

Neurology for the Practicing Chiropractor

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Background:

- ◆ BS in Health Sciences BYU
- ◆ DC from Life-West
- ◆ DACNB from American Chiropractic Neurology Board
- ◆ Private Practice Sonoma, CA 1996-present

Disclosures:

- ◆ Team Chiropractor “Sonoma Stompers” 2015-present
- ◆ Vice President CCA-North Bay District 2015-present
- ◆ Vice President of Rosemarie Piper Foundation 2008-present
- ◆ Senior Examiner for ACNB 2001-present

Personal Principles:

- ◆ I am a Vitalist at heart
- ◆ Know your craft...love your craft and people will seek you out
- ◆ Give more than you take or need
- ◆ Love deeply, laugh often and be a good friend
- ◆ Don't sweat the small stuff...

Learning objectives:

- ◆ Sharpen old and introduce new examination skills
- ◆ Understand concept of Hemisphericity
- ◆ Caring for the patient with dizziness, lightheadedness or vertigo
- ◆ Application of Neuro and spinal rehabilitation
- ◆ Chiropractic techniques: How and why so many different techniques work

What's the Takeaway...

- ◆ Seeing with new “eyes”
- ◆ Utilize in practice immediately
- ◆ Understand and apply concepts
- ◆ Inspired to learn and study neurology on your own

Let's get started...



MEDICINE

RARE STUDY OF SIAMESE TWINS IN SOVIET

Masha and Dasha



Balancing themselves on shared legs, these sisters are bound to each other physically—and permanently. This picture was taken nine years ago in the U.S.S.R., when Masha (*left*) and Dasha (*right*) were 7; they are now 16. They are Siamese twins. Between them they have four arms, but only three legs—two perfectly good ones plus a third vestigial leg, partly visible behind Dasha's left arm.

At the age of 7, Masha and Dasha showed how to stand up on their own.

Prosthetics, during the years, helped them learn how to walk.





A 1937. Masha and Dasha, seated on a couch, are held by camera behind their closed lips, as they await the arrival of their admirer. (Source: *Portrait of a Young Girl*, by Ilya and Evgeny Ilya.)

are entirely different, although they have identical genes and share the same environment as fully as any two human beings ever can. Dasha—the one on the right—is quick, bright and serious. She loves to read. She is also more temperamental and usually wins a sisterly argument. Masha has always been slower. “She is a light-minded chatterbox,” says Professor Anokhin, “and already flirts with boys.” But a few years ago when



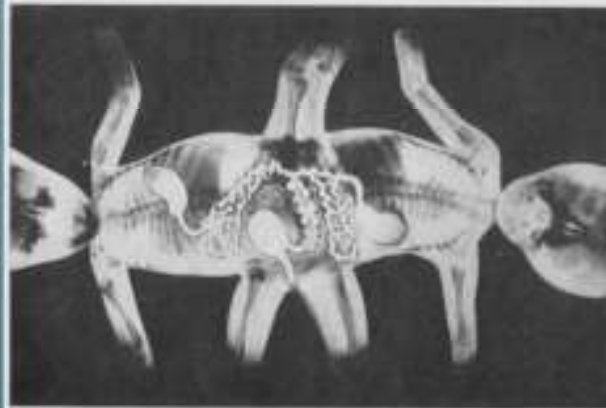
FIGURE 1. In the top picture, as a pediatrician presses on Dasha's side of the foot, Dasha cries out while Masha feels nothing. In the bottom picture Masha cries when the other side of the foot is tickled. The X-ray at left was



RARE STUDY OF SIAMESE TWINS IN SOVIET

Masha and Dasha

They can sleep, cry and become ill separately



In these pictures, taken when the twins were a year old, their leg is at the top, on the left of their body. It has a child with eight toes. Half of Masha's, half Dasha's. She can feel pain in her half leg, but not in Dasha's—an error. In the top picture, pediatrician probes on Dasha's side of the foot. Dasha cries out while Masha lies motionless. In the bottom picture Masha cries when the other side of the foot is tickled. The X-ray at left was taken when the girls were babies. A superimposed drawing shows how Masha's and Dasha's internal organs and bones are connected. Their pelvic bones join and their spines meet at the coccyx. Their circulatory system is

Although their spines connect, their spinal cords do not. Hence their nervous systems—e.g., sense of touch—are totally distinct. They become ill separately, fall asleep separately. They

have two stomachs (double in drawing), and separate upper intestines which join into a single lower intestine and rectum. They have four kidneys—but only one bladder, and they don't always agree on when to urinate; sometimes one twin wants to and the other doesn't. Soviet doctors say there is no physiological reason why Masha and Dasha could not become a mother; they have a common reproductive system.

LIFE

One Body, Two Souls

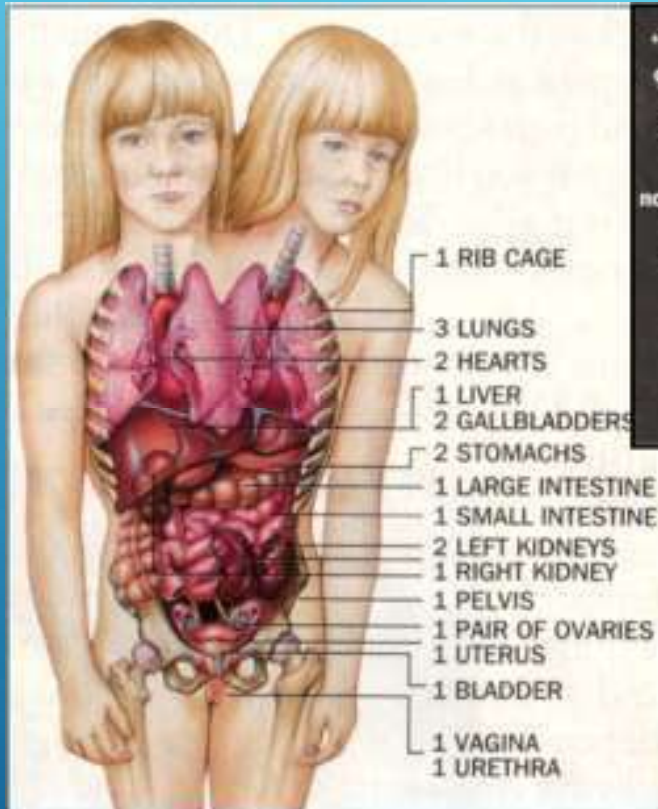
JOINED SINCE BIRTH, Abigail and Brittany Hensel want to stay that way FOREVER. A story of one family's COMPLEXION and COURAGE.



PHOTOGRAPH BY JEFFREY M. HARRIS
 STYLING BY JENNIFER L. HARRIS
 HAIR BY JENNIFER L. HARRIS
 MAKEUP BY JENNIFER L. HARRIS
 DRESS BY JENNIFER L. HARRIS
 SHIRT BY JENNIFER L. HARRIS
 SHOES BY JENNIFER L. HARRIS



"They're two people above the waistline, one below," says the twins' pediatrician, Dr. Jay Westerdale. Food is digested in two separate stomachs but excreted through shared intestines; nutrients reach both. If they were separated, their formerly joined veins could not support functioning, profligate, bodies. Should they stay joined, the twins could have a baby someday. Their life expectancy is normal, but if one were to fall seriously ill, the other would be in jeopardy.



- 1 RIB CAGE
- 3 LUNGS
- 2 HEARTS
- 1 LIVER
- 2 GALLBLADDERS
- 2 STOMACHS
- 1 LARGE INTESTINE
- 1 SMALL INTESTINE
- 2 LEFT KIDNEYS
- 1 RIGHT KIDNEY
- 1 PELVIS
- 1 PAIR OF OVARIES
- 1 UTERUS
- 1 BLADDER
- 1 VAGINA
- 1 URETHRA

"They're two people above the waistline, one below," says the twins' pediatrician, Dr. Joy Westerdahl. Food is digested in two separate stomachs but excreted through shared intestines; nutrients nourish them both. If they were separated, their formerly joined sides could not support functioning prosthetic limbs. Should they stay joined, the twins could have a baby someday. Their life expectancy is normal, but if one were to fall seriously ill, the other would be in jeopardy.



