



## **Back To Chiropractic Continuing Education Seminars Neurology ~ 6 Hours**

**Welcome:**

**This course is approved for 6 Hours of Neurology for the Chiropractic Board of Examiners for the state of California and is also accepted in Colorado, Iowa, Michigan, Oregon and Washington.**

**There is no time element to this course, take it at your leisure.  
If you read slow or fast or if you read it all at once or a little at a time  
it does not matter.**



**How it works:**

- 1. Helpful Hint: Print exam only and read through notes on computer screen and answer as you read.**
- 2. Printing notes will use a ton of printer ink, so not advised.**
- 3. Read thru course materials.**
- 4. Take exam; e-mail letter answers in a **NUMBERED** vertical column to [marcusstrutzdc@gmail.com](mailto:marcusstrutzdc@gmail.com).**
- 5. If you pass exam (70%), I will email you a certificate, within 24 hrs, if you do not pass, you must repeat the exam. If you do not pass the second time then you must retake and pay again.**
- 6. If you are taking the course for DC license renewal you must complete the course by the end of your birthday month for it to count towards renewing your license.**  
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- 7. Upon passing, your Certificate will be e-mailed to you for your records.**
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Marcus Strutz DC  
CE Provider  
Back To Chiropractic CE Seminars**

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# **Chiropractic Neurology For The Practicing Chiropractor**

**Presented by:**

**John Donofrio, DC, DABCN, FACFN**

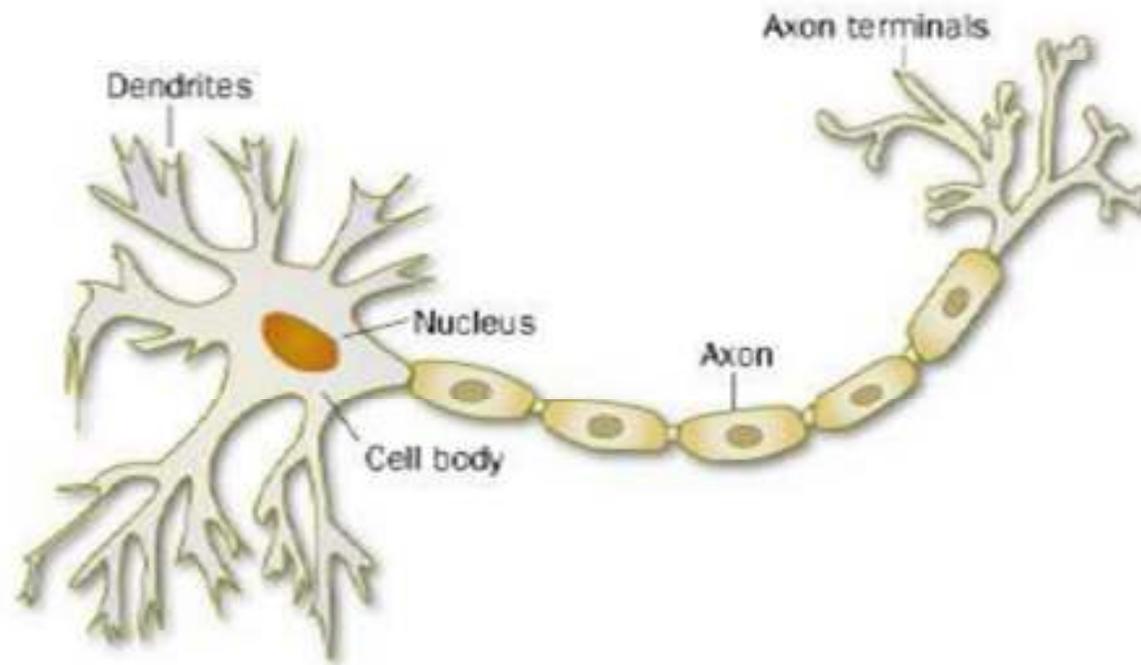
**Joe Thomas, DC**



## **Overview of Neurology**

➤ Before we can get into the tricks of the trade for the chiropractic office, we will need to do a little review of basic neurology.

## Structure of a neuron



Dendrites = impulse towards cell body  
Axons = impulse away from body



## Dermatomes

- A dermatome is an area of skin that is mainly supplied by a single spinal nerve
- The dermatomes are more accurate in the lower extremity than the upper extremity because there is sometimes cross over of innervation in the upper extremity.



➤ Dermatomes in the thoracic region can be very useful indicator of neurological pathologies.

Eg. MS & Neurofibromas.

Dermatomes may be altered by nerve root compression or sometimes by a subluxation.

➤ Dermatomes normally should be perceived equal bilaterally but they can be altered with nerve root compression, pathologies as well as sometimes subluxation.



➤ Dermatomes are important in the upper extremity in helping to differentiate C8/T1 neuropathy vs. thoracic outlet syndrome.

