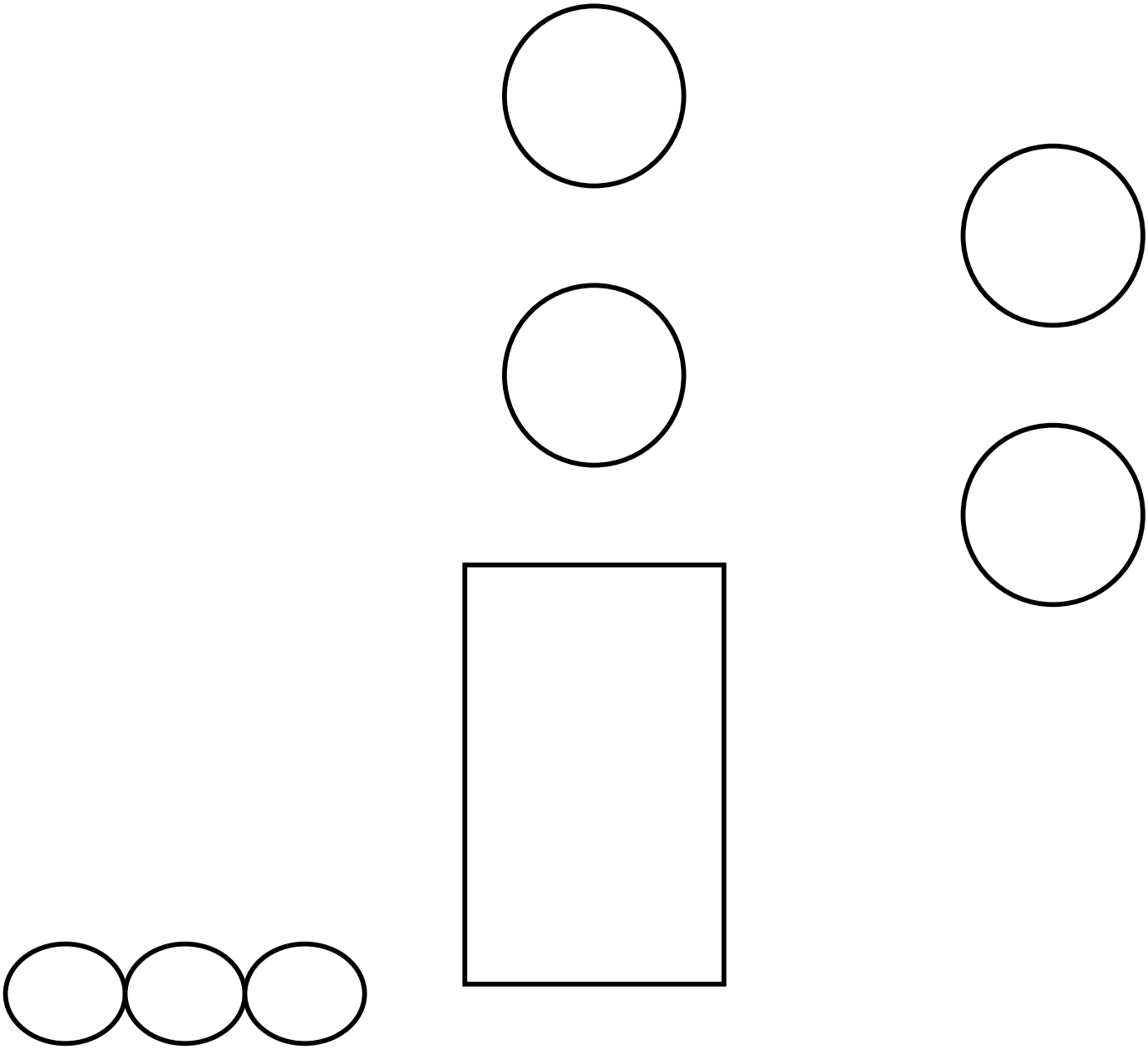


CATECHOLAMINES

BETA-ADRENORECEPTORS

Vestibular Nucleus Relays





1) _____

2) _____

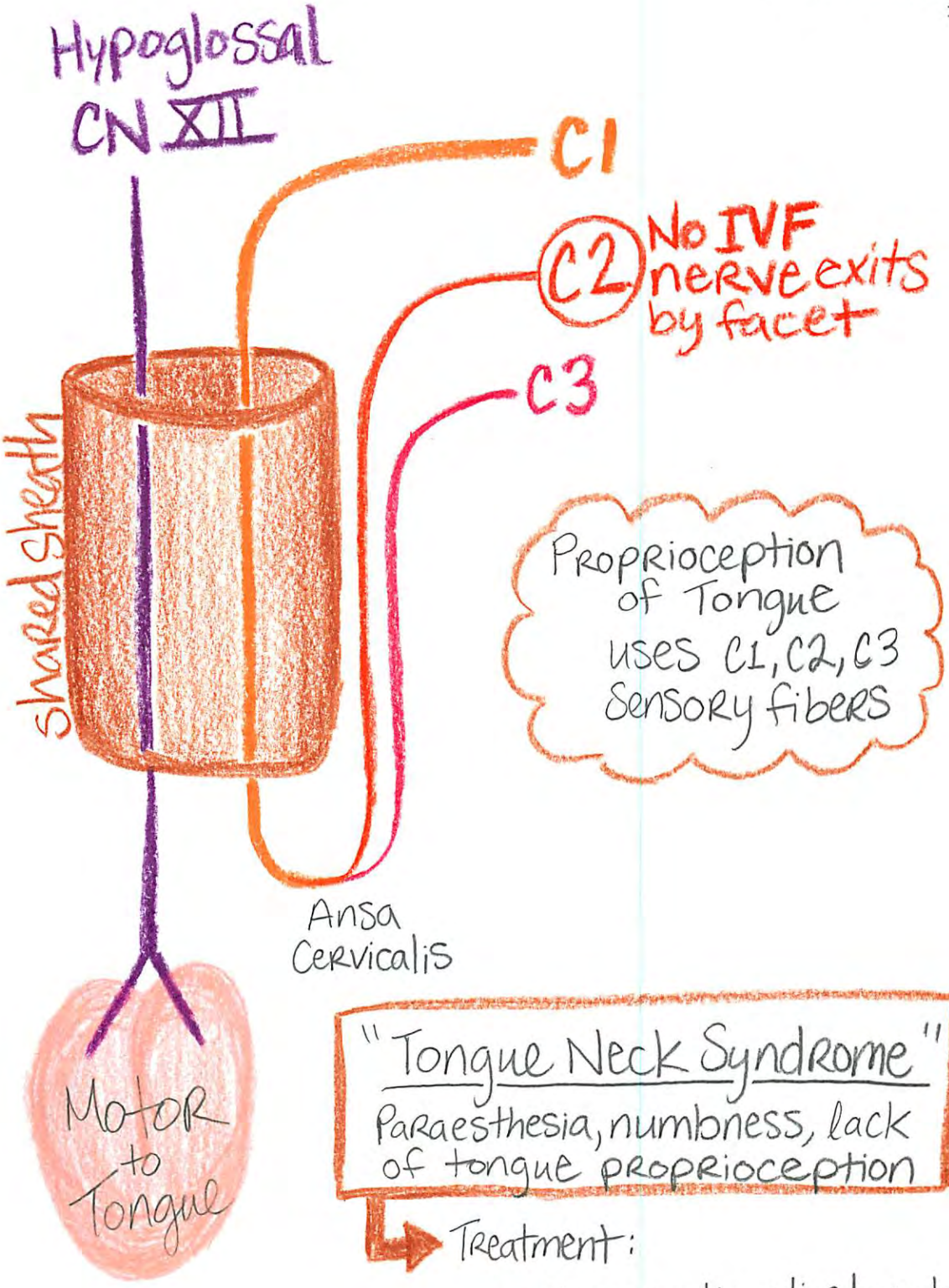
3) _____

4) _____

5) _____

6) _____

Judith Hoffman
#30



"Tongue Neck Syndrome"