The twins were happy infants (left, at three months, before the removal of their vestigial arm). And they've grown to be rambunctious six-year-olds (right, with mom Patty and brother DaKota). Their health is generally good, although they have suffered two bouts of pneumonia and a kidney infection. Britty tends to get more colds than Abby; if Britty's throat is sore, Abby can take the medicine for her. Oddly, says Patty, "whoever has the fever will be ice-cold, while the other one is sweating buckets."

dicephalus: No more than four sets of surviving twins in recorded history have shared an undivided torso and two legs. Each of the Hensel twins has her own heart and stomach, but together they rely on three lungs. Their spines join at the pelvis, and below the waist they have the organs of a single person. Each controls the limbs and trunk, and feels sensations, on her own side exclusively: If you tickle the ribs on the right, only Abby giggles. Yet the girls manage—no one knows exactly how—to move as one being.





People say, "We pray for you and the girls," says Patty. "But we don't need anyone to feel sorry for us."





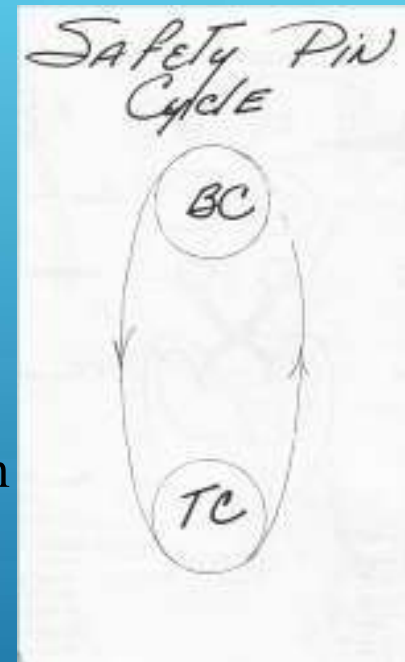


Learning to ride a bike, the twins say, was "very hard"—but only the balancing part. Pedaling together came naturally. Although the girls have separate spinal cords, there may be connections between their nervous systems that help them coordinate movements.



Out with the old...maybe not:

- We are receptor driven
- Afferent system is the driver
- Efferent system reacts/responds
- Purpose of Nervous System: to receive and transmit information.
- BJ's Safety Pin Cycle was pretty spot on



In with the new...

New imaging has allowed us to expand our understanding of the brain and its function



A Few Neurological Concepts:

- Hemisphericity
- Central Integrated State of the Neuron
- Neural Plasticity: The ever changing Brain
- Metabolic Capacity: Cellular and Global
- Active inhibition vs Active excitation of neuronal pools
- Reciprocal inhibition
- Longitudinal Level of the Lesion(LL)/Vertebral Subluxation Complex
- Hard Pyramidal signs Vs Soft Pyramidal signs
- Biological Half life of muscle protein= 6-10 days
- Neurons need: 1. Fuel 2. Oxygen 3. Activation
- Neurons that fire together...wire together

D.D. Palmer Neural Tone Theory



Life is the expression of tone. In that sentence is the basic principle of Chiropractic.

Tone is the normal degree of nerve tension. Tone is expressed in functions by normal elasticity, activity, strength, and excitability of the various organs, as observed in a state of health. Consequently, the cause of disease is any variation of tone-nerves too tense or too slack.

Tone is the foundation upon which I built the science, reasoned out its philosophy and created the art of adjusting luxated vertebrae.

The amount of nerve tension determines health or disease. In health there is normal tension, known as tone, the normal activity, strength and excitability of the various organs and functions as observed in a state of health. The kind of disease depends upon what nerves are too tense or too slack.

D.D. Palmer Neural Tone Theory

Functions performed in a normal manner and amount result in health.

Diseases are conditions resulting from either an excess or deficiency of functioning.

The tone or tension of muscles and organs depends upon the tonicity of the nervous system. The science or philosophy is built on tone. The source of every chiropractic principle whether physiological or pathological is founded on tone.

Tone, in biology, is the normal tension or firmness of nerves, muscles, or organs, the renitent, elastic force acting against an impulse. Any deviation from normal tone, that of being too tense or too slack, causes a condition of renitence, too much elastic force, too great resistance, a condition expressed in function as disease.

DD Palmer, "The Chiropractor's Adjustor", 1910

The Central Nervous System Synapses

- “Every medical student is aware that information is transmitted into the central nervous system mainly in the form of nerve impulses through a succession of neurons, one after another. However, it is not immediately apparent that each impulse (1) may be blocked in its transmission from another neuron to the next, (2) may be changed from a single impulse into repetitive impulses, or (3) may be *integrated* with impulses from other neurons to cause highly intricate patterns of impulses in successive neurons.”
- GUYTON, A TEXTBOOK OF MEDICAL PHYSIOLOGY (8th ed), P. 481-82 WB Saunders, Philadelphia, 1991

The Central Integrated State of Neurons

“Our understanding of human neurophysiology is based upon the fact that membrane potential differences exist between internal and external environments of a neuron. It is true that, in the laboratory, resting membrane potentials can be observed. However, due to the complexity of human behavior and environmental stimulation, it is doubtful that a true resting membrane would exist in man. In fact, in man, there is always a constant flux of membrane potential differences which occur as a result of spatial a temporal synaptic bombardment, as well as the effects of other factors such as pH, oxygen tissue saturation and changes in temperature.

The Central Integrated State of Neurons

“This constant change in membrane potential differences can be visualized as shifts toward either depolarization or hyperpolarization. That is to say, towards a more or less excited state. This has led some to believe that neurons can actually exist in either an inhibited or excited state, and thus, we have the terms central inhibitory and central excitatory states of neurons. Unfortunately, these blanket terms do not realistically portray human nervous system function during life, which, as stated earlier, is forever changing.

The Central Integrated State of Neurons

“The function of the human nervous system is an integration of all those things which collectively result in potential differences across the membrane of a neuron. The integration of these effects is different at individual neurons, at different times during human function, due to the interrelationships of centripetal and centrifugal activities of neurons.

The Central Integrated State of Neurons

“In this regard, I refer to the description of membrane potential differences as the central integrative state of a neuron. This definition has profound clinical ramifications as the clinician can augment a multitude of factors which, in and of themselves, can change the central integrative state of a neuron and provide far reaching therapeutic consequences.”

Dr. Frederick R. Carrick. 1984

Gravitational influence on Physiology:

“The majority of stimulation of the brain comes from muscles, joints, especially from the postural muscles in the form of unconscious, touch, or perception. The source of this stimulation is gravity which is the only constant source of stimulation in our environment. The discussion about changes in the genetic production of cells increased cells in the early hominid brain. It was determined that it required activation and increased connectivity in order to survey. The bi-pedal posture of early hominids required a larger cerebellar and cortex to coordinate and control this

Gravitational Influence Cont.

movement. This increased size and most likely provided new cortical cells with available connection sites. The cortical cells also connected to other cortical cells, forming association areas in the brain, which in turn, altered better cross-communication and inter-hemisphericity. The cells require a source to keep them active and that source is gravity. Its harnessed by the bi-pedal posture, which dramatically increased the frequency and duration of constant firing to the brain from muscle and joint receptors in the spine and postural muscles. This not only maintains an increased number of cells that require increased number

Gravitational Influence Cont.

of glial cells for support, but would also form a dense network of connection."

Melillo, Robert, Leisman, Jerry. "Neurobehavioral Disorders Childhood: An Evolutionary Perspective." Chp. 3 p.38 Klijv Academic/ Klemum Publishers. New York.2004

Temporal Summation:

Integration that the neuronal level occurs because of a process known as “summation.” Temporal summation occurs when the same input is triggered repeatedly so that the excitation or stimulus threshold is lowered to permit the cell to fire. The concern is the speed in which the contacts fire. Each time a wave of polarization passes through the cell, it will degrade in approximately 15ms, however, when the cell is activated. It can super add that wave on top of the previous waves. This increased frequency results in a dramatic increase in amplitude. This amplitude can depolarize many cells.

Spatial Summation:

Spatial summation results when sufficiently different dendritic spines are stimulated simultaneously, so that firing threshold is reached. In spatial summation, the more contacts that activate the cell simultaneously, the greater the likelihood the cell will depolarize sufficient to produce an action potential. The most important aspect of stimulation is frequency which means that the more often the brain is stimulated, the more it will grow.”

Schneider, JS, Wojowicz, JM “Effects Of Adult and Neurogenesis on Synaptic Plasticity in the Right Dentate Gyrus.” *Journal of Neurophysiology*. 88, pp. 23-24, 31, 2001.