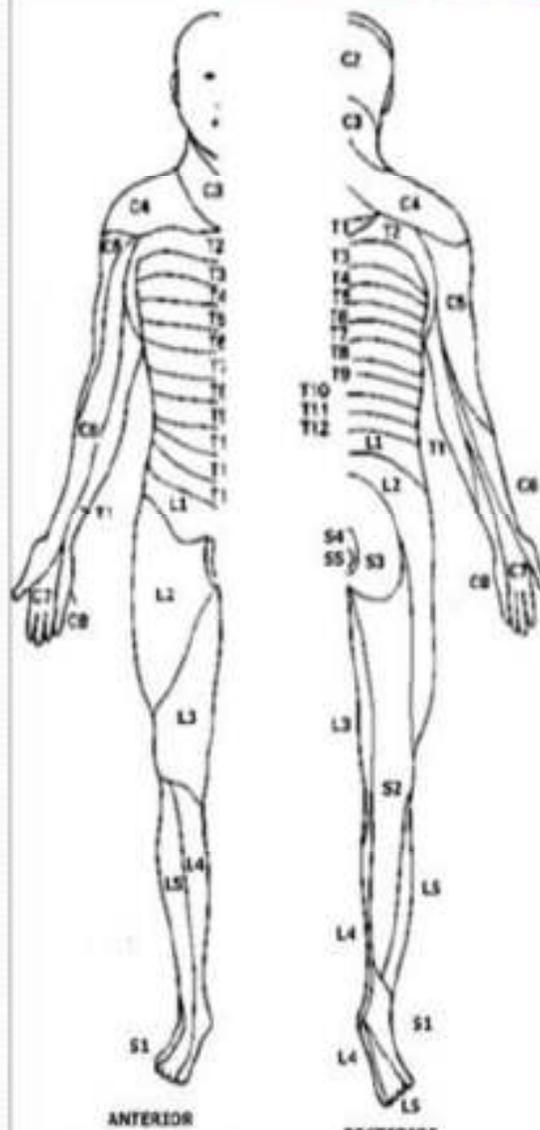


## **Dermatomes**

**Purpose:** To identify a sensory abnormality and localize the problem to a given dermatome, which can then be correlated to a specific segmental level of the spinal cord.

**Technique:** The examiner instructs the patient to close their eyes. The examiner permits the weight of the Wartenburg pinwheel to glide across the areas being examined. The doctor may alternately use the blunt end of the instrument to determine the patient's ability to differentiate between sharp and dull sensations.

**Findings:** The patient should have no evidence of neurological deficiency, and have the ability to distinguish between sharp and dull sensations. Abnormal findings may be analgesia, hypalgesia, hyperalgesia.



Distribution of spinal nerve roots on the skin.  
Territories of the roots (dermatomes) overlap.



## Reflexes

- in musculoskeletal system = “Myotatic reflex” = “stretch reflex” = uses a reflex hammer
- Upper motor neuron = from Cerebral cortex to but not including anterior horn cells (Alpha motor Neuron)
- Lower motor neuron = from anterior horn cell to Muscle
- Monosynaptic = strike tendon → Stimulates Muscle spindle → cells synapses on alpha motor neuron

## Grading of a Reflex

- Normal reflex is graded as 2+
- However in some patients you may not elicit a reflex due to the fact that the patient is thinking about it and cortically overriding the reflex. In that case a cortical distraction maneuver known as Jendrassick maneuver which will distract the patient. It is done either by having the patient interlocking the fingers and trying to pull the hands apart to elicit a lower extremity reflex or having them push their feet into the floor to elicit an upper extremity reflex.

- 
- Reflexes can be decreased by lower motor neuron lesions and sometimes by subluxations .
  - They can be increased by upper motor neuron lesions or sometimes even anxiety.



# Upper vs. Lower Motor Neuron Lesion

## Upper Motor Neuron Lesion ( no inhibition)

Clonus because constant firing,  
No inhibition

Spasticity because  
↑ firing = ↑ muscle tone

Hyperreflexia  
because muscle spindle so tight

Plantar Response up going  
(Babinski's sign)

## Lower Motor Neuron Lesion

Fasciculations = muscle dying,  
spontaneously firing

Hypotonia: lose 1b & 1a afferents  
for tone

Hyporeflexia:  
decrease tone on spindles

# Reflexes

➤ Deep Tendon Reflexes – Measured 0-5 (Wexler scale)

0: absent with reinforcement

1: hypoactive with no reinforcement or normal with reinforcement

2: normal

3: hyperactive

4: hyperactive with transient clonus

5: hyperactive with sustained clonus

Westphal's Sign absence of any DTR, especially patellar,  
lower motor neuron lesion

Jendrassik's Maneuver brings our reflex by cortical distraction.  
AKA: Reinforcement Test or Cortical Distraction Test

# Reflexes

| Reflex          | Mechanism/AKA   | Nerve or Root                            |
|-----------------|---|--|
| Jaw Jerk        | Place thumb on open jaw and tap it with a reflex hammer | CN V (trigeminal nerve)                  |
| Biceps          |   | C5 level or musculocutaneous nerve       |
| Brachioradialis |   | C6 or radial nerve                       |
| Triceps         |   | C7 or radial nerve                       |
| Pectoralis      | Place thumb in axilla on tendons and tap with hammer    | C5 through T1 or anterior thoracic nerve |
| Patellar        | AKA: quadriceps or knee jerk                            | L2 through L4 or femoral nerve           |
| Achilles        | AKA: triceps surae/ ankle jerk                          | S1 level or tibial nerve                 |



## Muscle Testing

- Muscles may show up weaker due to nerve root compression, peripheral neuropathies, pathologies, disuse or muscle injury.
- So when assessing a patient, it is extremely important that we perform an analysis which includes muscle, reflex and sensory testing.

# Muscle Grading

| Muscle Gradations | Description   |
|-------------------|---|
| 5- Normal         | Complete range of motion against gravity with full resistance |
| 4 - Good          | Complete range of motion against gravity with some resistance |
| 3- Fair           | Complete range of motion against gravity                      |
| 2- Poor           | Complete range of motion with gravity eliminated.             |
| 1- Trace          | Evidence of slight contractility. No joint motion.            |
| 0- Zero           | No evidence of contractility                                  |

| <b>NERVE</b>           | <b>MOTOR TEST</b>  | <b>SENSATION TEST</b>                           |
|------------------------|--|---|
| Radial Nerve           | Wrist Extension<br>Thumb Extension                       | Dorsal web space between thumb and index finger |
| Ulnar Nerve            | Abduction-little finger                                  | Ulnar aspect ring finger - little finger        |
| Median Nerve           | Thumb pinch<br>Opposition of thumb<br>Abduction of thumb | Radial aspect ring finger – ulnar aspect thumb  |
| Axillary Nerve         | Deltoid  | Lateral Arm-Deltoid patch on upper arm          |
| Musculocutaneous Nerve | Biceps   | Lateral forearm                                 |