Paraesthesia, numbness, lack of tongue proprioception

Treatment:

- Chiropractic adjustments
- Muscle stretches
- Strengthening exercises

Judith Hoffman
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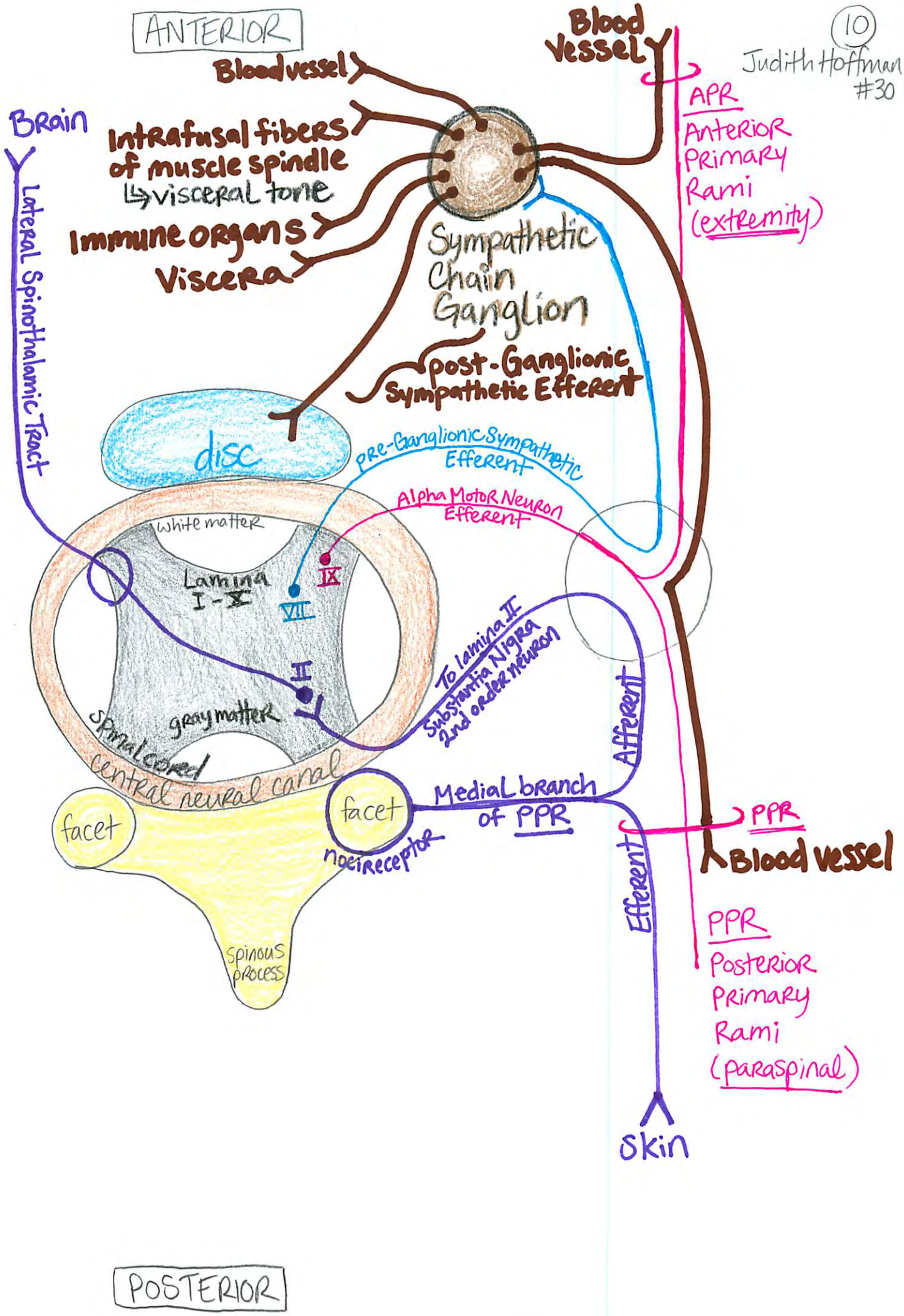

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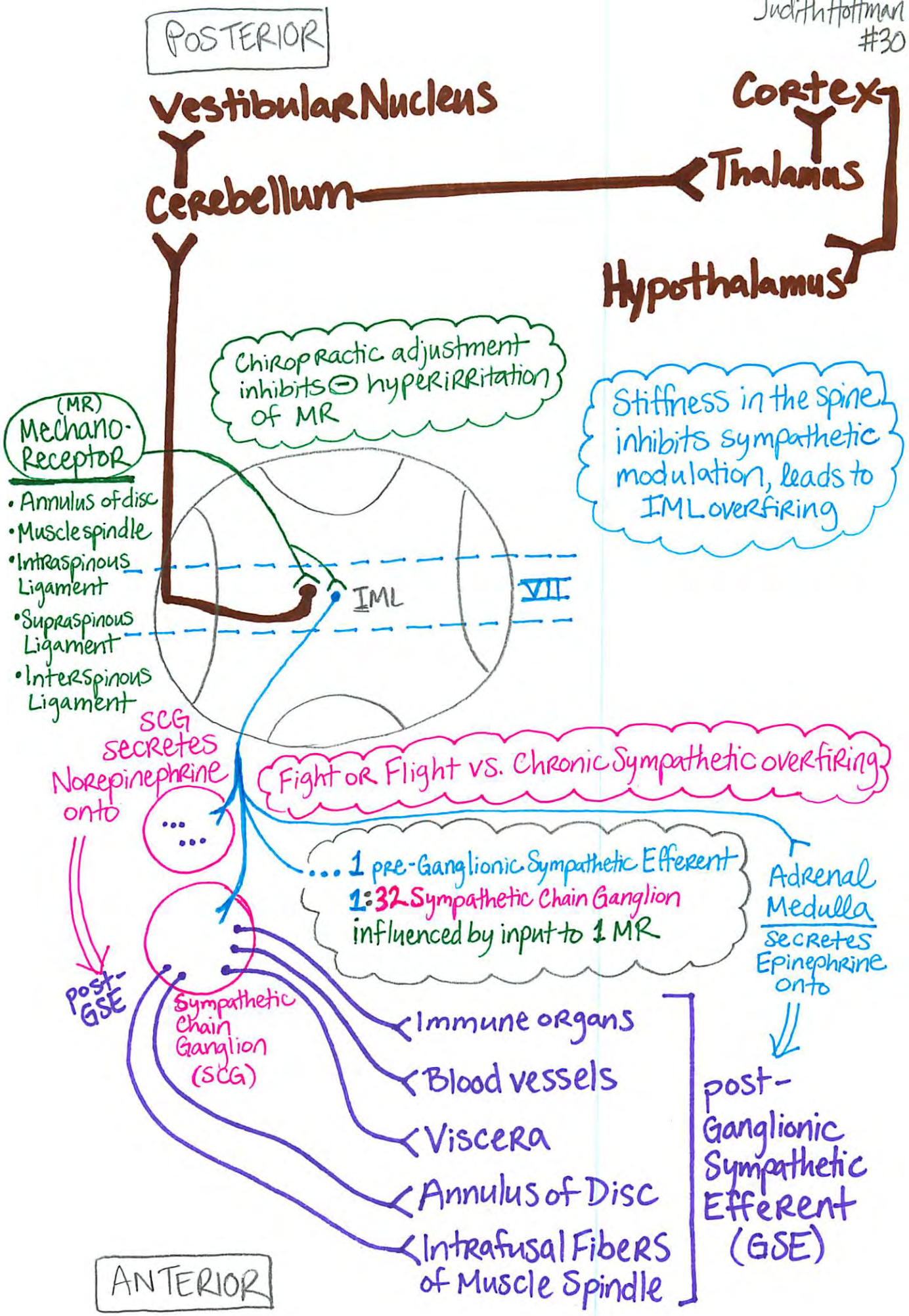