Jamell, C and O’Mara, SM “Plasticity and the Projection From the Anterior Thalamic Nuclei To the Anterior Cingulate Gyrus On the Right In Vivo: Peripulse Facilitation. Long-term potentiation and Short-term depression.” *Neuroscience*. 109, pp 401-406
2002.

Gravitational Influence on Physiology

“Humans cannot survive very long without gravity, whether in space, under water, or lying in bed. Results and damage are similar. All of the physiological changes we see in astronauts we also see in people who are in extended bed rest.”

Kessler, JG, Cook, JR “Cognitive Performance In Space and In Antigravity Environments.” International Journal of Cognitive Ergonomic. Pp. 351-372. 1999.

Gravitational Influence on Physiology

“There are cases of “space dyslexia”. Astronauts describing symptoms of the same profile that we see in children with Attention Deficit Hyperactive Disorder, another learning disability and “cognitive processing problems.”

Waylan, R “Musculoskeletal Adaptation To Mechanical Forces On Earth and In Space.” *Physiologists* 36 S127-S130.1993.

Eddy, DR, Schiflett, Schlegelre, Schehab, RL “Cognitive Performance Aboard the Life and Microgravity Space Lab.” *Acta Astronautica* 43 pp. 193-210. 1998.

Gravitational Influence on Physiology

“University of California Berkeley’s rats showed increased plasticity and growth of the brain when they used their muscles and joints “in novel and interesting ways.” When the same type of rat goes into space, they have reversed plasticity and show rapid degeneration of their brain cells.”

DeAmelio, F, Woo, LC, Fox, RA, Dalton, MG, Kirkoran, ML, Polyakovi. “Hypergravity Exposure Decreases Gamma Amino Butyric Acid Immunoreactivity In Axon Terminals, Contact In Pyramidal Cell In The Rat, Somatosensory Cortex, A Quantitative Immunopsyochemical Image Analysis.” *Journal of Neuroscience Research*. 53. pp. 135-1742. 1998. B.



A good history and then some...Observe

- Disposition
- Sweating: Clues to metabolic capacity
- Skin: Pallor, redness, puffy, etc...
- Eyes: Sclera, lid lag/droopy, Skew deviation
- Sitting Posture: Antalgic, Slouching, Defensive
- Speech Patterns: Responsiveness, Appropriate, Context

Basic Examination:

- Vitals (including bilateral BP)
- Blind Spot (perform early due to fatigue)
- Posture: Head Tilt, Angulation, Rotation, Translation, Dystonia
- Gait: Broad based, Scissor, Varus, Valgus, etc...
- ROM: Spine & Extremities
- Cranial Nerves: Emphasis on eye movements, pupils, etc.
- Muscle Testing UE & LE
- Pinwheel (pain, temp and crude touch pathways)

Basic Examination Cont...

- Vibration(128hz tuning fork)/Light touch
- DTR's or MSR (muscle stretch reflex)
- Circumference Measurements UE & LE
(atrophy: disuse or compressive)
- Orthopedic/Chiropractic Tests
- Cardiovascular: Heart, Lungs, Proximal &
Distal Pulses
- Palpation: Spine, Lymph, Abdominal

Special Neuro Exams:

- Romberg Test/Sway
- Fukuda's Test
- Wykes Balance Test
- Heel to Shin
- Finger to nose Test
- Dix-Hall Pike

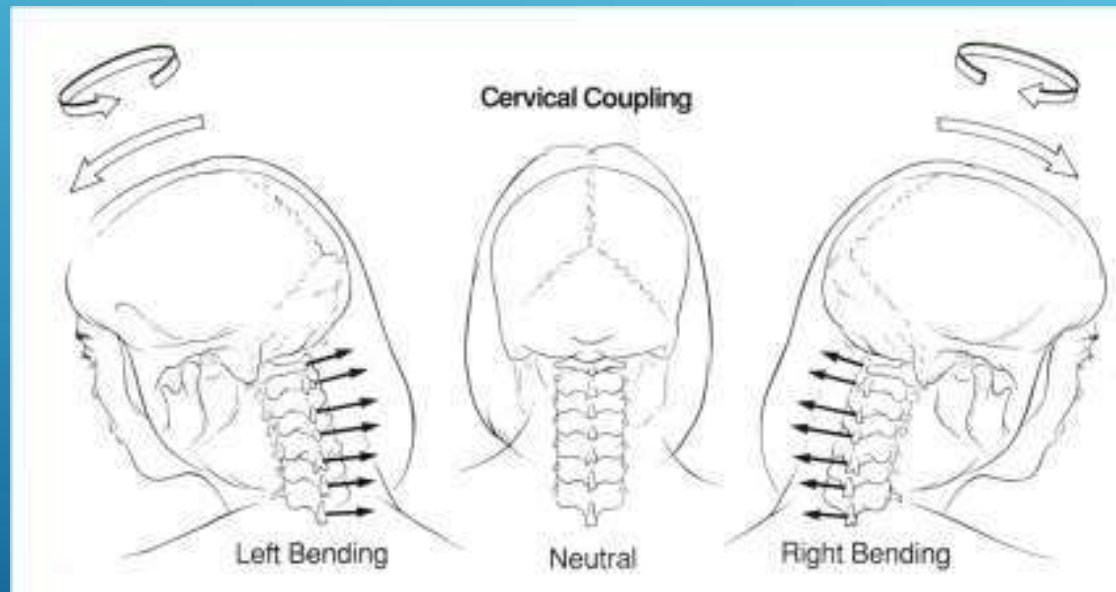
Special Neuro Exams cont...

- ◆ Tandem Walk Test
- ◆ Piano Test (Dyspraxia)
- ◆ Rapid alternating Hand Test (Dysdiadokinesia)
- ◆ Claudication Test
- ◆ Clonus/Myotonia/FRA/Hoffmans/Tromner (UMN lesions Vs LMN lesions)
- ◆ Dual tasking: Gait test and count backward from 100 by 7 or Alphabet

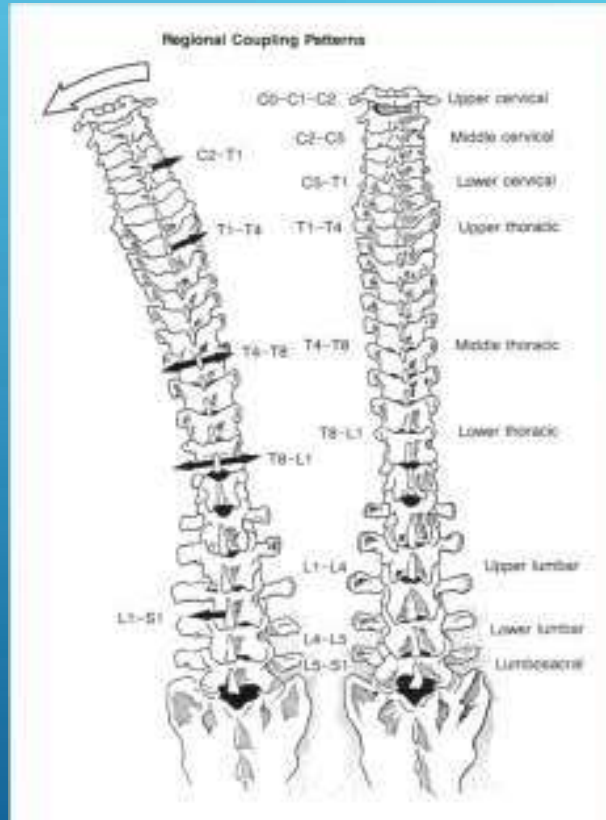
X-Rays:

- Should we or should we not...?
- If so...what should we take?
- Full Spine w/lateral bending and Nasium/Base Posterior
- If not...why not?