# Neurology of the Upper Extremity

| Disc  | Root | Reflex                                    | Muscles                                      | Sensation  |
|-------|------|---|--|--|
| C4-C5 | C5   | Biceps Reflex                             | Deltoid<br>Biceps                            | Lateral Arm<br>Axillary nerve                    |
| C5-C6 | C6   | Brachioradialis Reflex<br>(Biceps Reflex) | Wrist Extension<br>Biceps                    | Lateral Forearm<br>Musculocutaneous<br>Nerve     |
| C6-C7 | C7   | Triceps Reflex                            | Wrist Flexors<br>Finger Extension<br>Triceps | Middle Finger                                    |
| C7-T1 | C8   |   | Finger Flexion<br>Hand Intrinsic             | Medial Arm<br>Medial Brachial<br>Cutaneous Nerve |
| T1-T2 | T1   |   | Hand Intrinsic                               | Medial Arm<br>Medial Brachial<br>Cutaneous Nerve |

# Neurology of the Lower Extremity

| Disc  | Root | Reflex          | Muscles                  | Sensation                      |
|-------|------|-----------------|--------------------------|--------------------------------|
| L3-L4 | L4   | Patellar Reflex | Anterior tibialis        | Medial Leg and medial foot     |
| L4-L5 | L5   | None            | Extensor Hallucis longus | Lateral leg and dorsum of foot |
| L5-S1 | S1   | Achilles Reflex | Peroneus longus & brevis | Lateral foot                   |



## Overview:

- When in the chiropractic office the major responsibility of the chiropractor is to localize the longitudinal level of lesion.
- The longitudinal level of the lesion refers to the area that the neurological problem is originating from. The only areas that this can occur is either at the Receptor/Effector  
Peripheral nerve → Spinal cord → Brainstem → Thalamus → Cerebellum & Cerebral Cortex.
- Lets take a closer look at these areas.



## **Receptors**

Pacinian = vibration

Ruffini = joint position sense

Pain/temp = free naked nerve endings

Meissner's / merkel's = touch



## Effector

➤ Is either a muscle or gland innervated by a nerve.



**Spinothalamic tracts:**

**Lateral = Pain/Temp**

**Ventral = crude touch/pressure**

- **Receptors = Free naked nerve endings**
- **Fiber type = unmyelinated C fibers**



**DCML = Dorsal Columns Medial Lemniscus:**

**Conscious proprioception, vibration, position sense = 2 point discrimination.**

**Gracilis = from legs. Cuneatus = from upper extremities.**

➤ **Receptors (Ab fibers). Meissner's/Merkel's = touch. Pacinian = vibration.**

**Ruffini = Joint position sense**

➤ **Legs → Ab fibers → spine (fasciculus gracilis) → Dorsal columns → Medulla (nucleus gracilis) → decussation (Medial lemniscus) → VPL of contralateral thalamus → contralateral cortex**

➤ **Arms → Ab fibers → spine (fasciculus cuneatus) → Dorsal columns → Medulla (nucleus cuneatus) → decussation (Medial lemniscus) → VPL of contralateral thalamus → contralateral cortex**



## **Spinal Cord Tracts:**

### **Motor tracts/Descending Tracts**

- **Rubrospinal** = from red nucleus of midbrain = Proximal muscle flexors of upper & lower extremity
- **Reticulospinal** = from reticular formation in brainstem = Extensor muscles of back and arms and for visceral function.



## **Spinal Cord Tracts:**

### **Motor tracts/Descending Tracts**

- **Tectospinal tract** = Tectum (midbrain) to neck muscles. Reflex to turn head in direction of light (superior colliculus) or sound (inferior colliculus)



## **Spinal Cord Tracts:**

**Motor tracts/Descending Tracts.**

**Vestibulospinal tract = from cerebellum & vestibular nuclei =  
Extensor muscles of back & legs**

**- Vestibulospinal tract to the eyes (CN 3, 4, & 6) =  
medial longitudinal fasciculus (MLF) for Vestibular Ocular Reflex**

### **Pathway**

**From cerebellum: dentate nucleus → anterior horn of spinal cord →  
gamma motor neurons → intrafusal fibers for TONE of muscle.**