Perception of Headache/Neck Pain

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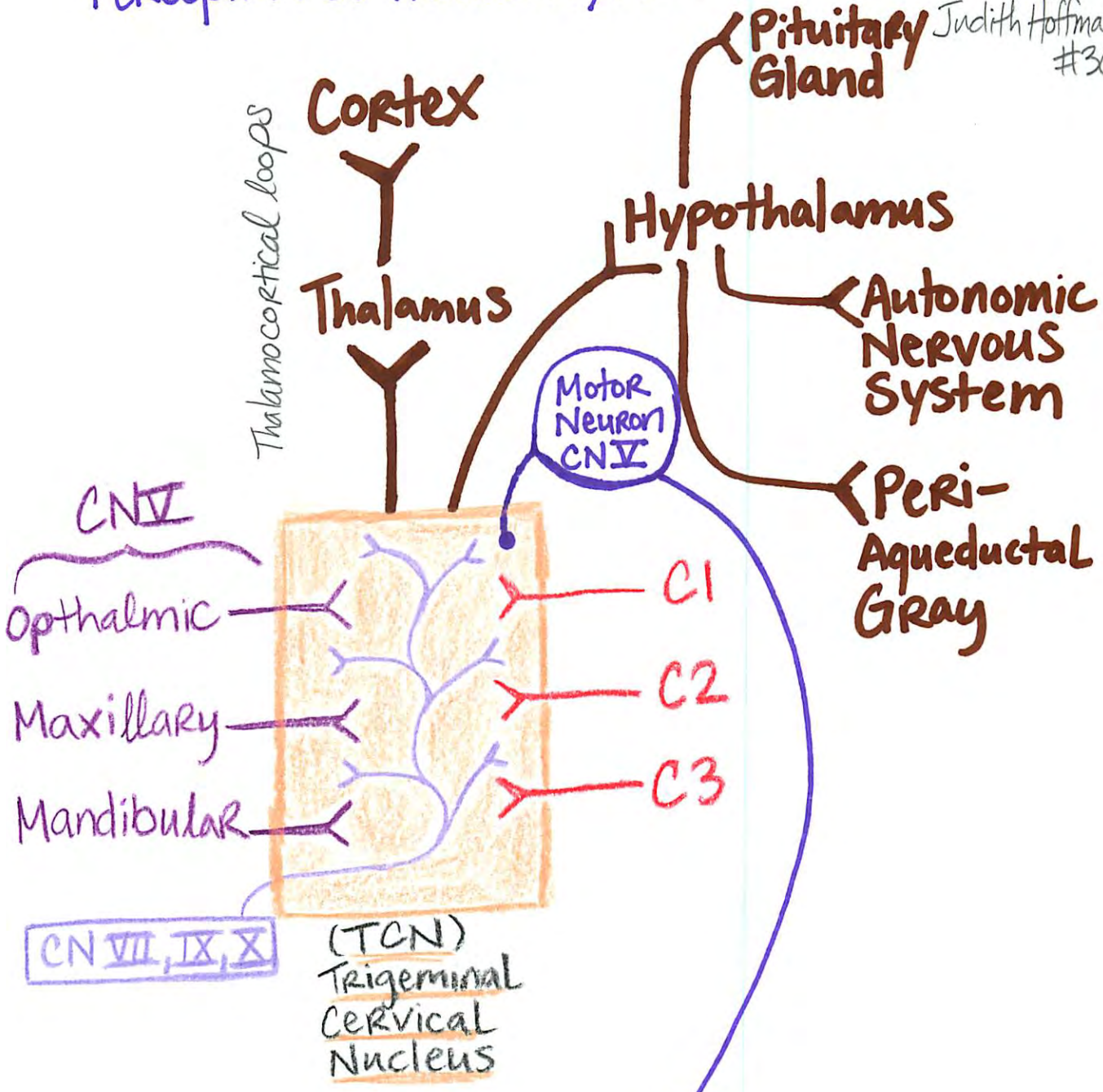
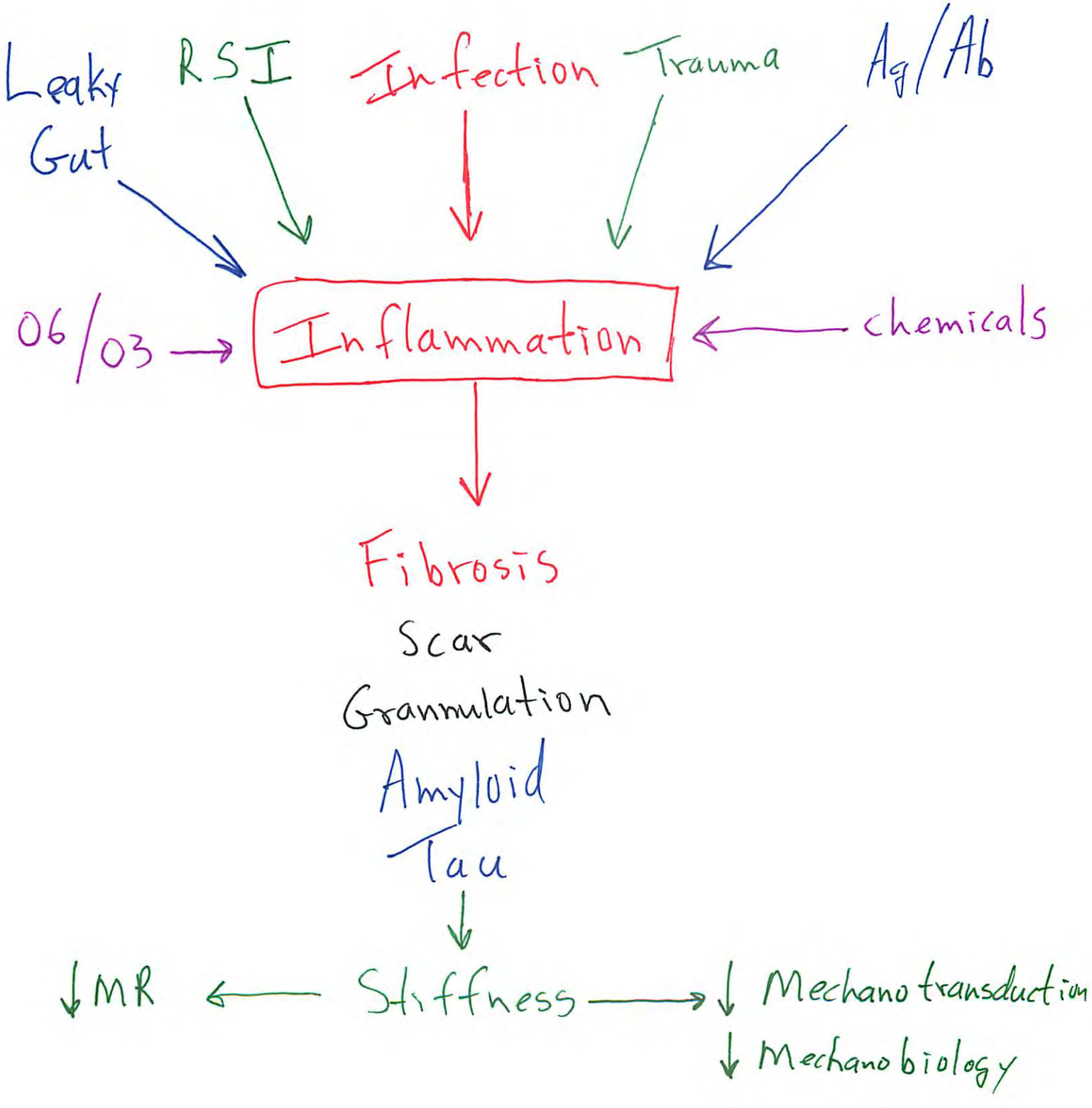


