

Cranial Nerves & Spinal Nerves

https://www.youtube.com/watch?v=qPix_X-9t7E

CRASH COURSE

Peripheral and Central Nervous System

- Peripheral nervous system – includes all the nerves that lie outside the spinal cord and the brain
 - The PNS Carry information to and from the central nervous system
- Central Nervous System – Consists of nerves and nervous tissue within the Brain and Spinal Cord

Sensory Nerves

- Sensory Nerve - a **nerve** that passes impulses from receptors toward or to the central nervous system. AKA an Afferent Nerve.
 - Individual nerve fibers vary widely in diameter and also may be myelinated or unmyelinated. Myelin in the peripheral nervous system derives from Schwann cells, and the distance between nodes of Ranvier determines the conduction rate

Sensory Nerves Continued

- Sensory neurons are somewhat unique, having an axon that extends to the periphery and another axon that extends into the central nervous system via the dorsal root . The cell body of this neuron is located in the dorsal root ganglion or one of the sensory ganglia of sensory cranial nerves

Sensory Nerves Continued

- Before a sensory signal can be relayed to the nervous system it must be transduced into an electrical signal in a nerve fiber. This involves a process of opening ion channels in the membrane in response to mechanical deformation, temperature or, in the case of nociceptive fibers, signals released from damaged tissue. Many receptors become less sensitive with continued stimuli and this is termed adaptation. This adaptation may be rapid or slow, with rapidly adapting receptors being specialized for detecting changing signals.

Sensory Nerves Continued

- There are several structural types of receptors in the skin. These fall into the category of encapsulated or non-encapsulated receptors. The non-encapsulated endings include free nerve endings, which are simply the peripheral end of the sensory axon. These mostly respond to noxious (pain) and thermal stimuli. There are some specialized free nerve endings around hairs that respond to very light touch and also free nerve endings that contact special skin cells, called Merkle's cells. These Merckle's cells (discs) are specialized cells that release transmitter onto peripheral sensory nerve terminals. The encapsulated endings include Meisner's corpuscles, Pacinian corpuscles and Ruffini endings. The capsules that surround encapsulated endings change the response characteristics of the nerves. Most encapsulated receptors are for touch, but the Pacinian corpuscles are very rapidly adapting and therefore are specialized to detect vibration. Ultimately, the intensity of the stimulus is encoded by the relative frequency of action potential generation in the sensory axon

Motor Nerves

- There are three types of motor nerves.
- Somatic motor nerves control skeletal muscles, which cause movement.
- Special visceral motor nerves control muscles in the face and neck.
- General visceral motor nerves control the smooth muscles that lack voluntary control, such as the heart. Another term for a motor nerve is "motor neuron." Motor nerves work by sending chemicals, known as neurotransmitters, across a gap between the nerve and the muscle. The neurotransmitters bind to receptors in the muscle fiber and trigger movement. AKA Efferent Nerves

Mixed Nerves

- **Mixed nerves** contain both afferent and efferent axons, and thus conduct both incoming sensory information and outgoing muscle commands in the same bundle

Classifications of Peripheral nerves

- Peripheral nerve fibers are grouped based on the diameter, signal conduction velocity, and myelination state of the axons. These classifications apply to both sensory and motor fibers. Fibers of the A group have a large diameter, high conduction velocity, and are myelinated.
- The A group is further subdivided into four types (A-alpha, A-beta, A-delta, and A-gamma fibers) based on the information carried by the fibers and the tissues they innervate.

A Fibers

- A-alpha fibers are the primary receptors of the muscle spindle and golgi tendon organ.
- A-beta fibers act as secondary receptors of the muscle spindle and contribute to cutaneous mechanoreceptors.
- A-delta fibers are free nerve endings that conduct painful stimuli related to pressure and temperature.
- A-gamma fibers are typically motor neurons that control the intrinsic activation of the muscle spindle.

B and C Fibers

- Fibers of the B group are myelinated with a small diameter and have a low conduction velocity. The primary role of B fibers is to transmit autonomic information
- Fibers of the C group are unmyelinated, have a small diameter, and low conduction velocity. The lack of myelination in the C group is the primary cause of their slow conduction velocity.

C Fibers Continued

- C fiber axons are grouped together into what is known as Remak bundles. These occur when an unmyelinated Schwann cell bundles the axons close together by surrounding them. The Schwann cell keeps them from touching each other by squeezing its cytoplasm between the axons.
- C fibers are considered polymodal because they can often respond to combinations of thermal, mechanical, and chemical stimuli.

Pain Sensation

- A-delta and C fibers both contribute to the detection of diverse painful stimuli. Because of their higher conduction velocity, A-delta fibers are responsible for the sensation of a sharp, initial pain and respond to a weaker intensity of stimulus.
- These nerve fibers are associated with acute pain and therefore constitute the afferent portion of the reflex arc that results in pulling away from noxious stimuli. An example is the retraction of your hand from a hot stove. Slowly conducting, unmyelinated C fibers, by contrast, carry slow, longer-lasting pain sensations.