# Spinal Cord Tracts:

## Motor tracts/Descending Tracts.

Corticospinal (pyramidal) = precentral gyrus of frontal lobe

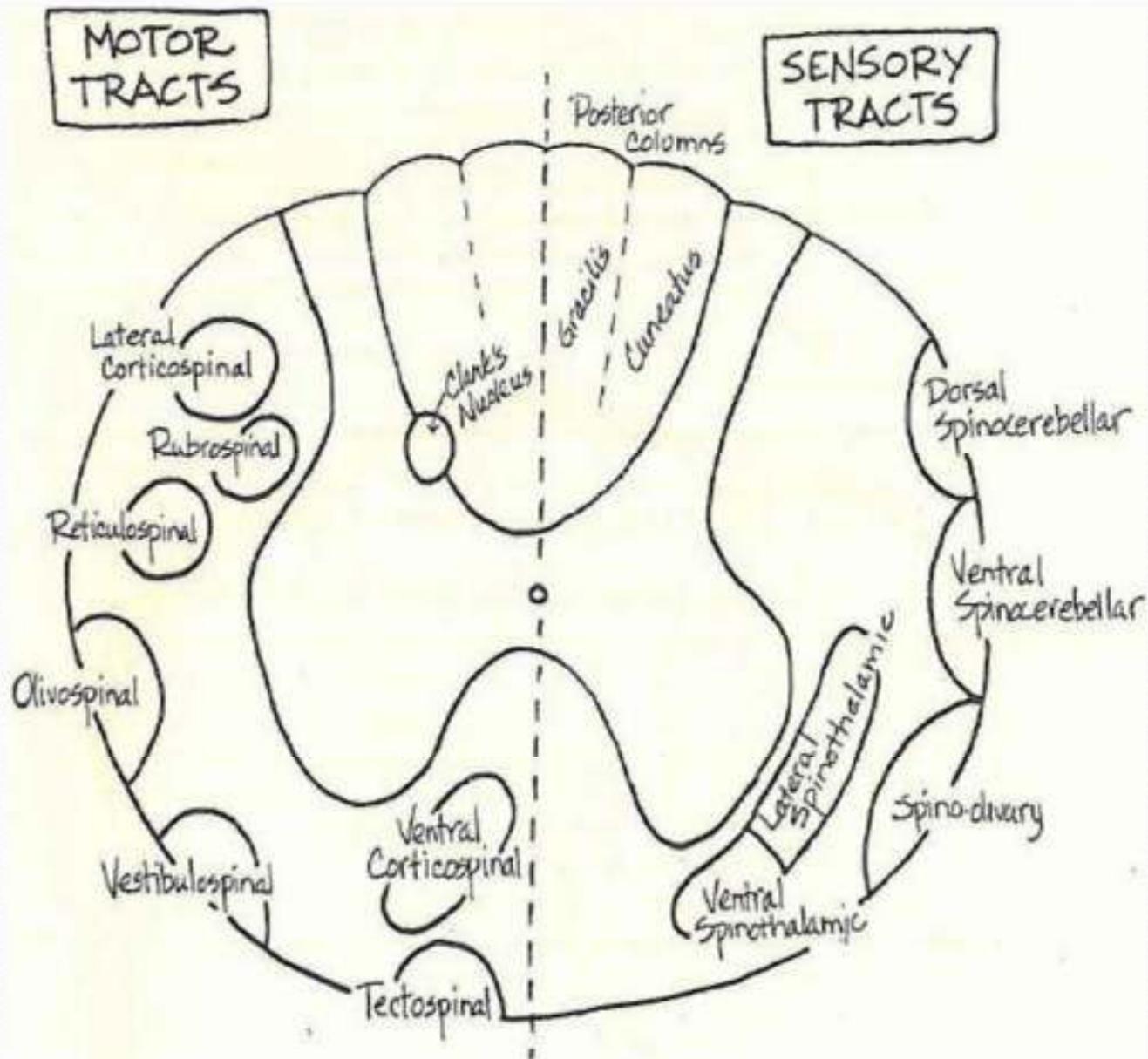
- Lateral corticospinal = decussates at medulla at medullary pyramids for flexors of distal extremities

- Ventral corticospinal = decussates at spinal level for flexors of trunk that they innervate.

### Pathway

- Precentral gyrus → anterior horn → alpha motor neurons → extrafusal fibers of muscle → for movement and strength of the muscle.

# Spinal Cord Tracts:





# **Brainstem**

**3 parts**

- Midbrain
- Pons
- Medulla



# The Midbrain

What is found in the midbrain?

- Cranial nerves 3 and 4
- Cerebral Aqueduct of Sylvius around which endorphins and enkephalins are produced to block pain
- Superior and Inferior Colliculi which are the reflex centers to light and sound



## The Midbrain

**Cerebral peduncles= Anterior portion = cerebral peduncles**

= Contains corticospinal tracts

= Red nucleus=rubrospinal tract

= substantia nigra – to produce dopamine for basal ganglia

If the Substantia nigra pathways are damaged functional motor dystonias can occur especially Parkinson's disease

Midbrain is the homolog of the sympathetic nervous system which will be discussed later in patient treatment protocols



## **PONS**

What is found in the PONS?

- Cranial nerves 5 to 8.



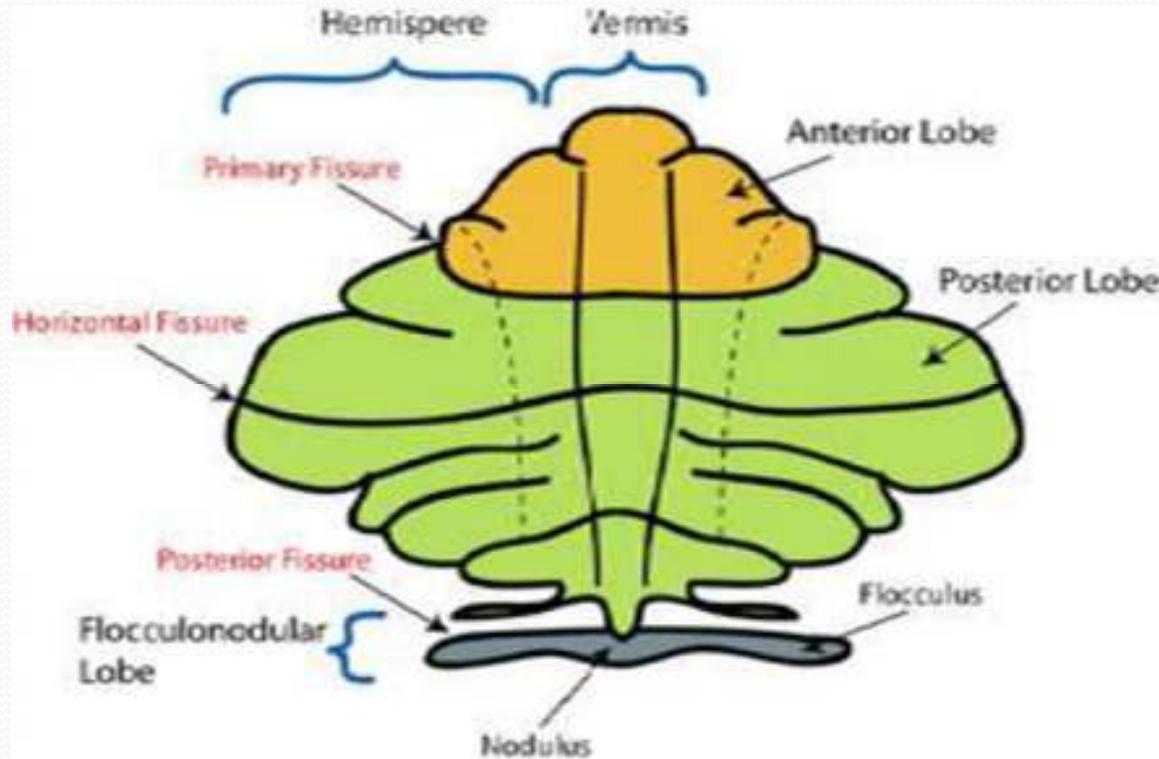
# **Medulla Oblongata**

What is found in the medulla?