1. Temporalis
2. Masseter
3. Lateral Pterygoid
4. Medial Pterygoid

→ crosses Temporomandibular Joint

5. Tensor Tympani ⇒ tension of eardrum
   - ↳ i.e. Tinnitis
   - ↳ Otitis Media
6. Tensor Veli Palatini

→ Meniere's Disease


Leaky Gut
RSI
Infection
Trauma
Ag/Ab
06/03
Inflammation
chemicals
Fibrosis
Scar
Granulation
Amyloid
Tau
MR
Stiffness
Mechanotransduction
Mechanobiology

"A MONUMENTAL WORK."
—DAVID PERLMUTTER, MD,
author of the #1 *New York Times* bestsellers *Grain Brain* and *Brain Maker*

The End *of* Alzheimer's

The First Program to Prevent and Reverse Cognitive Decline

2017

DALE E. BREDESEN, MD
Professor and Founding President, Buck Institute; Professor, UCLA

An Elegant DEFENSE

THE EXTRAORDINARY NEW SCIENCE OF THE IMMUNE SYSTEM

A Tale in Four Lives

PULITZER PRIZE WINNER

MATT RICHTEL

New York Times Bestselling Author

2019

An Elegant Defense
The Extraordinary New Science of the Immune System

Matt Richtel, 2019

Inflammation is defined as "a *curative reaction* of organisms, and morbid symptoms are no other than the signs if struggle between the mesodermic cells and the microbes."

"Pathogens, unlike the healthy cells in our own bodies, don't like to stay in a particular area. They are built to cross borders, push into virgin tissue, spread, eat, and replicate."

"Once inside, the pathogen mingles with our cells, reproduces, makes a colony." "At this point, one or more of a number of first-line immune system cells suspect danger. [The Innate Immune Response] They are the constituents of a fire brigade." "This is inflammation."

"You need inflammation to protect against invaders." BUT "In millions of people, excessive immune response is its own chronic disease." [Key Point]

Pathogens "move around and through barriers in our bodies more easily than other cells."

"Bacteria and viruses replicate very quickly—bacteria can multiply every 20 to 30 minutes, some viruses faster."

"Blood moves from head to toe in seconds. So, if a pathogen gets into the bloodstream, *Whoosh!*" "A major role of the immune system is to keep infection out of our circulatory system."

"When you are first infected, your body generates a kind of generic response. It is during this period that your elegant defense is waiting for your T cells and B cells to generate a powerful response. The delay can take 5 to 7 days."

In injury, with the initial inflammatory response, "there can be more tissue damage 24 hours after the insult takes place than there was at the moment it happened."

"After you experience a wound, even a minor one, the pain and inflammation are worse in the days that follow the event. Your immune system has done housecleaning with industrial-strength chemicals." Then "the macrophages eat."

"The term for one of the key cell types stimulating regeneration of our tissues is *fibroblast*—highly versatile and hearty cells that proliferate and migrate to the site. These cells are drawn by signals sent by macrophages." Macrophages "play a role in stimulating the growth of new tissue."

"As the fibroblast cells come together, they form connective tissue, a bridge between the new and old tissue. At the wound site, the new tissue takes on a granular quality, hence its name granulation tissue. A kind of a tenacious web forms, a fibrous matrix that protects against invading pathogens."

••••••••••

"In times of stress, the release of cortisol comes slightly after the release of one of two other key hormones, norepinephrine and epinephrine. Steroids and these other two hormones are separate but highly related pathways in the stress experience. The first—the release of epinephrine and norepinephrine—is known as the sympathetic response, and it involves the central nervous system."

The "norepinephrine high" is a "survival mechanism in the short term. But in the long term, it is dangerous, even deadly."

•••••••••

"The hygiene hypothesis stated that our environment has become so clean that it has left our immune system insufficiently trained."

"What does an immune system do when it's not properly trained? It overreacts," accounting for the rise in autoimmunity.

••••••••••

"There is arguably no more powerful medicine on earth than antibiotics. They are vital for our survival. Full stop. But their widespread use also threatens now to cause the evolution of bugs that will make past plagues look like the common cold."

"We are pulling back sharply on the use of antibiotics so that the element that saves us doesn't lead to civilization-threatening pandemics."

The Orthopedic Basis of the Chiropractic Subluxation

The June 2015 issue of the journal *Scientific American* has an article by primary care physician Wajahat Z. Mehal, MD, from the Department of Veterans Affairs Medical Center in Connecticut, and Yale University, titled (1):

Cells on Fire

In this article, Dr. Mehal notes that inflammation is set in motion by cells of the immune system, and that it is helpful because it kills pathogens and blocks their spread in the body. The inflammatory cascade, initiated by the *innate* immune response's macrophages, weakens and immobilizes adverse microbes.