Crash course Nervous system Videos

- <https://youtu.be/QY9NTVh-Awo> 3
- https://youtu.be/qPix_X-9t7E 1
- https://youtu.be/OZG8M_1dA1M 2

Cranial Nerves

Number	Name	Type of Nerve
I	Olfactory	Sensory
II	Optic	Sensory
III	Oculomotor	motor
IV	Trochlear	Motor
V	Trigeminal	Mixed
VI	Abducens	Motor
VII	Facial	Mixed
VIII	Vestibulocochlear	Sensory
IX	Glossopharyngeal	mixed
X	Vagus	mixed
XI	Accessory	motor
XII	Hypoglossal	motor

How to remember Cranial Nerves

Oh, Oh, Oh, To Touch And Feel Very Green
Vegetables, AH

Olfactory, Optic, Oculomotor, Trochlear,
Trigeminal, Abducens, Facial,
vestibulocochlear, Glossopharyngeal,
Vagus, Accessory, Hypoglossal

CN I Olfactory Nerve

- sensory for smell
- bundles of axons of olfactory receptors extend through the olfactory foramina within the cribriform plate
- they end as the olfactory bulbs
- here the axons synapse with new neurons that run through the olfactory tracts
- these end in the temporal lobe (olfactory cortex)
- Emerges from the nose

CN II Optic Nerve

- sensory
- rods and cones in the eye convey visual signals to optic nerves
- the optic nerves pass through the optic foramen and then merge to form the optic chiasm within the chiasm, axons from the medial portion of each eye cross over axons from the lateral portion of each eye remain ipsilateral these axons terminate in the occipital lobe. Emerges from the Eyes

CN III Oculomotor

- Motor
- Passes through the superior orbital fissure into the orbit supplies some of the mm that move the eyeball and the mm of the upper eyelid also supplies parasympathetic innervation to the eyeball for pupil constriction & lens adjustment
 - PNS – Pupil constriction
 - SNS – Pupil dilation
- Emerges from the Brain Stem

CN IV Trochlear

- Motor
- Smallest of the cranial nerves. Passes through the superior orbital fissure. Innervates a mm that moves the eyeball (superior oblique mm)
- Emerges from the Brain Stem

CN V Trigeminal

- Mixed, largest cranial nerve
- Has 3 large branches (TRI-geminal)
 - Ophthalmic(V1) – enters the orbit through the superior orbital fissure
 - sensory axons from skin over the upper eyelid; eyeball; lacrimal gland; upper part of nasal cavity; side of nose, forehead and anterior scalp
 - Maxillary (V2)– exits the foramen rotundum
 - sensory axons from nose, palate, pharynx, upper teeth and lip, lower eyelid
 - Mandibular (V3)– exits the foramen ovale
 - sensory axons from the anterior tongue (not taste); cheek, lower teeth and lip, skin over the mandible
 - also has motor fibres and innervates the mm of mastication
- Emerges from the Brain Stem

CN VI Abducens

- motor
- enters the orbit through the superior orbital fissure. Supplies a muscle that moves the eyeball (lateral rectus mm). Causes lateral rotation of the eye (or abduction)
- Emerges from Brain Stem

CN VII Facial

- Mixed
- Sensory axons extend from taste buds and from proprioception in mm of the face and scalp
- Motor neurons pass through the temporal bone to innervate the mm of facial expression; also supplies parasympathetic to the lacrimal glands, nasal glands, palatine glands, and sublingual and submandibular glands
- Emerges from the Brain stem

CN VIII Vestibulocochlear

- sensory nerve with 2 branches: vestibular and cochlear (balance and hearing)
- Emerges from the inner ear

CN IX Glossopharyngeal

- mixed
- sensory axons from the posterior taste buds of the tongue and from proprioceptors in swallowing mm
- motor neurons exit through the jugular foramen and innervate stylopharyngeus mm
- parasympathetic info to the parotid gland
- Emerges from the Brain Stem

CN X Vagus Nerve

- Mixed
- travels from head and neck into the thorax and abdomen
- sensory axons from the skin of the external ear, some taste buds in the epiglottis and proprioceptors in mm of neck and throat. Also from baroreceptors, chemoreceptors, sensory receptors for most organs of the thorax and abdomen
- somatic motor neurons supply mm of the pharynx, larynx, and soft palate
- parasympathetic innervation to the glands of the GI tract and to smooth mm of the respiratory pathways, esophagus, stomach, gallbladder, small intestine, and large intestine
- Emerges from the Brain Stem