Coupled Motion of Spine: Cervical Spine

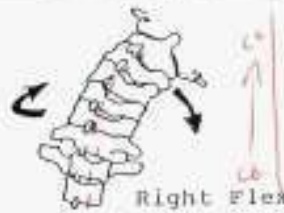


Coupled Motion: Lumbar Spine





Left Flex



Right Flex

DATE LAST SURVEY

ADAMS

CHIROPRACTIC OFFICES
 101 Andrew Street - Sonoma, CA 95470
 (707) 996-4513

1/1 extra
L2-A1
120 front angle

INSTRUCTIONAL REHABILITATIVE MANEUVERS (IRM) ASSIGNED TO CERVICAL SPINE:

IRM	DATE ASSIGNED AT THIS TIME	RATIO
1-#1/OT/4	1-#1/OT/4	1:1
1-#2/OT/4	1-#2/OT/4	1:1
1-#3/OT/4	1-#3/OT/4	1:1
1-#4/OT/4	1-#4/OT/4	1:1
1-#5/OT/4	1-#5/OT/4	1:1
1-#6/OT/4	1-#6/OT/4	1:1
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OTHER		

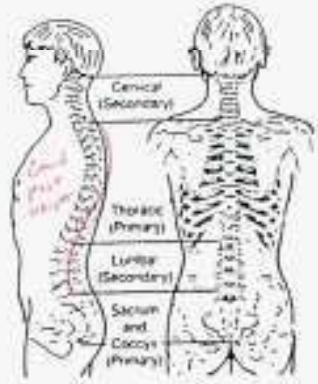
Thoracic Left Lat Flex



Right Flex

INSTRUCTIONAL REHABILITATIVE MANEUVERS (IRM) ASSIGNED TO THORACIC SPINE:

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1-#15/OT/4	1-#15/OT/4	1:1
1-#16/OT/4	1-#16/OT/4	1:1
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1-#18/OT/4	1-#18/OT/4	1:1
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1-#97/OT/4	1-#97/OT/4	1:1
1-#98/OT/4	1-#98/OT/4	1:1
1-#99/OT/4	1-#99/OT/4	1:1
1-#100/OT/4	1-#100/OT/4	1:1
OTHER		



Lateral and posterior view of the spine, showing major regional divisions.



Lumbar Region

Right Lateral Flex.

INSTRUCTIONAL REHABILITATIVE MAKEUPERS (IEM) ASSIGNED TO LUMBAR SPINE
 () NONE ASSIGNED AT THIS TIME

[-PE/GL/A]	=====	ILIOPSOAS - BT	LY
[-PE/GL/A]	=====	PELVIC TILT/PROCE	-PP
[-PE/GL/A]	[-BT/AT/A]	=====	=====
[-PE/GL/A]	[-BT/PI/A]	=====	=====

OTHER _____

Hypomobile-II
 Plasticbiomechanics-PL
 Pathobiomechanics-P
 Pathoplastic Biomechanics
 -PP



Lumbar Side View

C	T	L
1 2	1 2	1 2
3 4	3 4	3 4
5 6	5 6	5 6
7 8	7 8	7 8
9 10	9 10	9 10
11 12	11 12	11 12
13 14	13 14	13 14
15 16	15 16	15 16
17 18		

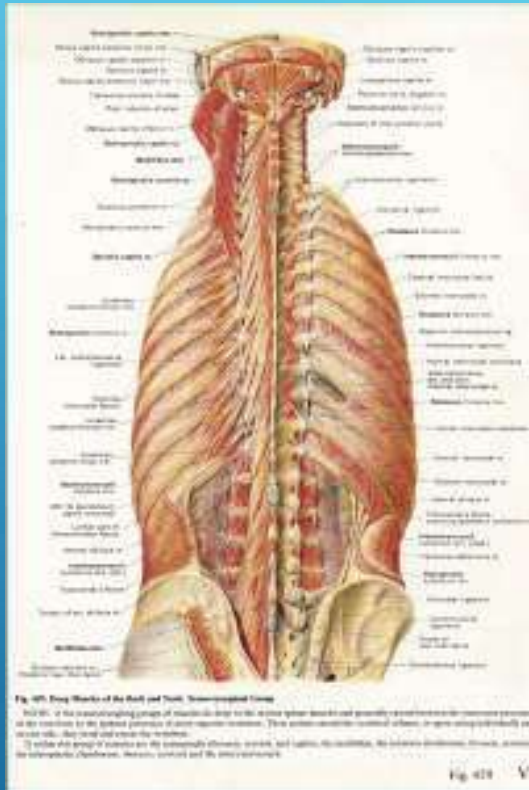


Fig. 479. Deep Muscles of the Back and Neck, Unaccompanied View.
 This view of the musculature of the back and neck is shown in the accompanying plates of the text. The muscles are shown in their natural position, and the bones are shown in their natural position. The muscles are shown in their natural position, and the bones are shown in their natural position. The muscles are shown in their natural position, and the bones are shown in their natural position.

Fig. 479 VI

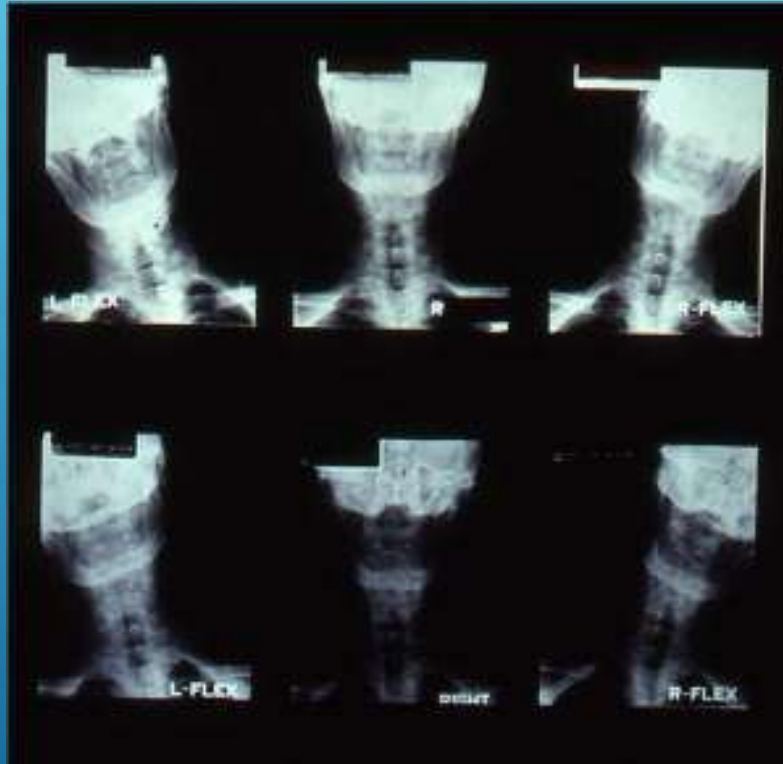
COMPARATIVE X- RAY



50













Sclerotogenous Referral

EXPERIMENTS ON PAIN REFERRED FROM DEEP SOMATIC TISSUES *

BY B. FEINSTEIN, M.D., J. N. K. LANGTON, M.D., R. M. JAMESON, M.D.,
AND F. SCHILLER, M.D., SAN FRANCISCO, CALIFORNIA

From the Departments of Anatomy and Neurology, School of Medicine, University of California, San Francisco

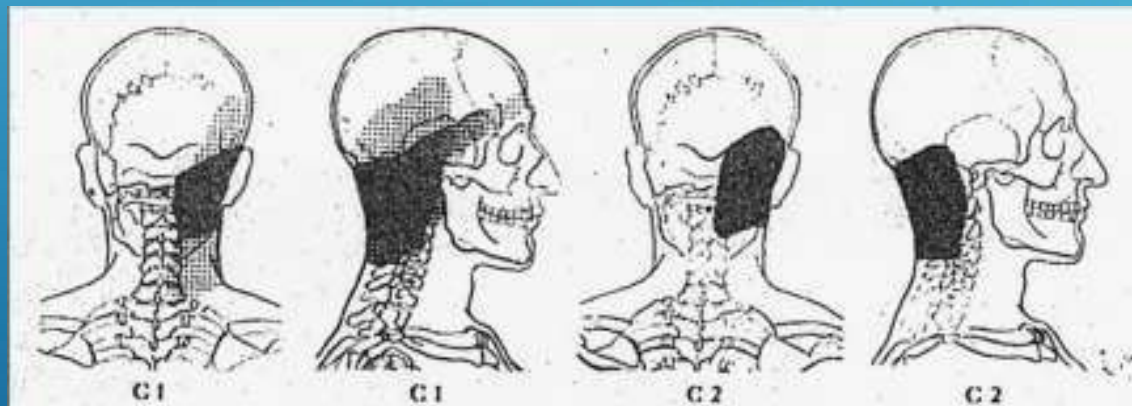
Pain provoked by the irritation of tissues deep to the skin has a characteristic quality and tends to be diffusely "referred". Unlike acute pain from the skin, it persists for a considerable period of time, is rather slowly transmitted to the consciousness, and is often associated with autonomic or other "reflex" concomitants, such as bradycardia, a fall in the blood pressure, nausea, and skeletal muscle spasm.