However, the same inflammatory cascade can occur when *no* microbes exist, triggered as a consequence of tissue damage and/or excessive tissue stress. This inflammatory response can, in-and-of-itself, become chronic and cause additional tissue damage.

As much as acute inflammation can be beneficial (containing and/or killing pathogens), chronic inflammation can be deleterious, serving no useful purpose.

Dr. Mehal broadly categorized the inflammatory response into two categories:

1) *Infectious inflammation:*
   This is an inflammatory response that is designed to contain and/or kill pathogens.
   This response is critical for individual and species survival.

2) *Sterile inflammation:*
   This is an inflammatory response in which there are no associated pathogens, a response that is triggered by tissue injury and /or excessive tissue stress.

   This response often becomes *chronic*. As such, this response is excessive and harmful.

In 1952, William Boyd, MD, Professor Emeritus of Pathology at the University of Toronto, published his reference text, titled (2):

PATHOLOGY
Structure and Function in Disease

In this text, Dr. Boyd states:

> "The inflammatory reaction tends to prevent the dissemination of infection. Speaking generally, the more intense the reaction, the more likely the infection to be localized."

In 1970, the eighth edition of Dr. Boyd's PATHOLOGY text was published (3):

In chapter 4, titled "Inflammation and Repair," Dr. Boyd states:

> "Inflammation is the most common, the most carefully studied, and the most important of the changes that the body undergoes as the result of disease."

Dr. Boyd notes that in chronic inflammation, the "only cells that proliferate are the fibroblasts." Consequently, the chronic inflammatory response is considered to be a "fibroblast reaction," or "fibrosis." The lesion of chronic inflammation becomes more and more fibrous as the collagen is laid down. The resulting fibrosis is much more marked than in acute inflammation situations. Also, the "newly-formed fibrous tissue invariably contracts as it becomes older."

In 1976, physicians WAD Anderson, MD, and Thomas Scotti, MD, published the ninth edition of their book titled (4):

Synopsis of Pathology

Drs. Anderson and Scotti were Professors of Pathology at the University of Miami School of Medicine. Similar to Boyd, they title chapter 3 of their text "Inflammation and Repair," in which they state:

> "Inflammation is the most common and fundamental pathological reaction."
>
> The agents leading to inflammation include "microbial, immunologic, physical, chemical, or traumatic."
>
> "Chronic inflammation is a process that is prolonged, and proliferation (especially in connective tissues) forms a prominent feature."
>
> "The proliferative activity, leading to the production of abundant scar tissue, may in itself be distinctly harmful."
>
> "The final healed state is achieved by development of a connective tissue scar."

An important premise from Drs. Anderson and Scotti is that in chronic inflammation, "abundant" scar tissue may form, and this connective tissue scar may "itself be distinctly harmful."

In 1979, Harvard Medical School professors Stanley Robbins, MD, and Ramzi Cotran, MD, published the second edition of their book, titled (5):

PATHOLOGIC BASIS OF DISEASE

Chapter 3 of their text "Inflammation and Repair", Robbins and Cotran state:

> "Inflammation serves to destroy, dilute, or wall-off the injurious agent."
>
> "Without inflammation, bacterial infections would go unchecked."
>
> But, "inflammation itself may be potentially harmful:"
>
> Chronic inflammation is "generally of longer duration and is associated histologically with the presence of lymphocytes and macrophages and the proliferation of small blood vessels and fibroblasts."
>
> Tissues are replaced by "filling the defect with less specialized fibroblastic scar-forming tissue."
>
> "Reparative efforts may lead to disfiguring scars, fibrous bands that limit the mobility of joints, or masses of scar tissue that hamper the function of organs."

It is of particular interest to chiropractors that this cascade of inflammation and fibrosis may "limit the mobility of joints."

In 1982, orthopedic surgeon Sir James Cyriax, MD, published the eighth edition of his book titled (6):

Textbook of Orthopaedic Medicine:
Diagnosis of Soft Tissue Lesions

In this text, Dr. Cyriax notes that harmful infections create tissue destruction, resulting in inflammation. Our body recognizes this inflammation and attempts to "wall off" the infectious pathogens by creating a fibrous response. Cyriax states:

> "The excessive reaction of tissues to an injury is conditioned by the overriding needs of a process designed to limit bacterial invasion. If there is to be only one pattern of response, it must be suited to the graver of the two possible traumas. However, elaborate preparation for preventing the spread of bacteria is not only pointless after an aseptic injury, but is so excessive as to prove harmful in itself. The principle on which the treatment of post-traumatic inflammation is based is that the reaction of the body to an injury unaccompanied by infection is always too great."

Once again, a link is expressed between infection, inflammation, and excessive-harmful tissue fibrosis.

In 1983, physicians Steven Roy and Richard Irvin published their book on sports injury titled (7):

Sports Medicine:
Prevention, Evaluation, Management, and Rehabilitation

In this book, Roy and Irvin state:

> "It is important to realize that the body's initial reaction to an injury is similar to its reaction to an infection. The reaction is termed inflammation and may manifest macroscopically (such as after an acute injury) or at a microscopic level, with the latter occurring particularly in chronic overuse conditions."

In 1986, physician and physiologist, Arthur Guyton, MD, published the seventh edition of his book, titled (8):

Textbook of Medical Physiology

At the time of publication, Dr. Guyton was Chairman and Professor of Physiology and Biophysics at the University of Mississippi School of Medicine. Dr. Guyton states:

> "One of the first results of inflammation is to 'wall off' the area of injury from the remaining tissues."

> "This walling-off process delays the spread of bacteria or toxic products."

Guyton expresses the concept of a sequential link between infection, inflammation, and fibrosis. This fibrosis, in the absence of inflammation, creates excessive mechanical impairments that are both mechanically and neurologically deleterious to the individual.

In 1992, physician I. Kelman Cohen and associates published their book titled Wound Healing, Biochemical & Clinical Aspects (9), in which they state:

> "There are two important consequences of being a warm-blooded animal. One is that body fluids make optimal culture media for bacteria. It is to the animal's advantage, therefore, to heal wounds with alacrity in order to reduce chances of infection."

> "The prompt development of granulation tissue forecasts the repair of the interrupted dermal tissue to produce a scar." In addition to providing tensile strength, scars are believed to be a barrier to infectious migration.

Cells, Tissues, and Disease
Principles of General Pathology

Second Edition

Guido Manjo, MD and Isabelle Joris, PhD

Oxford University Press
2004

Chapter 8
"Introduction to Inflammation"

"Inflammation is one of the basic processes in general pathology."

"Inflammation is primarily an antibacterial phenomenon." However,

1) "*Inflammation operates against all invaders*, including viruses, worms, fungi, and other parasites."

2) "*Inflammation is also triggered aseptically by injured tissues*."

"There can be inflammation without infection; remember that inflammation is triggered by products of tissue injury, thus any aseptic injury will trigger inflammation."

Injury means damage.

"The term exudate always refers to the product of inflammation, namely the extravascular mixture of protein-rich fluid and cells."