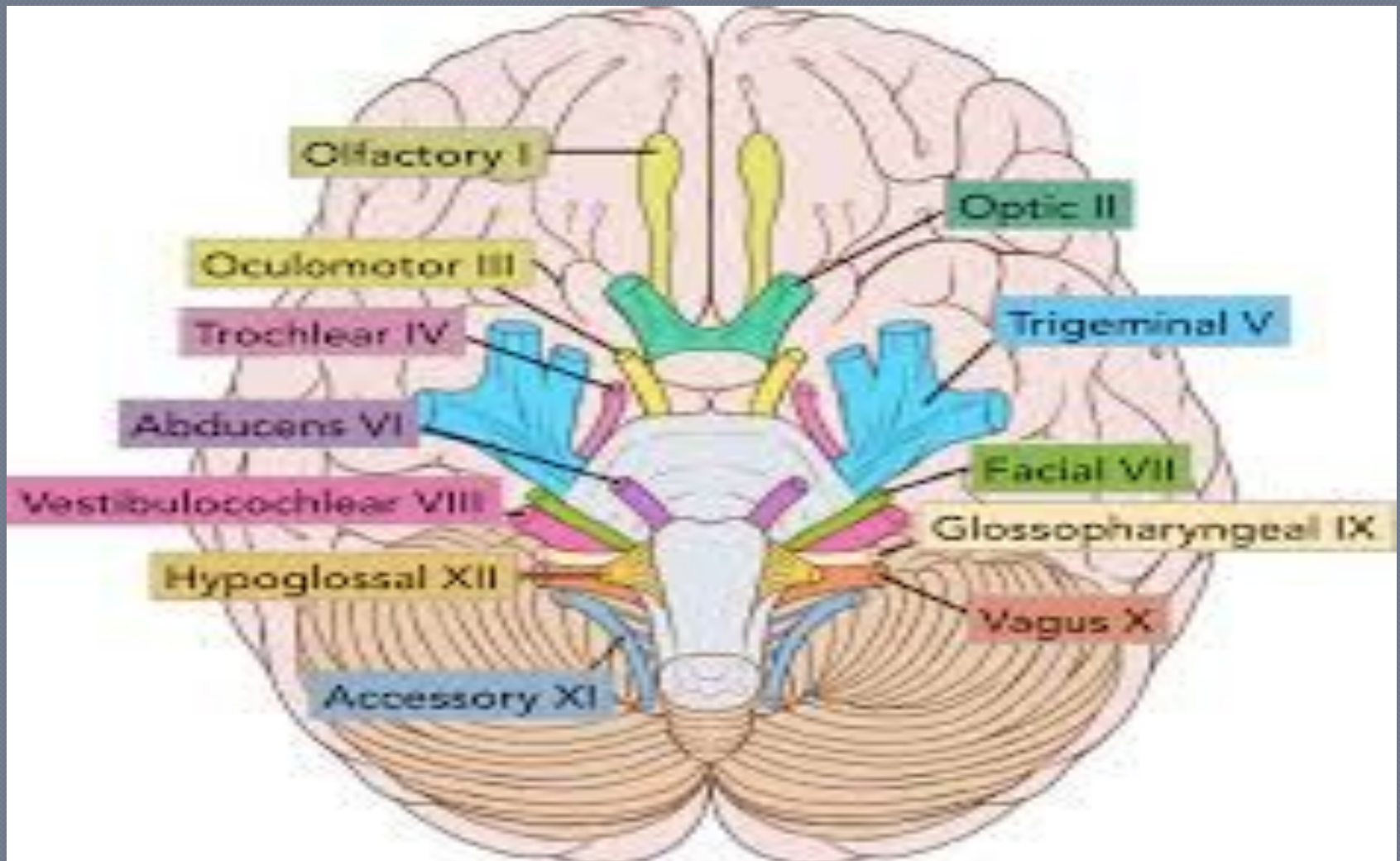
CN XI Accessory Nerve

- Motor
- motor neurons to SCM and trapezius
- Emerges from Spinal Cord

CN XII Hypoglossal Nerve

- motor
- passes through the hypoglossal canal to supply mm of the tongue
- helps with speech and swallowing
- Emerges from the Brain Stem