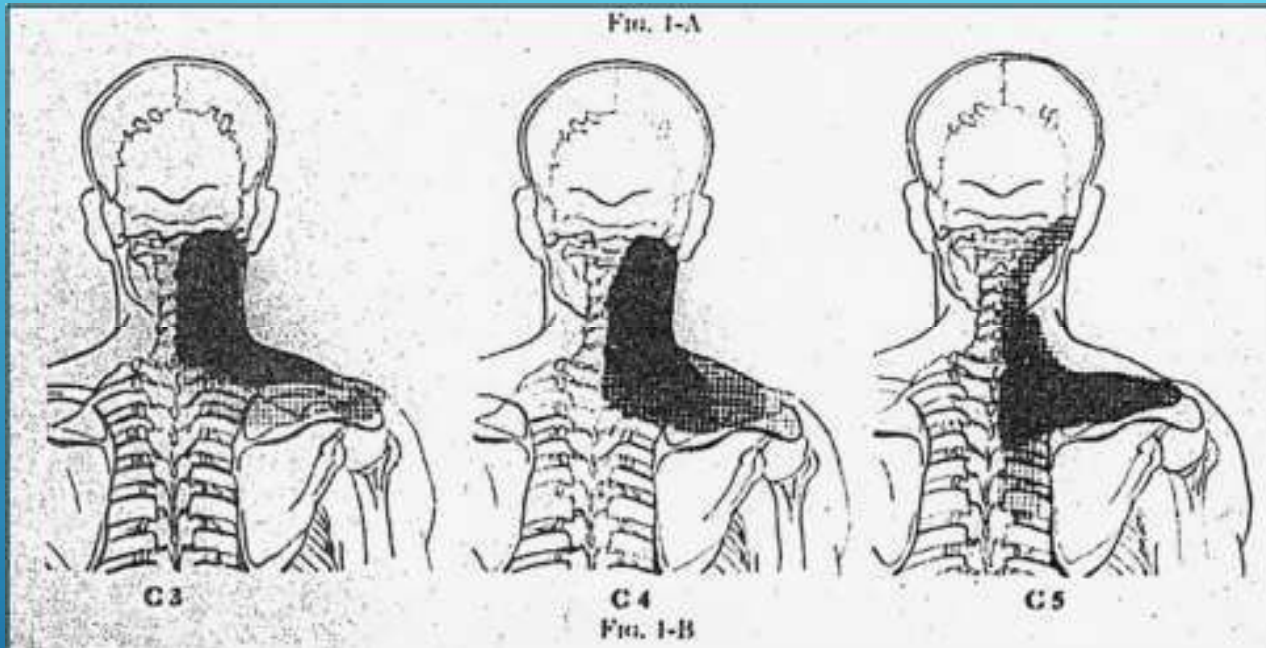
included. In addition, observations were made on such concomitant phenomena as the autonomic repercussions and the cutaneous sensory changes in the skin overlying areas of deep pain, and on the influence of somatic and sympathetic-nerve block.

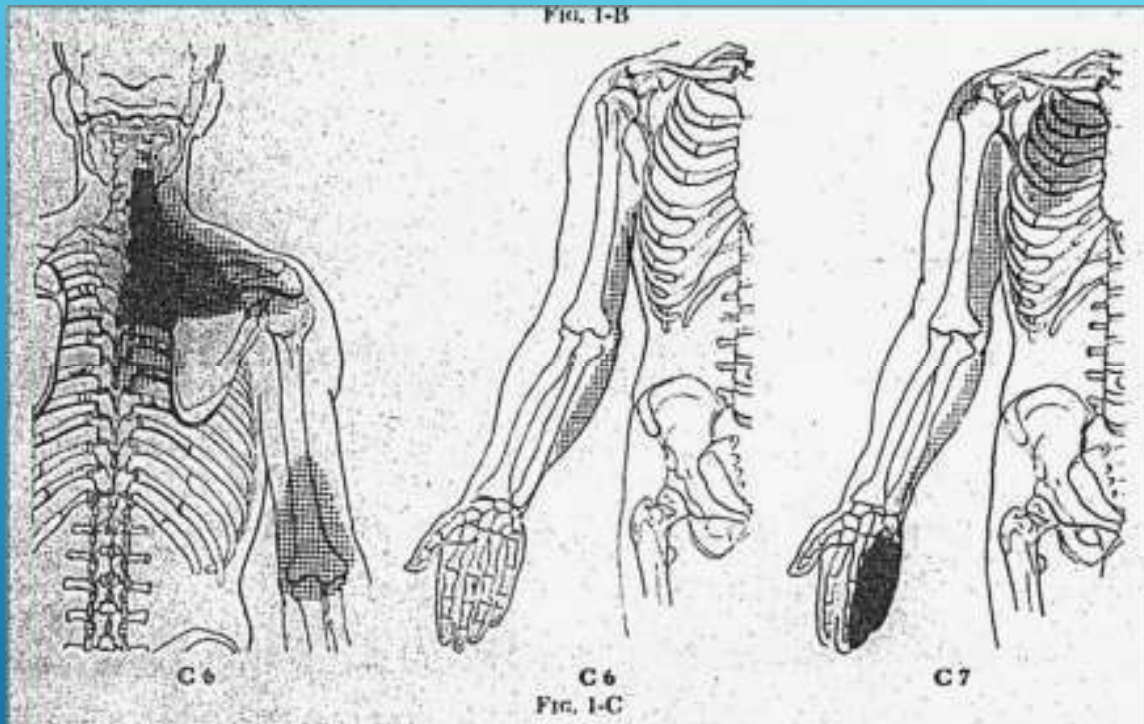
FEINSTEIN et al 1954 J Bone Joint Surgery