"Because local injury is part of everyday life, inflammation is probably the most common aspect of tissue pathology and has always been perceived as a central issue in the practice of medicine."

"Today we know that inflammation is a life-saving reaction, usually against infection."

Chapter 12
"The Inflammatory Exudate"

The evolutionary significance of inflammation is as a primary antibacterial response. "It is a matter of urgency. The doubling time of common pathogenic bacteria is of the order of 20 minutes. The number of bacteria required to produce clinical infection is about 10^5 per gram of tissue [100,000]; a single bacterium could reach that number in just 6 hours. Therefore it is essential to destroy the colony as soon as possible. Once bacteria have penetrated a tissue, there is a grace period of 2—4 hours during which the course of the infection can be influenced most successfully; after 6 hours the beachhead is well-entrenched and treatment is more difficult."

"Therefore, *an efficient antibacterial defense program requires that the acute inflammatory response be triggered BEFORE the bacteria reveal their presence.* The price to pay is that any kind of tissue damage, infected or not, will induce an immediate acute inflammatory response."

"Solid masses or sheets of fibrin are often seen on an inflamed surface."

"With the microscope, some fibrin is found in nearly all acutely inflamed tissues, but an exudate is called fibrinous when fibrin deposition is the dominant feature."

Chapter 13
"Chronic Inflammation: Defense at a Price"

Chronic inflammation causes increasing "collateral damage."

"Remember that all organs are made up of two components:

parenchyma (the functional part, i.e., glands, ducts, muscle) and

stroma (the 'bed' in which the parenchyma lies: connective tissue, vessels and nerves).

Inflammation takes place in the connective tissues."

"Normal cells do not thrive in a bath of inflammatory cytokines."

Granulation tissue "is a key component of chronic inflammation."

"After a day or two of acute inflammation, the connective tissue—in which the inflammatory reaction is unfolding—begins to react, producing more fibroblasts, more capillaries, more cells—more tissue. In other words, granulation tissue arises from normal connective tissue, but it cannot be mistaken for normal connective tissue, because its fibroblasts are plumb and activated."

"*Granulation tissue often acts as a barrier, e.g., forming a sheet between normal and dead tissue*, or between normal and infected tissue."

"With time, granulation tissue loses most of its cells, the collagen component increases, and the terminal picture blends with that of scar."

"Fibrosis means an excess of fibrous connective tissue. It implies an excess of collagen fibers, with a varying mixture of other matrix components. It can be a *local* phenomenon, as an end result o chronic inflammation and of wound healing."

"When fibrosis develops in the course of inflammation it may contribute to the healing process." "By contrast, an excessive or inappropriate stimulus can produce severe fibrosis and impair function."

Fibrotic tissue "consists of cells and fibers, with few vessels; and it tends to contract very slowly, over weeks and months or longer."

"'Fibrotic' collagen is characterized by *excess of hydroxylation and cross-linking*."

"Why does fibrosis develop? In most cases the beginning clearly involves chronic inflammation. Fibrosis is largely secondary to inflammation."

Fibrosis can be induced not only by inflammation and wound healing, but also by ischemia, alcohol abuse, radiation exposure, and a number of drugs.

In ischemia/hypoxia, there is increased anaerobic metabolism, which increases production of lactic acid. Increased lactic acid increases collagen production.

••••••••••

For more than half a century, experts in pathology, physiology, orthopedics, sports injuries, and wound healing have suggested the following model:

Inflammation is a paradox. Inflammation can directly kill pathogens. Inflammation also triggers a fibrous response that walls-off infection so that the pathogens are less likely to spread and kill the host. Without inflammation we would die of infection. All who are alive today had ancestors that could successfully initiate an inflammatory response, kill pathogens, and wall off the pathogens.

Infection can kill the young before they can reproduce. Hence, a strong inflammatory response is genetically selected, giving those with such a response a survivability advantage. Our ancestors genetically handed down these traits and we possess them. In a world prior to the availability of antibiotics, inflammation, with reactive walling-off fibrosis to contain pathogens, is desirable because it increases host survivability.

Infections were the primary cause of death for humans for millennias. Infections remained the primary cause of human death until very recent history, only a few decades ago.

Infection is not the only cause of inflammation. As noted above, inflammation is also triggered by trauma, excessive tissue stress, chemicals, and immunologic responses. Apparently, the body cannot distinguish the different causes of inflammation from each other, and they all trigger a fibrous response. "The resolution of inflammation in the body is fibrosis."

This fibrosis response is necesasary when there is an infection, it is life-saving. However in an aseptic sterile injury or tissue stress, the fibrous response is excessive and it creates adverse mechanical deficits. These adverse mechanical deficits create tissue stiffness and limit the mobility of joints. These mechanical deficits impair local biomechanical function, affecting performance, generating pain, and accelerating degenerative changes.

Common Vertebral Joint Problems

Gregory P. Grieve FCSP DipTP
Honorary Fellow of the Chartered Society of Physiotherapy
Formerly Clinical Tutor, Department of Rheumatology and Rehabilitation, Norfolk and Norwich Hospital
and Clinical Tutor, Spinal Treatment Unit,
Royal National Orthopaedic Hospital, London

Foreword by

Philip H. Newman CBE DSO MC FRCS
Lately Consultant Orthopaedic Surgeon to the Middlesex Hospital, and Consultant Surgeon to the Royal National Orthopaedic Hospital and Institute of Orthopaedics, London
Past President of the British Orthopaedic Association and formerly Chairman of the British Council of Management of the Journal of Bone and Joint Surgery

SECOND EDITION

"There is new evidence to support the view that suppleness and flexibility of muscle and connective tissues are of prior importance."

"Long and continued occupational and postural stress, asymmetrically imposed upon the soft tissues, tends to cause the fibroblasts to multiply more rapidly and produce more collagen."

"Because of this trespass, the tissue loses elasticity."

CHURCHILL LIVINGSTONE
EDINBURGH LONDON MELBOURNE AND NEW YORK 1988

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"Our bodies respond to mechanical input."

The conversion of mechanical input to "biochemical processes is called *mechanotransduction*."

Mechanotransduction is the "process by which cells sense and then translate mechanical signals (compression, tension, fluid shear) created by their physical environment into biochemical signals, allowing cells to adjust their structure and function accordingly."

"Gravity is one force your body responds to constantly."

"The loads created by gravity depend upon our physical position relative to the gravitational force."

The load created by gravity differs depending on alignment with the "perpendicular force of gravity."

"We experience load 100 percent of the time."

"The physical expression that is your body is the sum total of the loads experienced by your cells."

"Every unique joint configuration, and the way that joint configuration is positioned relative to gravity, and every motion created, and the way that motion was initiated, creates a unique load that in turn creates a very specific pattern of strain in the body." This is called "*load profile*."

Every load creates a "unique cellular deformation."

"It's not the *weight* that breaks you down, it's the *load* created by the way you carry it."

"Loads are often oversimplified to 'weight' because it makes them easier to understand, but there is much more going on with your sore knee (or foot, or back, or pelvic floor) than your weight."
"Weight is not the be-all and end-all of loads. When you want to improve your health, it's much more important to consider *how you carry* your weight than to spend hours contemplating the lone data point that is Your Weight."