Cranial Nerves



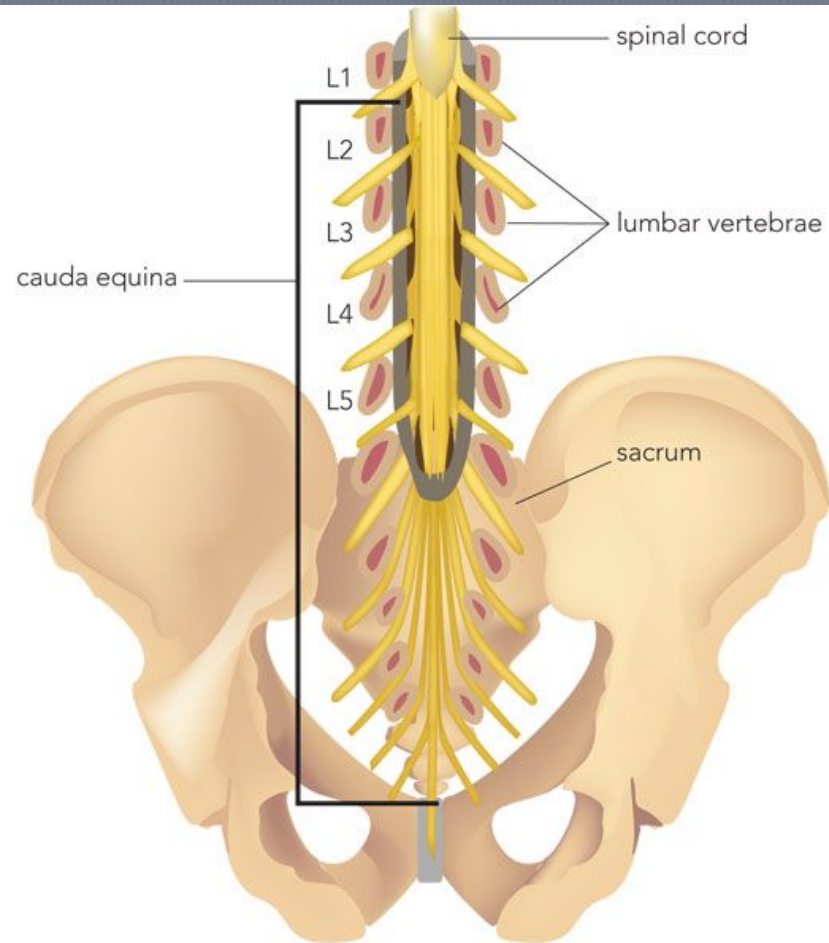
Spinal Nerves

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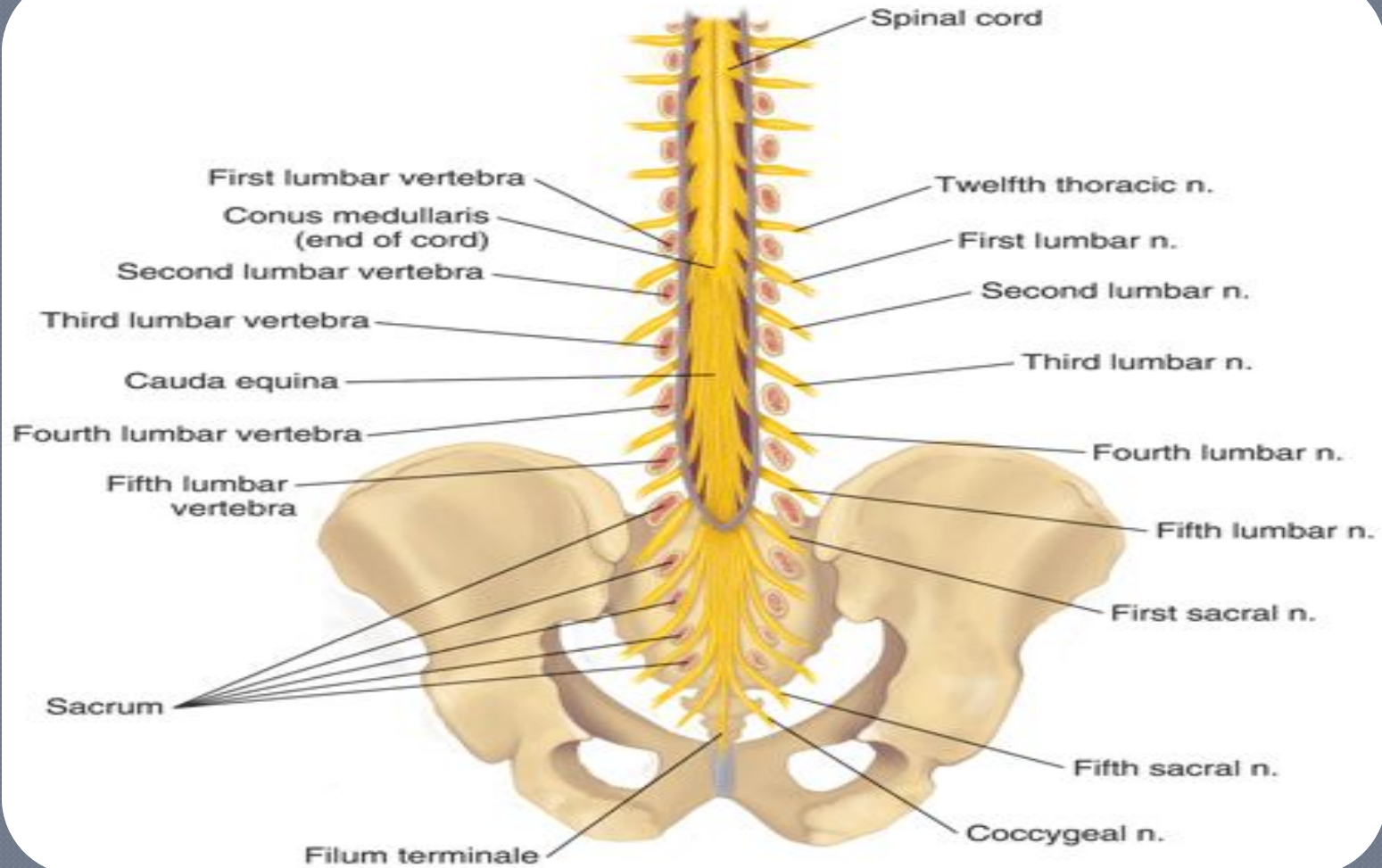
Spinal Cord

- The spinal cord comes off the base of the brain, runs throughout the cervical and thoracic spine, and ends at the lower part of the thoracic spine.
- The spinal cord does not run through the lumbar spine. After the spinal cord stops in the lower thoracic spine, the nerve roots from the lumbar and sacral levels come off the bottom of the cord like a "horse's tail" (cauda equina) and exit the spine

Cauda Equina




Spinal Cord



Spinal Nerves

- The spinal cord can be divided into segments according to the nerve roots that branch off of it.
- Spinal nerves are part of your Peripheral Nervous System and are responsible for voluntary movement and sensation.
- Nerves along the cord consists of 8 cervical nerves, 12 thoracic nerves, 5 lumbar nerves, 5 sacral nerves, and 1 coccygeal nerve.
- The nerve roots run through the bony canal, and at each level a pair of nerve roots exits from the spine.



VERTEBRAL LEVEL	NERVE ROOT*	INNERVATION	POSSIBLE SYMPTOMS
C1	C1	Intracranial Blood Vessels	Headaches • Migraine Headaches
C2	C2	• Eyes • Lacrimal Gland	• Dizziness • Sinus Problems
C3	C3	• Parotid Gland • Scalp	• Allergies • Head Colds • Fatigue
C4	C4	• Base of Skull • Neck Muscles • Diaphragm	• Vision Problems • Runny Nose • Sore Throat • Stiff Neck
C5	C5	• Neck Muscles • Shoulders	• Cough • Croup • Arm Pain
C6	C6	• Elbows • Arms • Wrists	• Hand and Finger Numbness or Tingling • Asthma • Heart
C7	C7	• Hands • Fingers • Esophagus	Conditions • High Blood Pressure
C8	C8	• Heart • Lungs • Chest	
T1	T1	Arms • Esophagus	Wrist, Hand and Finger
T2	T2	• Heart • Lungs • Chest	Numbness or Pain • Middle Back
T3	T3	• Larynx • Trachea	Pain • Congestion • Difficulty
T4	T4		Breathing • Asthma • High Blood
T5	T5	Gallbladder • Liver	Pressure • Heart Conditions
T6	T6	• Diaphragm • Stomach	• Bronchitis • Pneumonia
T7	T7	• Pancreas • Spleen	• Gallbladder Conditions
T8	T8	• Kidneys • Small Intestine	• Jaundice • Liver Conditions
T9	T9	• Appendix • Adrenals	• Stomach Problems • Ulcers
T10	T10		• Gastritis • Kidney Problems
T11	T11	Small Intestines • Colon • Uterus	
T12	T12	Uterus • Colon • Buttocks	
L1	L1	Large Intestines	Constipation • Colitis • Diarrhea
L2	L2	• Buttocks • Groin	• Gas Pain • Irritable Bowel
L3	L3	• Reproductive Organs	• Bladder Problems • Menstrual
L4	L4	• Colon • Thighs • Knees	Problems • Low Back Pain
L5	L5	• Legs • Feet	• Pain or Numbness in Legs
S A C R A L	S A C R A L	Buttocks • Reproductive Organs • Bladder • Prostate Gland • Legs • Ankles • Feet • Toes	Constipation • Diarrhea • Bladder Problems • Menstrual Problems • Lower Back Pain • Pain or Numbness in Legs