- Cranial nerves 9 to 12

- 
- Pons and the medulla are the regions responsible for vital organ function.
  - It is basically the homolog of the parasympathetic nervous system. (which we will discuss later in treatment protocols for the patients)

# Cerebellum



## **Cerebellum**

= balance, equilibrium, involuntary coordination, unconscious proprioception



# **Cerebellum**

## **3 lobes**

- Flocculonodular = midline = balance of spine**
- Anterior lobe = balance from arms & legs**
- Posterior lobe = how cerebellum talks to cortex**

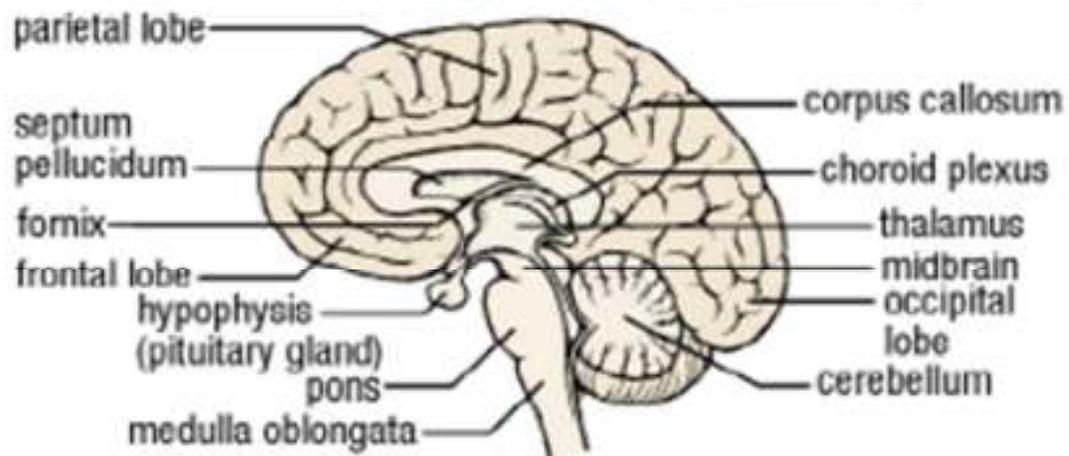
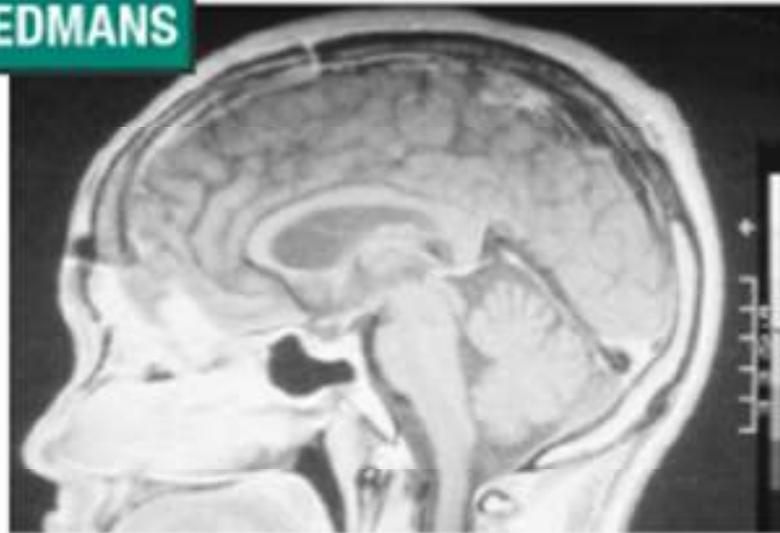


# Cerebellum

## Cerebellar Nuclei

- Fastigial = receives joint position sense from spinal structures
- Globos = proximal joints e.g. Glenohumeral
- Emboliform = middle joints, e.g. Elbow
- Dentate = is the motor nucleus of the cerebellum which is responsible for the tone within a muscle

STEDMANS



**brain:** (above) magnetic resonance image (MRI) of a normal brain; (below) illustration of the same midsagittal view



## **Brain – Simplified**

Thalamus = Relay station, sensory fibers.

Pulvinar region = integration of sensory information.

Region of Cranial nerve 2.

- VPM = ventral posteromedial = sensory from face
- VPL = ventral posterolateral = sensory from arms and legs
- Lateral geniculate = sensory from eyes
- Medial geniculate = sensory from ears



## **Brain – Simplified**

- Cerebrum = Intellect & association
- Parietal Lobe= Localization “somesthetic cortex”, abstract thinking, problem solving
- Occipital Lobe = Visual Cortex
- Temporal Lobe = Superior lobe = Hearing = superior lobe  
= inferior lobe= Long term memory, smell



## **Brain – Simplified**

➤ **Frontal Lobe** = Voluntary motor = precentral gyrus. Executive function. Personality and micturition reflex (urination reflex). Area of basal ganglion, olfactory bulb for smell and cranial nerve 1.

– Broca's motor speech area is, in the majority of people found in the inferior frontal lobe on left.



## **Brain – Simplified**

➤ **Hypothalamus** = hunger, thirst, temperature regulation and origin of hormone production.



Now that we have concluded our review of the neurological system, we can begin to explain clinical concepts of differential diagnosis with respect to common

Chiropractic cases such as; disc syndrome, nerve root vs. peripheral lesions and headaches.