"No matter the activity, when it comes to health, of utmost importance is the loads created."

“Every rate, size, and angle at which a force is being applied creates a unique environment for your cells.”

“The timing and rates of loads are important because loads are *occurrences over a period of time*.”

Each tissue type responds differently to a load, yet “they are all connected, which means that a load you perceive as only happening in one part of your body is actually affecting all other parts of you, and affecting each part uniquely.”

“We should recognize our lack of health as a sign of a broken (mechanical) environment.”

“With respect to disease, the human’s internal mechanical environment has been the least-discussed environment of all—a staggering oversight when almost every cell in your body has specialized equipment *just to sense the mechanical environment*.”

“You can eat the perfect diet, sleep eight hours a night, and use only baking soda and vinegar to clean your house, but without the loads created by natural movement, all of these worthy efforts are thwarted on a cellular level, and your optimal wellness level remains elusive.”

“Human diseases are repeatedly explained to us in terms of their chemical or genetic makeup; meanwhile, we’ve completely ignored the load profile that the function of our body depends upon.”

“Whether out of convenience or ignorance, we have failed to address the habitat [“habitual position relative to gravity”] in which our genes dwell, and the impact of the way we move on the state of our health.”

“The loads that are perceived by your cells’ mechanosensors, and the response triggered by the cell deformations—are collectively called the mechanome. A mechanome is the interplay between forces and biology.”

“Movement, like food, is not optional.”

“Movement is what most humans are missing more than any other factor, and the bulk of the scientific community has dropped the ball.”

“A decrease in movement is associated with decreases in muscle size, vascularization, and the sensitivity in your proprioceptive system.”

“Cellular loads are an inherent part of movement.”

“Movement, position, and resting state of our musculoskeletal system are huge influencers of our mechanical environment.”

“All movement and lack of movement create subtle differences in outcome in individuals and their genes.”

“Our lack of movement input is slowly suffocating us on a cellular level.”

The amount your joints move is integrated by your sensory system. “Movement provides information for the body. Movement is an environmental or epigenetic factor. Our movement environment has been polluted.”

“If you want your health to change, you must change the way you move.” Even tiny adjustments to your loading “can be worth millions in unspent healthcare dollars and bring about tremendous relief from your load-induced ailments.”

“Tissues that spend most of their time in a fixed position will adapt to that position by making alterations that are fairly permanent.”

“An under-moved area of the body will experience increases in the connective tissues.” The author calls these “extra-connected” areas of the body “sticky spots.”

Immobility-induced connective tissue growth creates a binding and “behaves much like scar tissue.”

“On the cellular level, a sticky spot interferes with the transmission. Of forces throughout your tissues—mechanical signals that give cells context about loads placed upon them as well as position.”

When a joint has a sticky spot, “you compensate by moving other joints,” which may “come with a heavy dose of damage.” Areas just outside of the sticky spot “experience unnaturally high loads.”

Exercise cannot come close to restoring the tissues already adapted. “Exercise is good, but not good enough.”

Small deformations translate into a constant stream of data to your brain and require constant communication throughout most of your body.

“We need a tool to measure the loads, both on the whole body and on every body part. The tool I use is alignment.”

Muscles become physically shorter in response to “chronic joint positioning.”

"EXPLORES HOW INDUSTRY HAS MANIPULATED OUR MOST DEEP-SEATED SURVIVAL INSTINCTS."

—DAVID PERLMUTTER, MD, AUTHOR OF THE *NEW YORK TIMES* BEST SELLERS *GRAIN BRAIN* AND *BRAIN MAKER*

2017

THE HACKING *of the* AMERICAN MIND

The Science Behind the Corporate Takeover of Our Bodies and Brains

ROBERT H. LUSTIG, MD, MSL

AUTHOR OF THE *NEW YORK TIMES* BEST SELLER *FAT CHANCE*

The Hacking of the American Mind
The Science Behind the Corporate Takeover of Our Bodies and Brains

Robert Lustig, MD
Avery, 2017

Background (not in the book)

- Increased, sustained sympathetic tone increases the release of norepinephrine.

- Increased, sustained sympathetic tone that increases the release of norepinephrine has many deleterious health effects, including immunosuppression, increased pain, vascular constriction, artery disease, visceral pathology, and shortened telomere length.

- Chiropractic spinal adjusting works in part because it improves mechanical integrity that in turn inhibits sympathetic tone and inhibits the release of norepinephrine.

- Norepinephrine is a chemical member of the group catecholamines.

- Other catecholamines, particularly dopamine, can readily be converted into norepinephrine.

- Lifestyles that increase the levels of the catecholamine dopamine also increase the levels of the catecholamine norepinephrine, making it more difficult for the chiropractic adjustment to effectively improve health by inhibiting sympathetic tone and inhibiting the release of norepinephrine. Such lifestyles effectively render the chiropractic adjustment as an exercise in "swimming upstream." Such lifestyles did not exist in the heydays of DD and BJ Palmer, but they are the rule today. Such lifestyles are against innate intelligence.

- Potentially the best book ever written to help understand such lifestyles and how it has negatively influenced neurochemistry and health is The Hacking of the American Mind, by Robert Lustig, MD.

Two Stories From 2019 (not in the book)

In my travels this year, two chiropractors shared nearly identical experiences. The chiropractors do not know each other. One is from Northwestern and the other is from Palmer Davenport. Both claimed life-changing events while participating in a chiropractic mission to third world countries (one in Asia and the other in a Caribbean country). Both claimed observing more chiropractic miracles in a single week than either had experienced in decades of clinical practice in the US. These

third world patients do not have lifestyles that increase levels of the catecholamine dopamine. Despite poverty, they live the innate lifestyle.

The Book

Robert Lustig, MD, is a pediatric endocrinologist at the University of California, San Francisco. His goal is to have the reader understand that *pleasure* and *happiness* are similar, as they both feel good, but they are not the same. *Pleasure* and *happiness*, are separate phenomena, and often function as opposites. They are controlled by different neurochemicals:

Dopamine is the neurochemical for *pleasure*.

Serotonin is the neurochemical for *happiness*.

In our instant gratification culture, we buy a *pleasure* to increase *happiness*. But this changes our brain and saps our happiness, making us unhappy. Our minds have been "hacked." Ironically, the more affluent the society (as contrasted to third world), the greater the hacking, the more the population is addicted to pleasure seeking, and the greater the societal unhappiness.

Governments and business have been able to harness the confusion between *pleasure* and *happiness* for their own purposes by taking advantage of our neurobiology.

People should understand the neuroscience of *pleasure* and *happiness*, each one's relationship to the other, and how they are manipulated by our current food, technology, and media environments. Industries willfully confuse the concepts of *pleasure* and *happiness* with the sole motive being profit. They prey and capitalize on our addictions [*pleasures*] in the name of selling *happiness*.

Pleasure and *happiness* rely on the presence of each other, but they are decidedly different phenomena. Both *pleasure* and *happiness* have been slowly and mysteriously vanishing from our global ethos as the prevalence of addiction and depression continue to climb.

In the last half-century, America and most of the Western world have become more and more unhappy and sicker.