Autonomic Nervous System

- Your Peripheral Nervous System also contains autonomic nerves and these are responsible for involuntary functions of the body. Autonomic nerves assist with the functioning of organs such as your heart, intestines, bladder, bowel and sexual organs.
- The autonomic nerves are made up of parasympathetic and sympathetic. They work together to keep the body functions in balance. Sympathetic response increases activity and parasympathetic response decreases activity (for example heart rate up and down).

Autonomic Nervous System

- The autonomic nervous system plays an essential role in keeping the body's internal environment (temperature, salt concentration, blood sugar, oxygen and carbon dioxide level in blood, etc) in proper balance, a condition called homeostasis. The autonomic nervous system also plays a major part in emotional experience and expression. When you are emotionally excited, the body shows many changes: blood pressure and heart beat increase, mouth is often dry, stomach has "butterflies" in it. These and other body actions are controlled by the autonomic nervous system.

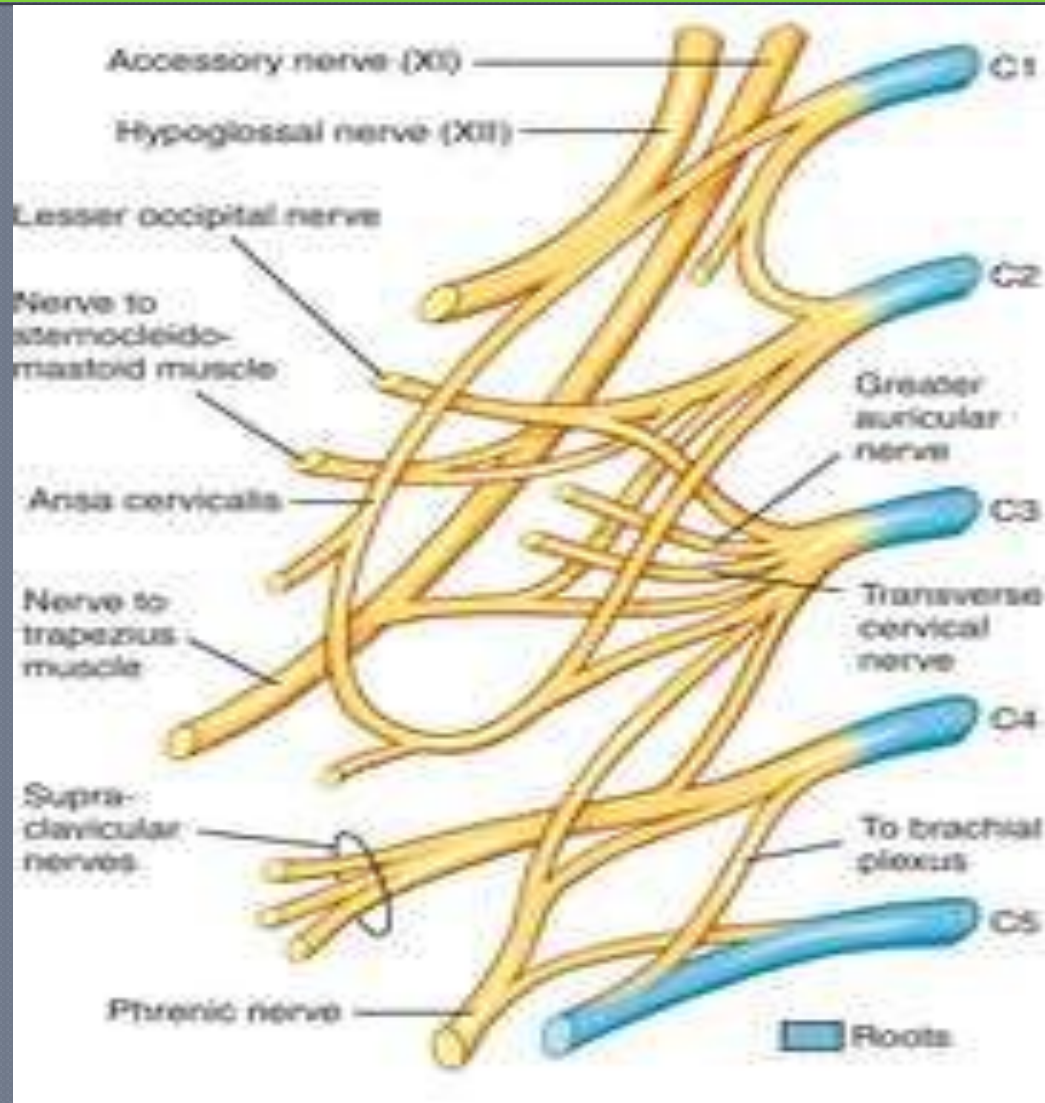
Autonomic Nervous System

- The autonomic nervous system controls the insides of the body: the viscera or gut. It carries information about the inside of the body to the CNS and controls the action of internal organs, including the gut, the heart, the secretion of epinephrine (adrenalin) and norepinephrine (noradrenalin) from the medulla (middle part) of the adrenal gland, etc.