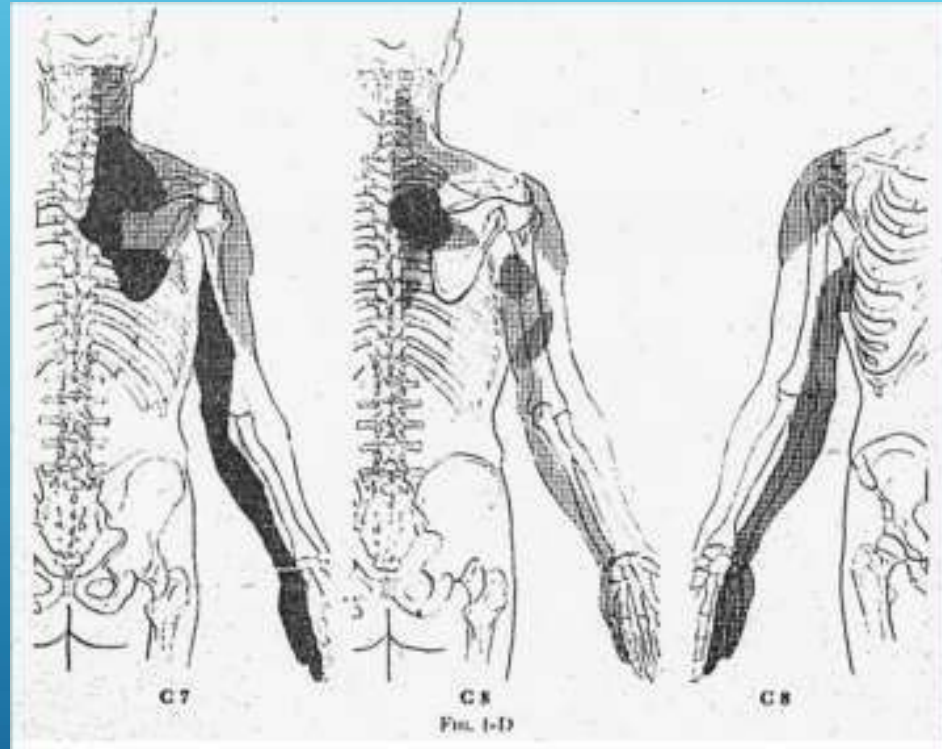
Sclerotogenous Referral

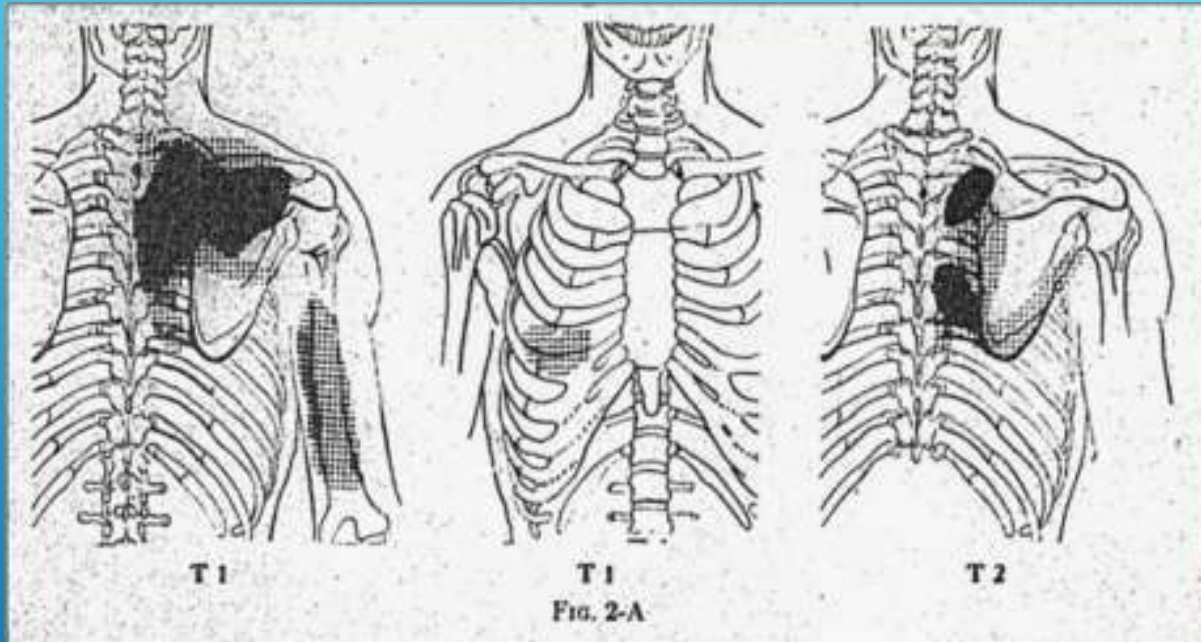
Little attention, has been paid to the autonomic and affective concomitants which are characteristic of pain in deep tissue.