Most confuse *pleasure* with *happiness*. Corporations have profited big from increased consumption of virtually everything by promising *happiness*, but they are really selling *pleasure*, and we have lost big-time. People have abdicated *happiness* for *pleasure*. We have been suckered into believing that no *pleasure* means no *happiness*. Chronic excessive *pleasure* eventually leads to addiction and depression, the two most unhappy states of the human condition.

Chiropractic Connection

Modern lifestyles are against innate intelligence. They purposefully exploit *pleasure* (dopamine) at the expense of *happiness* (serotonin). Dr. Lustig eloquently attributes this to a profit motive. The chiropractic connection is that such elevated levels of dopamine also result in elevated levels of norepinephrine, reducing the historic effectiveness of the chiropractic adjustment. Yet, apparently, chiropractic miracles remain commonplace in less affluent societies whose inhabitants have experienced less “hacking” of their brain neurochemistry.

This book is one of the most important books ever written for anyone who truly wants to understand the modern world and its ills. It also shows a pathway for solutions, and that is a return to the innate lifestyle.

Dan Murphy, DC

↓ Telomeres

Shrinks Brain

↑ Blood Pressure

Damaged Blood Vessels

Vasoconstriction → ↓ ATP

↑ Pain

Immunosupressive

↑ Consumption

Needing

Wanting

Food / Sex

Short-Lived

Things

Reward

Pleasure

Long-Lived

Deeds

Contentment

Happiness

Catecholamines

Norepinephrine ← Cu / Cu/Zn — Dopamine

SCG — Post GSE

× 120

LVII — Pre GSE ⊖

mechanoreceptors

Tyrosine

Junk Food

Chocolate

Alcohol

Narcotics

Caffeine

Sugar

Shopping

Social Media

Phenyl-Alanine

Aspartate

[Aspartame]

↓

NMDA

↓

Ca^{++}

↓

FR

↓

Neuro Degen Dis

Serotonin

Tryptophan

Least Common

Not in Corn

Low in Animals Fed Corn

Jamie Laing (39)
Drawing # 5

* BRAIN SHRINKS *

↑ Blood Pressure

Damaged Blood Vessels

VASOCONSTRICTIVE = ↓ATP

↑ PAIN (↓nociceptive threshold)

IMMUNOSUPPRESSIVE

(Need / Want)
↑ CONSUMPTION

FOOD/SEX

Pleasure is
SHORT-LIVED

Activated by
THINGS

PLEASURE
(REWARD)

* Need ↑ TRYPTOPHAN
activated pathway
⋮
↓ TYROSINE

* DOPAMINE < SEROTONIN

Happiness becomes
LONG - LIVED

Doing Good
DEEDS

HAPPINESS
(CONTENTMENT)

NOREPINEPHRINE ← *Catacholamine* DOPAMINE
Cu : Zn

POST GSE — *From Symp. Chain Ganglia

x 120

PRE GSE — *From Lamina VII

MECHANORECEPTORS

↓ mechanoreception = ↑ symp.

TYROSINE

- Narcotics
- Caffeine
- Sugar
- Shopping
- Junk food
- Chocolate
- Alcohol
- SOCIAL MEDIA

PHENYL-ALANINE
+ Aspartate
= Aspartame
↓
N-Methyl-D-Aspartate
↓
Ca^{++}
↓
FREE RADICALS
↓
NEURO-DEGENERATIVE Dx.

SEROTONIN

TRYPTOPHAN

- LEAST common in food
- NOT in CORN
- LOW in animals fed CORN

Dan Murphy, DC
PO Box 7044
Auburn, CA 95604
Phone: (530) 878-6869
Fax: (530) 878-6559
www.danmurphydc.com
Email: dan@danmurphydc.com

Seminar Coordinator
General Contact and
Professional Assistant:
Michelle Schaer DC
(602) 826-2277
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Did You Know?

- Spinal stiffness was linked to visceral pathology with nearly 100% accuracy based upon sympathetic innervation. (*Medical Times*, 1921)

- 1,000 capsules of Tylenol in a lifetime doubles the risk of end stage renal disease. (*New England Journal of Medicine*, 1994)

- The average time for a whiplash-injured patient to achieve maximum improvement is 7 months 1 week. (*Spine*, 1994)

- 93% of patients with chronic whiplash pain who have failed medical and physical therapy care improve with chiropractic adjustments. (*Injury*, 1996)

- Taking the correct drug for the correct diagnoses in the correct dose will kill about 106,000 Americans per year, making it the 4th most common cause of death in the US. (*Journal of the American Medical Association*, 1998)

- Nonsteroidal anti-inflammatory drugs for rheumatoid and/or osteoarthritis conservatively cause 16,500 Americans to bleed to death each year, making that the 15th most common cause of death in the US. (*New England Journal of Med*icine, 1999)

- Glutamate and aspartame can cause chronic pain sensitization, and removing them from the diet for 4 consecutive months can eliminate all chronic pain symptoms. (*Annals of Pharmacotherapy*, 2002)

- Chiropractic spinal adjusting has been shown to be better than 5 times more effective than the NSAIDs pain drugs Celebrex and Vioxx in the treatment of chronic neck and low back pain. (*Spine*, 2003)

- In patients suffering from chronic pain subsequent to degenerative spinal disease, 59% can eliminate the need for pain drugs by consuming adequate levels of omega-3 essential fatty acids. (*Surgical Neurology*, 2006)

- Chiropractic adjustments have been shown to significantly lower blood pressure. (*Journal of Human Hypertension*, 2007)

- The estimated incidence of chronic pain from whiplash trauma is 15-40%. (*Jour of the Am Academy of Ortho Surg*, 2007)

- Meniere's Disease has been linked to a disorder of the upper cervical spine facet joints. (*International Tinnitus Jour*, 2007)

- Supplementing with vitamin D3 has the potential to reduce cancer deaths in America by 75%. (*Ann of Epidemiology*, 2009)

- Potentially, the largest exposure of Americans to the neurotoxin mercury is through the consumption of products containing High Fructose Corn Syrup. (*Environmental Health*, 2009)

- Those who consumed the highest amounts of nonsteroidal anti-inflammatory pain drugs increased their risk of dementia, including Alzheimer's dementia, by 66%. (*Neurology*, 2009)

- The newest estimate for the incidence of autism is 1 in 91 US children. (*Pediatrics*, 2009)

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Dr. Dan,
Any chiropractor that truly cares about his patients and not about just making a buck needs to be subscribing to your Article Review Updates. I certainly am going to do my part to see that each chiro I come in contact with knows what an absolutely invaluable resource it is. I sat in amazement at the last two articles you sent regarding antibiotic overuse and atopic disorders. What crucial information to pass on to my practice members. Thanks and keep up the awesome work. Dr. G.M.; August 1, 2002
Dear Dan,
I hope you can continue providing this information for many years to come. I have been in practice for 18 years and find these citations to be the most informative, chiropractically relevant information that I have received in my career. I would be willing to pay more for this information to make sure that it keeps coming. Again, thank you!! JR, DC; January 8, 2005

Dan Murphy, DC

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