Autonomic Nerves

- Because there are many spinal and autonomic nerves in the end of your spinal cord, it is called a major reflex centre. Reflex (unconscious) activity takes place between your spinal cord and skeletal muscles, as well as your bladder, bowel and sexual organs.

Cervical Plexus Review



Continued

- The cervical plexus is a network of nerve fibres that supplies innervation to some of the structures in the neck and trunk.
- It is located in the posterior triangle of the neck, halfway up the sternocleidomastoid muscle, and within the prevertebral layer of cervical fascia. The plexus is formed by the anterior rami (divisions) of cervical spinal nerves C1-C4.

Continued

- The spinal nerves C1 – C4 form the basis of the cervical plexus.
- At each vertebral level, paired spinal nerves leave the spinal cord via the intervertebral foramina of the vertebral column.
- Each nerve then divides into anterior and posterior nerve fibres. The cervical plexus begins as the anterior fibres of the spinal nerves C1, C2, C3 and C4.

Continued

- The cervical plexus gives rise to numerous branches which supply structures in the head and neck. They can broadly be divided into two groups – muscular branches and sensory branches.
- Phrenic Nerve- The phrenic nerve arises from the anterior rami of C3-C5. It provides motor innervation to the diaphragm.
- The C1 spinal nerve gives rise to nerves to the geniohyoid (moves the hyoid bone anteriorly and upwards, expanding the airway) and the thyrohyoid (which depresses the hyoid bone and elevates the larynx) These nerves travel with the hypoglossal nerve to reach their respective muscles

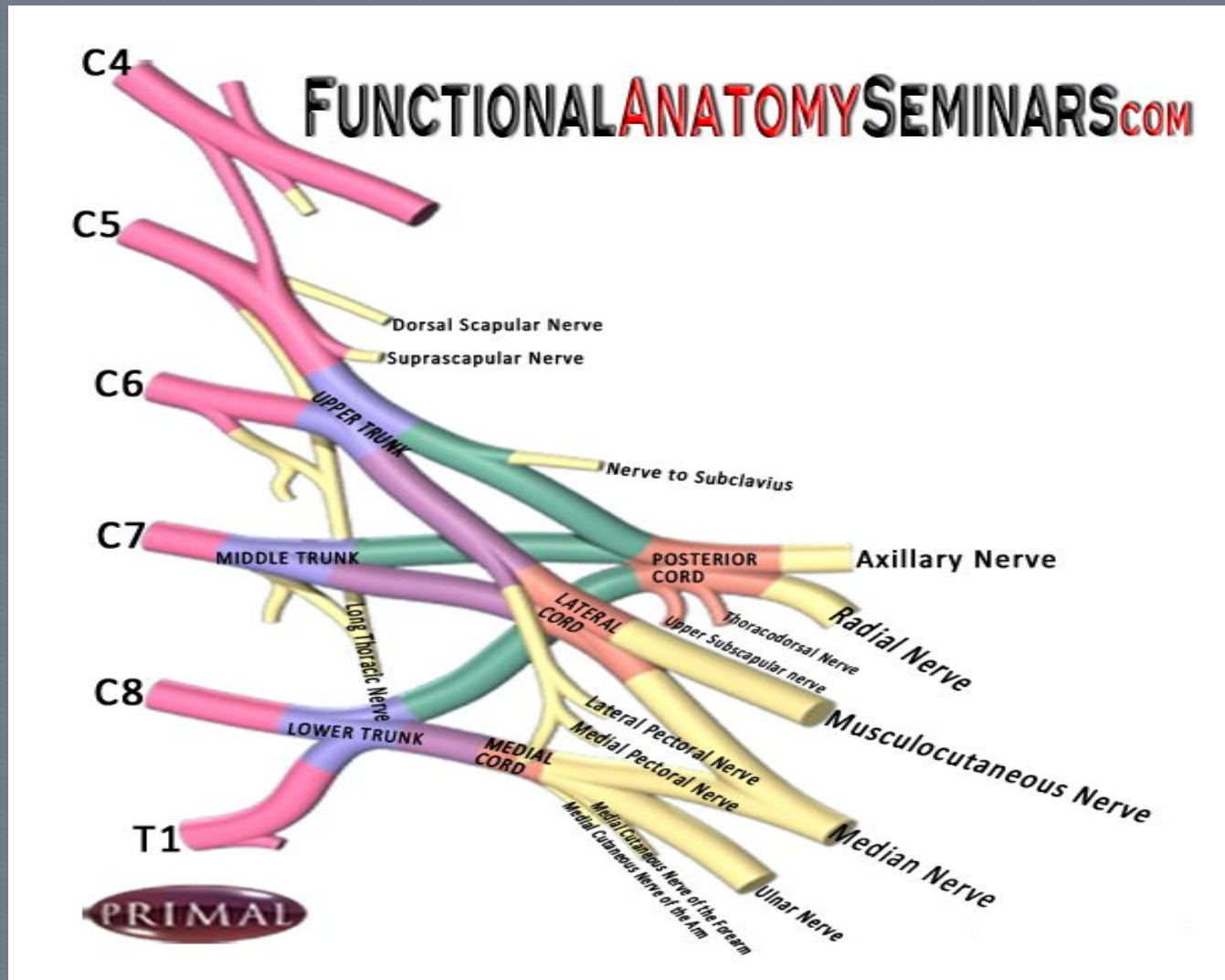
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- The ansa cervicalis (goose's neck) is a loop of nerves, formed by nerve roots C1-C3. It gives off four muscular branches – superior and inferior omohyoid, sternohyoid and sternothyroid
- Several other minor branches arise from the nerve roots to supply muscles of the neck and back:
 - C1-C2: Rectus capitis anterior and lateralis
 - C1-C3: Longus capitis
 - C2-C3: Prevertebral muscles and sternocleidomastoid
 - C3-C4: Levator scapulae, trapezius and scalenus medius
 - The middle and anterior scalenus muscles also receive innervation directly from the cervical plexus.