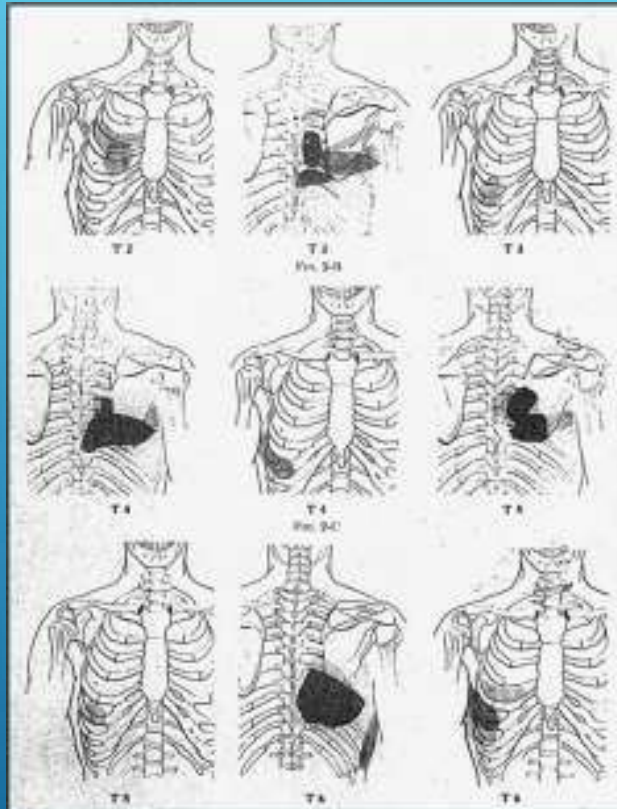


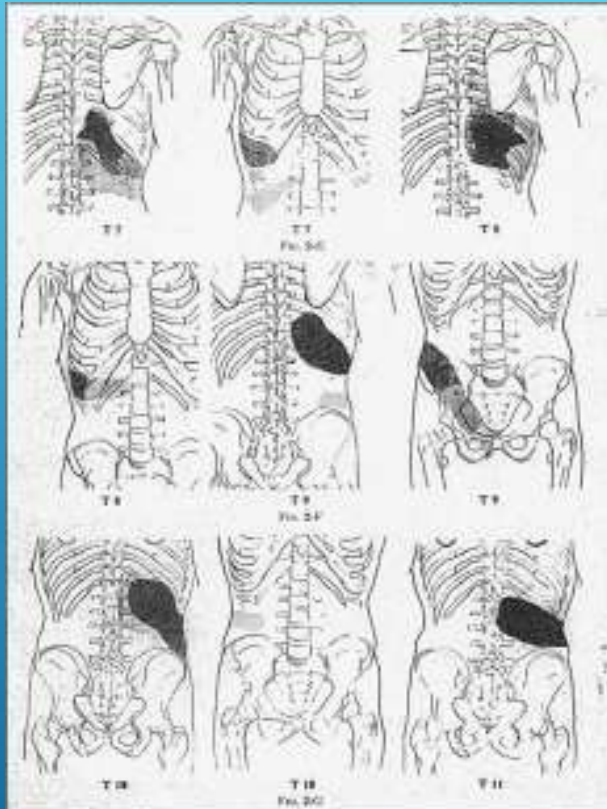


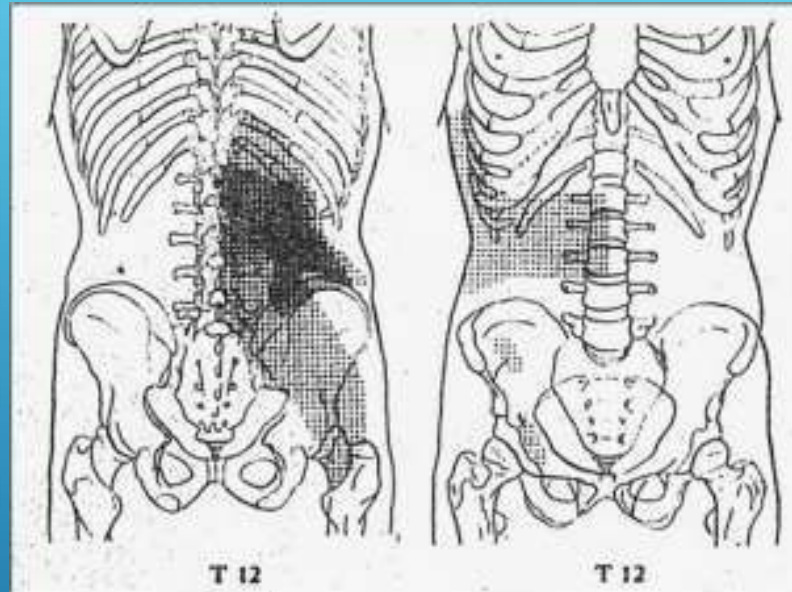


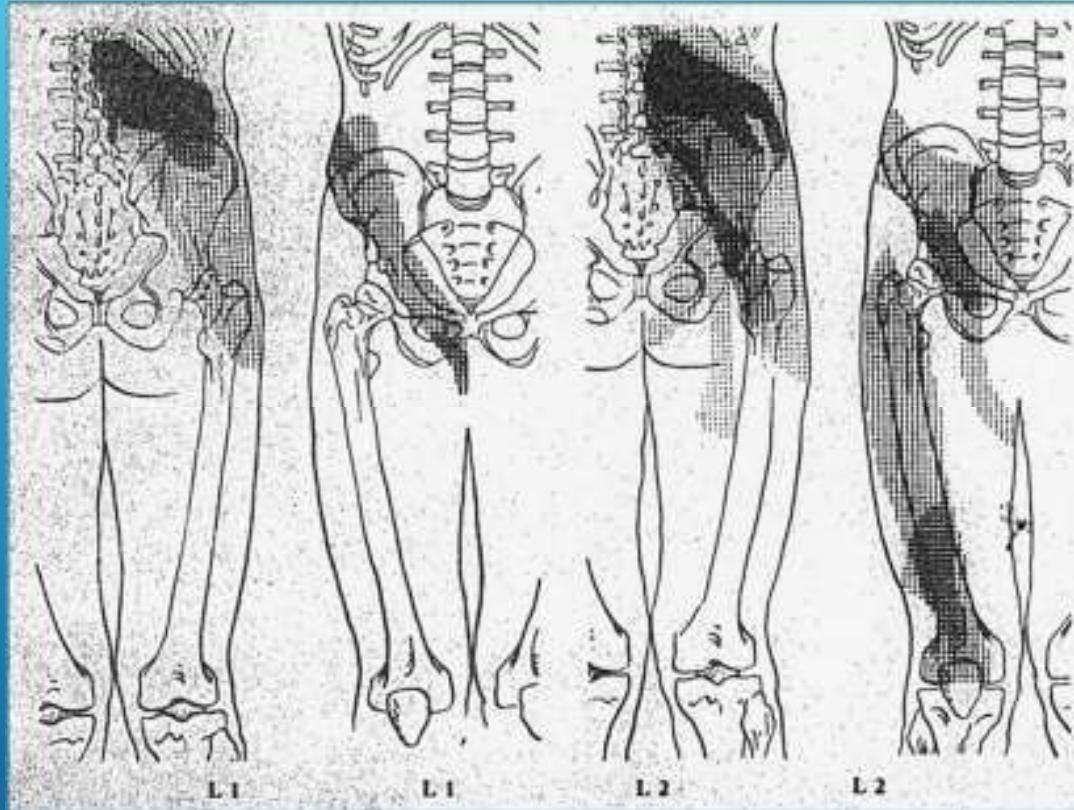
Autonomic concomitants: The pain elicited from muscles was accompanied by a characteristic group of phenomena which indicated involvement of other than segmental somatic mechanisms. These autonomic reactions were most common with injections in the thoracic region, and comparatively rare with injections in the cervical and sacral regions. The manifestations were pallor, sweating, bradycardia, fall in blood pressure, subjective "faintness", and nausea, but vomiting was not observed. Syncope occurred in two early procedures in the series of paravertebral injections and was subsequently avoided by quickly depressing the subject's head or by having him lie down at the first sign of faintness. These features were not proportional to the severity of the pain or to the extent of radiation; on the contrary, they seemed to dominate the experience of subjects who complained of little pain but who were overwhelmed by this distressing complex of symptoms. Most common were pallor and sweating. The sweating was usually generalized; in only a few instances was it confined to the side of the pain.

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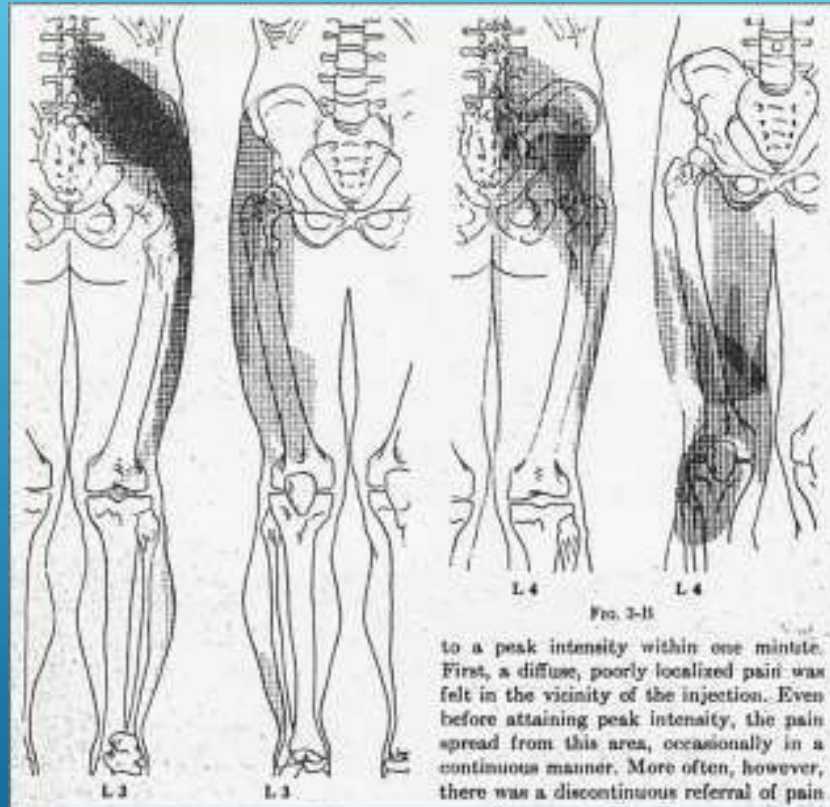
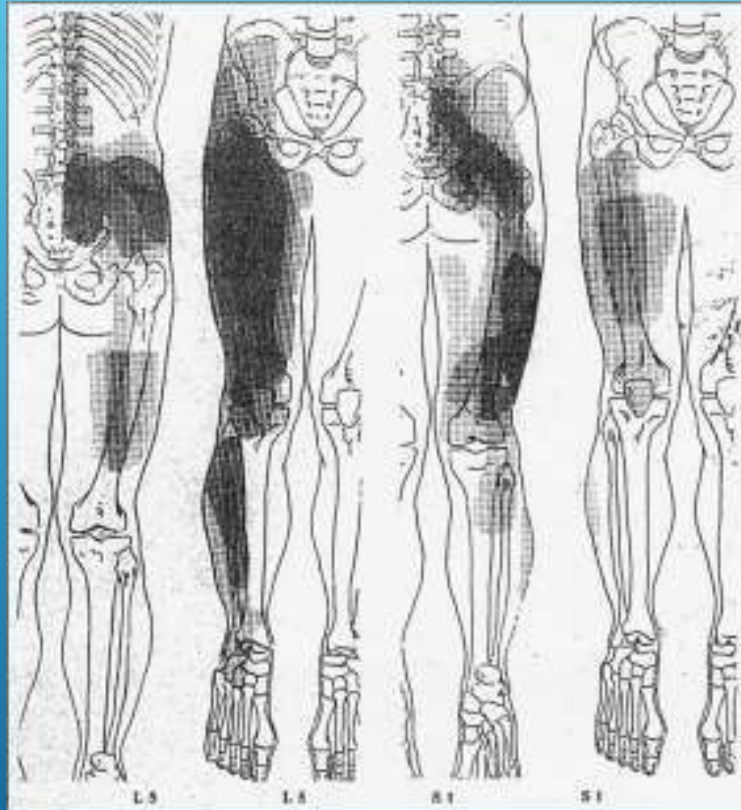
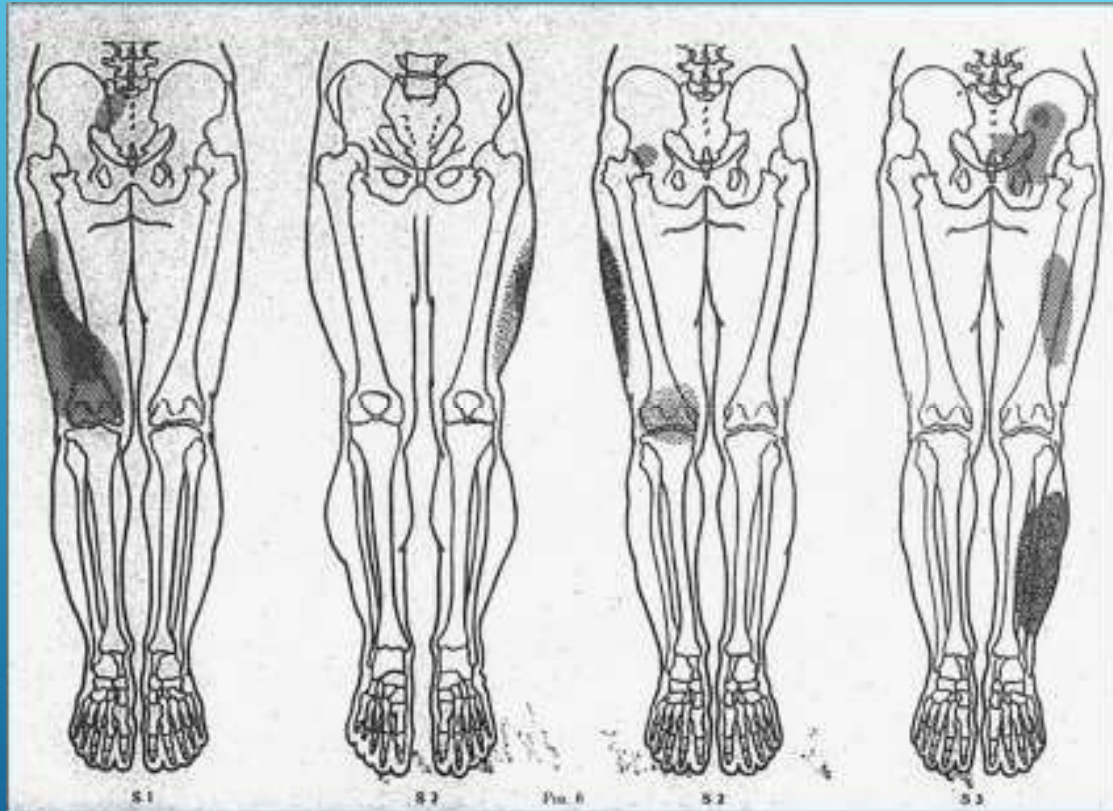
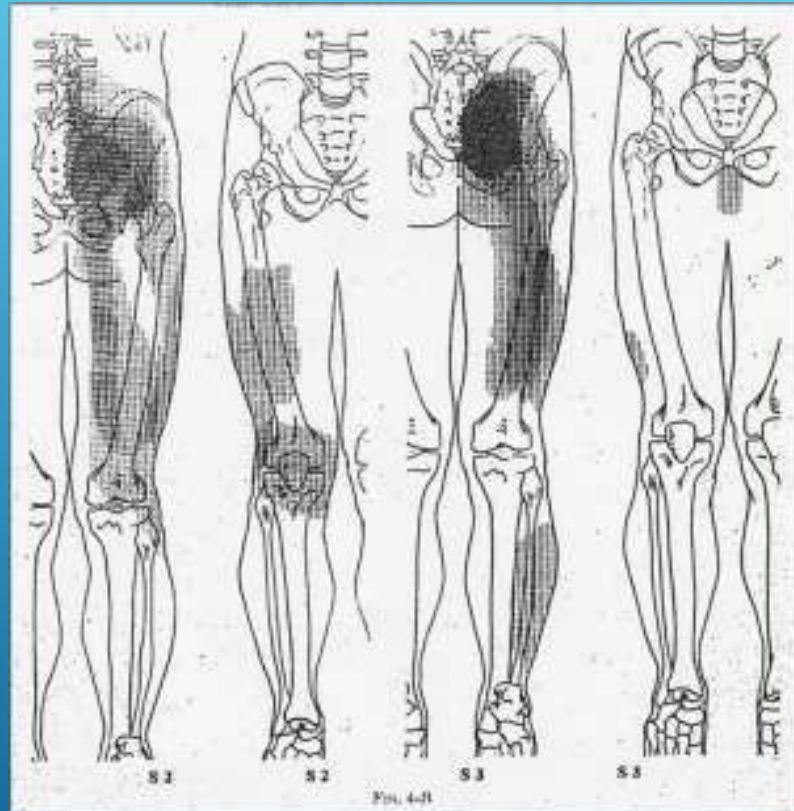