# Differential Diagnosis for Monday Morning In Your Office

## Disc Syndrome vs Sclerotogenous referral

Let us begin with a typical case. 32 Year old male presents to your office with low back pain going down the leg to the floor. It started 3 days ago when he was lifting boxes of approximately 50lbs a piece. Neurologically how do we differentiate between a disc putting pressure on a nerve root vs. a sclerotogenous referral? (Sclerotogenous pain comes from the bone, muscle, tendon or ligament. A sclerotogenous pain referral will refer pain away from the area that is injured. Technically it does not follow a dermatomal pattern but it sometimes can mimic it.)



Clinically speaking,  
sclerotogenous referral basically is:

➤ When you have a subluxation ( segmental dysfunction) at any spinal level it can refer pain to the muscles, tendons or ligaments that are innervated by those nerves.



For example, an L5/S1 subluxation (segmental dysfunction) can refer pain to muscles innervated by L5/S1. Examples of those muscles are Gluteus Medius, Gluteus Minimus, Hamstrings and the Peronei muscles giving the presentation of a possible nerve root compression.

- 
- How do we differentiate neurologically between the two?
- This analysis can be performed with the appropriate neurological testing. It is a neurological fact that when we have a compression neuropathy (disc pressing on a nerve root), that the largest diameter fibers within the nerve root will be compressed first.
  - Some of the largest sensory fibers transmit dorsal column sensations. Two of the main ones are:
    1. Vibration and
    2. Joint Position sense.



- The largest motor fibers are the alpha motor neurons that go to the extrafusal muscle fibers of the muscle for strength and movement of the muscle.

- Now how do we perform these tests?

Vibration is tested by using a 128hz tuning fork on the distal bony prominences of the toes comparing the sensation of one foot to the other. If we have a compression neuropathy we should have decreased perception on the affected side.



➤ To confirm we will check joint position sense of the distal extremities. This is performed by holding the distal phalanx on the lateral and medial sides of the distal phalangeal joint. While the patient has their eyes closed, the doctor moves the distal phalanx up and down to see if the patient can perceive the difference.

➤ If the patient has loss of vibration sense and loss of joint position sense, then we move on to check the strength of the muscle.

➤ Since the alpha motor neuron supplies the muscle, if it is compressed we will see muscle weakness in the affected limb and possible atrophy



**Question:** How long does it take for a muscle to start to atrophy?

**Answer:** 6-10 days

(This is very important to help differentiate a patient that comes into your office claiming to have a disc herniation pressing on a nerve that has been going on for months. By this time atrophy would be visualized. )

➤ When examining this patient if you do not find decreased vibratory sense, decreased joint position sense and muscle weakness (please refer back to muscle grading scale) then you are most likely looking at sclerotogenous referred pain and not a disc pressing on a nerve.



Remember that reflexes and dermatomes can sometimes be altered by subluxation (segmental dysfunction).

So vibration, joint position and muscle testing are the most reliable to make this differentiation.



## **Case 2**

31 Year old female comes into your office complaining of numbness and tingling in the 4th and 5th digits on the hand. She indicates that at times the fingers feel cold with pallor.

Now reviewing what we did on the last case, we now need to differentiate between a C8/T1 nerve root lesion and a Thoracic outlet syndrome.



## **So how is this done?**

- The same way we differentiated in the previous case.
- We will first rule out a compression neuropathy by checking the large diameter fibers of the nerve root. We will again do this by utilizing a 128 Hz tuning fork bilaterally to look for decreased perception of vibration.

- 
- We will also check joint position sense, once again by holding the distal phalangeal joint medially and laterally with the patients eyes closed to see if they can perceive the difference between up and down movements.
  - We will also check motor strength by checking finger flexion (C8) and Finger Abduction/Adduction (T1).



- If vibratory sense is perceived equally bilaterally, if they can discern correctly the up and down movement of the distal phalange and their muscle strength is bilaterally equal we would lean away from the nerve root lesion as being the cause of the patient symptoms. We would then explore the possibility of Thoracic Outlet Syndrome.

## **NOTE:**

Before we can perform the TOS testing, we must first make sure that the radial and ulnar arteries are patent.

Therefore the first test to be performed should be Allen's test.

### **Allen's Test**

The patient is seated with elbow flexed and forearm supinated, ask the patient to pump the hand while the examiner occludes the radial and ulnar arteries until hand is blanched. The patient slowly opens the hand while the doctor opens one artery and records filling time. Repeat for other artery.

Positive: Delay of more than 10 seconds for the blood to return

Indicates: Occlusion of the corresponding artery.



## **TOS Testing**

We would now perform Thoracic Outlet Testing

### **Adson's Test Aka Scalenus Anticus Test**

With the patient seated, doctor slightly abducts, extends and externally rotates the arm while taking the radial pulse. Patient rotates head toward tested side and extends head. Patient takes deep breath.

Positive: Alteration in amplitude of radial pulse



# **TOS Testing**

## **Costoclavicular Maneuver Aka Eden's Test**

The Dr. palpates the radial pulse while drawing the pt's shoulder down and into extension. The pt. flexes the cervical spine to chest.

Positive: Alteration in the amplitude of radial pulse.

Indicates: Compression between first rib and clavicle.



## **TOS Testing**

### **Wright's Test Aka Hyper Abduction Maneuver**

Patient seated while Dr. palpates radial pulse.

Arms are abducted to 180 degrees. The Dr. notes angle at which radial pulse diminishes or disappears

Positive: If pulses are lost with more than 100 diff.

Indicates: Pectoralis Minor Syndrome, Axillary artery.



# Hemisphericity

Hemisphericity is a term that describes an imbalance between the cortices of the brain, in which one cortex becomes stronger and the other cortex becomes weaker for a variety of reasons.