Continued

- Sensory Branches
 - Greater Auricular Nerve
 - Transverse cervical Nerve
 - Lesser Occipital Nerve
 - Supraclavicular nerve

Brachial Plexus Review



Continued

- The Brachial Plexus is a network of nerve fibers that run from the spine, passing through the cervico-axillary canal to reach axilla. It is formed by the ventral rami of the lower four cervical and first thoracic nerve roots (C5-C8, T1)
- The brachial plexus is responsible for cutaneous and muscular innervation of the entire upper limb, with two exceptions: the trapezius muscle innervated by the spinal accessory nerve (CN XI) and an area of skin near the axilla innervated by the intercostobrachial nerve

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- The brachial plexus is divided into Roots, Trunks, Divisions, Cords, and Branches. There are five "terminal" branches and numerous other "pre-terminal" or "collateral" branches that leave the plexus at various points along its length.
 - The five Roots are the five anterior rami of the of the lower four cervical and first thoracic nerve roots (C5-C8, T1), after they have given off their segmental supply to the muscles of the neck. These Roots merge to form three Trunks:
 - Upper Trunk (C5-C6)
 - Middle Trunk (C7)
 - Lower Trunk (C8, T1)

-
- Each Trunk then splits into anterior and posterior divisions, to form six Divisions. The anterior/ posterior divisions innervate flexor groups versus extensor groups:
 - anterior divisions of the upper, middle, and lower trunks
 - posterior divisions of the upper, middle, and lower trunks
 - These six Divisions will regroup to become the three Cords. The Cords are named by their position with respect to the axillary artery.
 - The Posterior Cord is formed from the three posterior divisions of the trunks (C5-C8,T1)
 - The Lateral Cord is the anterior divisions from the upper and middle trunks (C5-C7)
 - The Medial Cord is simply a continuation of the anterior division of the lower trunk (C8,T1)
 - Specific Branches [1][3]

 - The branches are listed below. Most branch from the cords, but a few branch (indicated in italics) directly from earlier structures.