FIG. 3-11
 to a peak intensity within one minute. First, a diffuse, poorly localized pain was felt in the vicinity of the injection. Even before attaining peak intensity, the pain spread from this area, occasionally in a continuous manner. More often, however, there was a discontinuous referral of pain







CHIROPRACTIC & THE DORSAL HORN



Treatment Plan and Objectives:

- What is the cause?
- Where is it located?
- How and where do you begin? Slowly or quickly?
Recommendations?
- How do you know you are improving the patient?
- Are they getting worse or no change? Why?
- How are you communicating what you have found to the patient?
- Building trust
- Resolving Concerns
- Once they are improved, are they committed to long term care
- Rehab recommendations for maintaining favorable progress

Hemisphericity:

- ◆ A term used to describe an imbalance between the left and right hemispheres of the brain, in which case one cortex becomes stronger and the other becomes weaker.
- ◆ Imbalances can occur for many reasons including: Subluxations, Trauma, Developmental issues(ADD/ADHD), Emotional Stress, Malnutrition, Toxicities, etc...
- ◆ Input from one side of the body will cross over to the opposite cortex. (exceptions: Smell and some visual projections stay ipsilateral)
- ◆ Vascular System is under control of ipsilateral cortex eg. right brain=right blood supply

Hemisphericity cont...

- The Cortex controls the Autonomic Nervous System. Therefore the Sympathetic and Parasympathetic Systems are under ipsilateral cortical control.
- Cortical neurons ipsilateral inhibit the Midbrain(mesencephalic rostral reticular formation which is the homolog of the Sympathetic NS)
- The Mesencephalic RR formation is inhibitory to the Pons which is the homolog of the Parasympathetic NS
- Sympathetics push blood to extremities and brain(fight or flight)
- Parasympathetics push blood to gut and organs(relax and digest)
- Weaker cortex will lack the ability to inhibit key pathways resulting in Sympathetic excitation and parasympathetic inhibition

Hemisphericity cont...

- Lack of inhibition of inhibition=excitation
- Cortex is inhibitory to anterior muscles above T6 and posterior muscles below T6 (physiological flexors) associated with embryological development and upright posture.
- Weaker cortex side will result in excitation of physiologic flexors on same side of weakness and inhibition of opposite side flexors. Conversely, excitation of contralateral extensors

Increase cortical function:

- Right Cortex: 1. Adjustments from left 2. Complex movements(left) 3. Music left ear 4. Smell right Nostril 5. Vibration/Massage(left) 6. Drawing/Coloring 7. Looking at pictures 8. Left body rotation(thumbs in front) $\frac{1}{4}$ turn every 2 seconds 9. Saccades up and to the left 45 degrees etc.
- Left Cortex: All of the above except #6. Replace with 1. Talking 2. Performing math(addition, subtraction, division and multiplication with pen and paper)

The Dizzy Patient:

- ◆ First: Rule out most obvious possibilities: Meds, Dehydration, Concussion, eye conditions, Labyrinthitis, Meniere's Dx, Tumor(Acoustic Neuroma), etc...
- ◆ Onset: Gradual or Fast?
- ◆ Associated with head movement or neck movement?
- ◆ Do they spin or is the room spinning around them?
- ◆ Eye disorder?
- ◆ Nausea, vomiting, photophobia, phonophobia?
- ◆ Nystagmus?
- ◆ BPPV(Canaliths in the semicircular canals) Posterior most common
- ◆ Cervicogenic Vertigo: Neck injury and Arthritis

Treatment for Dizzy Patient:

- ◆ BPPV: Epley Maneuver (Demonstrate), Gaze Fixation(no-no & yes-yes)
- ◆ Cervicogenic Vertigo: Adjustments
- ◆ Concussion: Evaluation/Rest or Imaging if needed

Balance:

- Balance is maintained by 3 primary systems: Vision, Proprioception(touch) and the vestibular system(motion, equilibrium and spatial orientation)
- Semicircular Canals: Posterior, Superior and Horizontal positions
- Superior Canal detects side-to-side movement (head tilt to shoulder)
- Posterior Canal detects forward and back movement
- Horizontal Canal detects rotation (no-no head motion)
- Canals have direct input to Cerebellum
- Balance driven by proprioceptive input from Mechanoreceptors

Neuro and Spinal Rehab:

- ◆ Cross-Crawl: 1,2,3,4,5 & Dog position (Demonstrate)
- ◆ Extensor Exercises: Neck & Back(fitball, dog position)
- ◆ Abdominal Hollowing
- ◆ Front Plank(5 min Challenge)
- ◆ Side Planks
- ◆ Gaze Fixation(no-no & yes-yes)
- ◆ Complex Movements
- ◆ Vibration Plate
- ◆ Music
- ◆ Saccades

Adjusting Technique:

- Cervical
- Thoracic
- Lumbar
- Pelvis
- And whatever we want to cover...

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