This imbalance can be due to:

- Developmental ( ADD/ADHD)
- Toxicities (Alzheimer's, Autism)
- Physical trauma ( extremity or brain injury)
- Emotional stressors



## Hemisphericity

The first thing the doctor in their office **MUST** understand is that all neurological information that comes in from one side of the body will cross over to the opposite cortex. For example everything coming in from the right side of the body will end up in the left cortex. Anything coming in from the left side of the body will end up in the right cortex.



**Two exceptions to this rule are:**

1. Smell – goes to the ipsilateral cortex.

Example - right nostril goes to right cortex and left nostril goes to left cortex.

2. Some of the visual information through the eyes will travel ipsilaterally as well. (this topic will be covered in another program)



➤ So with this understanding that the neurological system is all contralateral, we now move to the vascular system.

➤ The big difference between the neurological system and the vascular system is that **the vascular system is ipsilateral.**

➤ The right cortex controls the right blood supply of the body and the left cortex controls the left blood supply of the body.



➤ This is accomplished by the fact that the cerebral cortex controls the autonomic nervous system which controls the sympathetics as well as the parasympathetics.

➤ Therefore the sympathetic nervous system which controls your blood supply is under control by the ipsilateral cerebral cortex.



➤ The mechanism behind this is that there is a cortical neuron which is inhibitory to a neuron in the midbrain (mesencephalic rostral reticular formation which is the homolog of the sympathetic nervous system)

➤ The Midbrain neuron (mesencephalic rostral reticular formation which is the homolog of the sympathetic nervous system) is inhibitory to the pons which is the origin of the parasympathetic nervous system (caudal paramedian pontomedullary region)

- 
- If the cortex on one side becomes weaker, it cannot ipsilaterally inhibit the midbrain neuron resulting in the sympathetic nervous system beginning to fire.
  - If that neuron in the midbrain fires, it will inhibit the neuron in the pons which will shut off the parasympathetic nervous system.
  - The parasympathetics are responsible for supplying your oxygen and nutrition to your vital organs.



➤ If the cortical weakness occurs we will decrease oxygen and nutrition to the vital organs.

➤ Now in the musculoskeletal system, when the cortex becomes weak this results in the muscles become ramped up for a sympathetic fight or flight response.

➤ It is accomplished by neuronal activity in which we get firing of neurons to the anterior muscles above the T6 vertebral level and firing to the posterior muscles below the T6 vertebral level. This will cause internal rotation of the upper extremities and external rotation of the lower extremities to prepare the fight or flight response.



➤ So let us now take a look at some of the conditions that a patient might present to a chiropractic office where their chief complaint can be a result of these neurological pathways being activated.

➤ If we have internal rotation of the upper extremities starting at the shoulder level, we would have firing of the subscapularis, pectoralis major, latissimus dorsi and teres major. This will cause the head and shaft of the humerus to rotate medially which can compress the supraspinatus tendon (in the subacromial hood area) which can lead to our shoulder impingement syndrome.



➤ Because of this anterior firing we will be stretching the supraspinatus and infraspinatus muscles that can lead to our tendonitis and bursitis complaints in the shoulder

➤ We will have firing to the biceps muscle which can lead to our bicipital tendonitis

➤ We will have firing to the pronator muscles of the forearm leading to pronator teres impingement of the median nerve



➤ We will have firing to the flexor muscles of the wrist which can lead to our carpal tunnel signs & symptoms.

➤ **Isn't it amazing that a person may present to a chiropractors office with these signs and symptoms not due to a physical injury but due to a cortical brain imbalance.**



Now lets take a look at what happens to the musculoskeletal system below T6 on the side of the weakened cortex when the sympathetic nervous system fires

We will now have firing to posterior muscles

- Gluteal muscles
- Piriformis – which will cause the leg to turn laterally or flare out.



➤ In 15% of the population the sciatic nerve which originates from L4-S2 pierces the piriformis muscle and in the other 85% of the population it runs anterior to the piriformis muscle.

➤ This can create sciatic nerve irritation signs and symptoms on the same side of the weakened cortex.

➤ There is also firing to the erector spinae muscles which attach to the iliac crest which will result in a pelvic distortion ( AS ilium) on that side as well.



➤ On the contralateral side we will have decreased firing to the posterior muscles below T6 and increased firing to the anterior muscles below T6 (This is due to the crossed extensor reflex). Now we will see increased firing to the iliopsoas and decreased firing to the piriformis which will result in medial rotation of that leg. This will accelerate DJD of the hip ( most common area to see DJD) and medial rotation of the knee accelerating the process of degeneration in the knee ( 2nd most common area to find DJD in the body)



➤ Due to this neurological response this will result in a PI ilium on the contralateral side. When we get a PI ilium, internal rotation of the femur and internal rotation of the tibia, this will result in the body weight being distributed more to the medial side of the foot, which will cause pronation of the foot leading to plantar fasciitis, heel spurs and a bunion on that side.

# Let us Review

| <b>Ipsilateral to Cortical Weakness</b>             | <b>Contralateral to Cortical Weakness</b> |
|---|---|
| Shoulder Impingement Syndrome                       | DJD of the Hip                            |
| Supraspinatus and Infraspinatus Bursitis/Tendonitis | DJD of the Knee                           |
| Bicipital Tendonitis                                | PI Ilium                                  |
| Pronator Teres Syndrome                             | Plantar Fasciitis                         |
| Carpal Tunnel Signs & Symptoms                      | Heel Spurs                                |
| Sciatic Nerve Irritation                            | Bunions                                   |
| Piriformis Syndrome                                 |   |
| AS ilium  |   |



➤ This information presented may be the key to understanding some of your difficult cases, improving patient results and improving patient retention.

➤ If a patient presents with right shoulder pain, it is the typical mind set of the chiropractor to adjust and/or perform therapy on the side of the pain.

➤ If this pain is musculoskeletal in origin and due to an injury, this approach will probably result in a successful outcome for both the doctor and the patient.



➤ But with the new understanding within this presentation that the vascular system is ipsilateral and the neurological system is contralateral, this pain may be due to a cortical weakness (hemisphericity) on the same side of the shoulder pain.

➤ If the chiropractor addressed the right shoulder, all that stimulation would cross over to the left cortex (which would be the stronger cortex in this scenario) This would create a greater imbalance between the left and right cortices.



➤ The result is either no change in the patient's symptomatology or the symptomatology may get worse.

➤ We now see that understanding vascular function is equally important as understanding neurological function especially for your most difficult cases.

➤ This is why it becomes so important to evaluate your patients neurologically.

# Cortex

➤ All sensory info comes in from the contralateral side of the body except smell.

Ways of determining hemisphericity (weaker cortex):

- Dilation of pupil (is because the sympathetics are firing)

- Joint angulation (Hand turned in above T6 and Foot turned out below T6) (is because the sympathetics are firing ramping up the muscles for a fight or flight response)

- Palatal paresis (see picture on next slide)

(parasympathetic division of Cranial nerves 9 & 10, they are responsible for raising up the soft palate. When the sympathetic nervous system fires then the soft palate will drop)

• All of these indicate ipsilateral weakened cortex.

# Left Palatal Paresis

Normal



Weak Left Cortex



# Left Palatal Paresis





**To Increase Left Cortical Function  
if this is the weaker side we will  
have the patient utilize:**

- ◆ **Mathematics** - (addition, subtraction, dividing and multiplying with a pen and paper for 20-30 min per day)
- ◆ **Smell under left nostril**  
(use different natural essential oils)
- ◆ **Music** in right ear with headphones  
\*Music with a beat
- ◆ **Talking** (will increase left cortical function)



**To Increase Left Cortical Function if  
this is the weaker side we will have the  
patient utilize:**

**Have the patient rotate their entire body to the right including their feet in a circular fashion while standing, or sitting in a rotating chair with arms outstretched and thumbs together, and eyes locked on to thumbs.**

**– Instructions for this maneuver:**

Perform until dizzy and then stop. Patient will then increase by 1 rotation when they have performed this maneuver and they are no longer dizzy. This maneuver should be performed 2-3 times per day.



**To Increase Right Cortical Function if  
this is the weaker side we will have the  
patient utilize:**

- ◆ Drawing and Coloring
- ◆ Look at Pictures
- ◆ Smell under right nostril
- ◆ Have the patient rotate their entire body to the left including their feet in a circular fashion while standing, or sitting in a rotating chair with arms outstretched and thumbs together, and eyes locked on to thumbs.  
(see previous slide for instructions)
- ◆ Music in left ear with headphones or background music  
\*Classical or Jazz



## Further instructions for the Doctor

- These neurological exercises are very powerful so the patient should never be pushed beyond their tolerance (metabolic rate). The patient will need to be assessed within a two week time frame again.

**CAUTION: please do not give these exercises to a patient without monitoring for they are very powerful and may lead to unwanted sequelae if not done properly.**



Two commonly Ingested Chemicals that may alter neurological function that the practicing Chiropractor should be aware of in their presenting patients with possible neurological signs and symptoms (including Headaches)

1. NutraSweet
2. Mercury

Now let us take a look to see how these chemicals affect neurophysiology.



## **NutraSweet ( AKA Aspartame) (Now called Amino Sweet)**

- It was originally created as a possible pesticide or as a chemical warfare agent
- It was found that it had properties of sweetness and it was introduced into the food chain as an artificial sweetener
- It breaks down into three components
  1. Aspartic acid (which excites the NMDA receptors in the CNS which can result in the neuron exceeding its metabolic rate and cause the neurons to die)



2. Methanol also known as wood alcohol is a known neurotoxin which has been linked with causing blindness.

3. Methanol within Aspartame will break down in the liver via the alcohol dehydrogenase enzyme into **formaldehyde**.

**Please go to the following link to read:**

**U.S. adds formaldehyde to list of carcinogens**

<http://www.reuters.com/article/2011/06/11/ususa-health-cancer-idUSTRE75AoKN20110611>

# Mercury

Mercury which is a heavy metal can be found in:

- CFL's ( compact fluorescent light bulbs)
- Dental Amalgam
- Thimerosal (still included in some vaccines such as influenza, tetanus and meningococcal)

➤ Mercury can interfere with the binding of GTP (guanosine triphosphate) on the microtubules of the neuron that can lead to neurofibrillary tangles similar to those seen in Alzheimer's disease and Autism.



**Informational video for those who  
desire more of an understanding on:**

**“How Mercury Causes  
Brain Neuron  
Degeneration”**

<http://commons.ucalgary.ca/mercury/>



## Example

- How a patient may present to a Chiropractors office from a toxicity creating neurological sign and symptoms.
- One time a 16 year old girl presented to our office by her parents. The child was complaining about not being able to have sensory perception below the elbows bilaterally.



➤ There is no one area in the brain or spinal cord that could of created this symptomatology.

➤ When questioned in the case history on the consumption of NutraSweet or the contact with the heavy metal mercury, the patient indicated that she was drinking 1½ liters of diet soda per day.



➤ When instructed by the doctor to stop consumption the patient regained sensory perception back to normal bilaterally within a 5 day period.

➤ So we cannot emphasize enough on any patient presenting to a chiropractors office that a complete case history should investigate for possible chemical toxicities that may create bizarre neurological signs and symptoms.



I hope this presentation gives the practicing chiropractor some insight into treating some of their difficult cases.

Now return to the website: [Backtochiropractic.net](http://Backtochiropractic.net)  
Click on the exam next to the Neurology course and answer the questions.

Then email your answers in a numbered vertical column  
To: [marcusstrutzdc@gmail.com](mailto:marcusstrutzdc@gmail.com)

Your certificate will be emailed back with-in 24 hours.  
Thanks for taking our courses, hope you return.

Marcus Strutz DC  
Back To Chiropractic CE Seminars