Lumbosacral Plexus Review

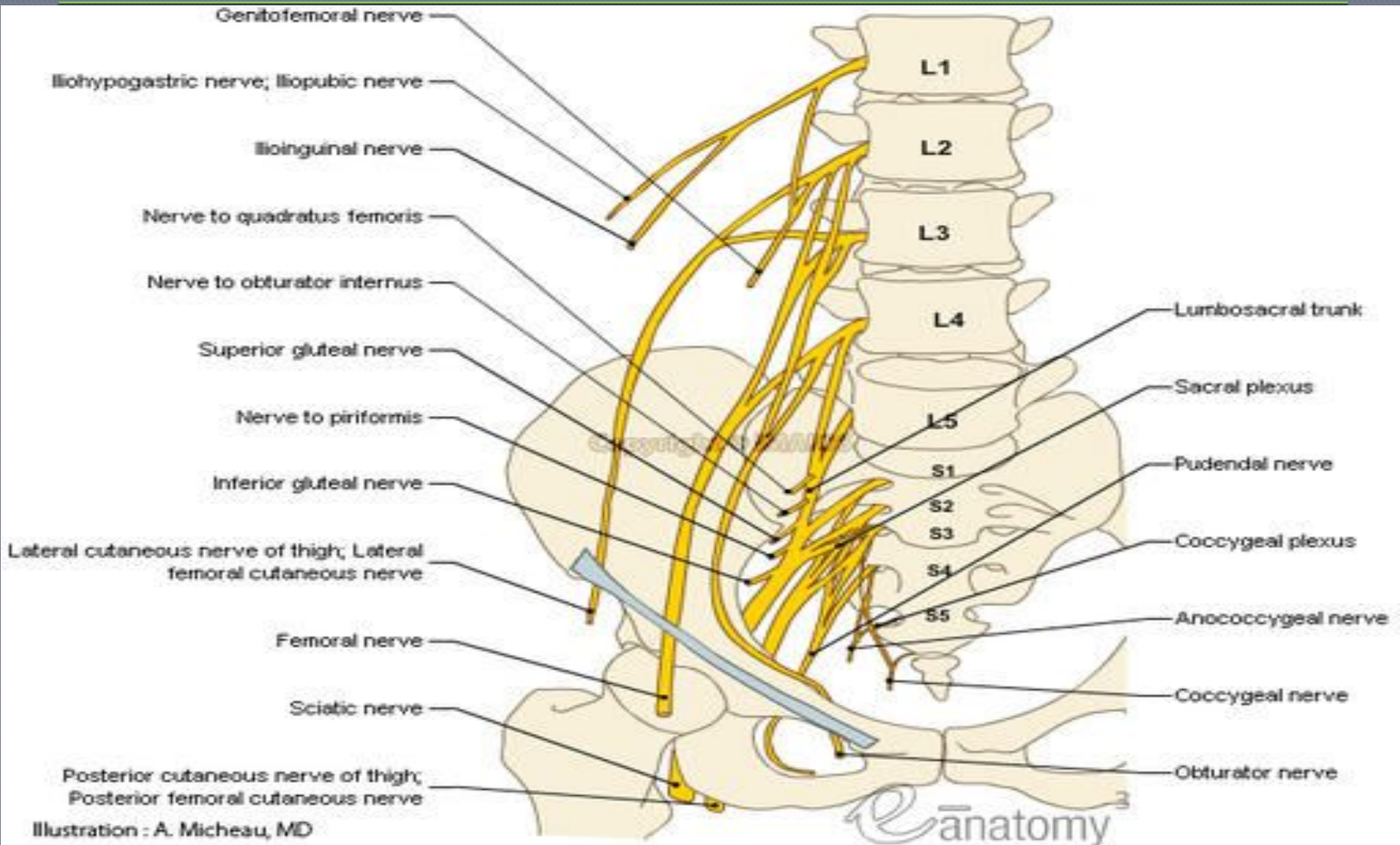


Illustration : A. Micheau, MD

Continued

- The lumbar plexus is a web of nerves in the lumbar region of the body which forms part of the larger lumbosacral plexus. It is formed by the divisions of the first four lumbar nerves (L1-L4) and from contributions of the subcostal nerve (T12), which is the last thoracic nerve.

Lumbar plexus Continued

- The lumbar plexus begins as the anterior fibres of the spinal nerves L1, L2, L3, and L4.
- The anterior rami of the L1-L4 spinal roots divide into several cords. These cords then combine together to form the six major peripheral nerves of the lumbar plexus. These nerves then descend down the posterior abdominal wall to reach the lower limb, where they innervate their target structures.

Nerves of the lumbar Plexus

- The iliohypogastric nerve is the first major branch of the lumbar plexus. It runs to the iliac crest, across the quadratus lumborum muscle of the posterior abdominal wall. It then perforates the transversus abdominis, and divides into its terminal branches.
- Roots: L1 (with contributions from T12).
- Motor Functions: Innervates the internal oblique and transversus abdominis.
- Sensory Functions: Innervates the posterolateral gluteal skin in the pubic region

Lumbar Plexus Nerves

Continued

- The ilioinguinal nerve follows the same anatomical course as the larger iliohypogastric nerve. After innervating the muscles of the anterior abdominal wall, it passes through the superficial inguinal ring to innervate the skin of the genitalia and middle thigh.
- Roots: L1.
- Motor Functions: Innervates the internal oblique and transversus abdominis.
- Sensory Functions: Innervates the skin on the upper middle thigh. In males, it also supplies the skin over the root of the penis and anterior scrotum. In females, it supplies the skin over mons pubis and labia majora.

Lumbar Plexus Nerves

Continued

- After leaving the psoas major muscle, the genitofemoral nerve quickly divides into a genital branch, and a femoral branch.
- Roots: L1, L2.
- Motor Functions: The genital branch innervates the cremasteric muscle.
- Sensory Functions: The genital branch innervates the skin of the anterior scrotum (in males) or the skin over mons pubis and labia majora (in females). The femoral branch innervates the skin on the upper anterior thigh.

Lumbar Plexus Nerves

Continued

- The Lateral Cutaneous Nerve of the Thigh has a purely sensory function. It enters the thigh at the lateral aspect of the inguinal ligament, where it provides cutaneous innervation to the skin there.
- Roots: L2, L3
- Motor Functions: None.
- Sensory Functions: Innervates the anterior and lateral thigh down to the level of the knee.

Lumbar Plexus Nerves

Continued

- The Obturator Nerve
- Roots: L2, L3, L4.
- Motor Functions: Innervates the muscles: obturator externus, pectineus, adductor longus, adductor brevis, adductor magnus, gracilis.
- Sensory Functions: Innervates the skin over the medial thigh.

Lumbar Plexus Nerves

Continued

- The Femoral Nerve
- Roots: L2, L3, L4.
- Motor Functions: Innervates the muscles: Iliacus, pectineus, sartorius, all the muscles of quadriceps femoris.
- Sensory Functions: Innervates the skin on the anterior thigh and the medial leg.

Sacral Plexus

- The sacral plexus is a nerve plexus that provides motor and sensory nerves for the posterior thigh, most of the lower leg, the entire foot, and part of the pelvis. The sacral plexus is derived from the anterior rami of spinal nerves L4, L5, S1, S2, S3, and S4.

Sacral Plexus Spinal Nerves

- The spinal nerves S1 – S4 form the basis of the sacral plexus.
- Each nerve then divides into anterior and posterior nerve fibres. The sacral plexus begins as the anterior fibres of the spinal nerves S1, S2, S3, and S4. They are joined by the 4th and 5th lumbar roots, which combine to form the lumbosacral trunk. This descends into the pelvis to meet the sacral roots as they emerge from the spinal cord.

Sacral Plexus Spinal Nerves

- The anterior rami of the S1-S4 spinal roots (and the lumbosacral trunk) divide into several cords. These cords then combine together to form the five major peripheral nerves of the sacral plexus.
- These nerves then descend down the posterior pelvic wall. They have two main destinations:
- Leave the pelvis via the greater sciatic foramen – these nerves enter the gluteal region of the lower limb, innervating the structures there.
- Remain in the pelvis – these nerves innervate the pelvic muscles, organs and perineum.

Sacral Plexus Spinal Nerves

- the superior gluteal nerve leaves the pelvis via the greater sciatic foramen, entering the gluteal region superiorly to the piriformis muscle. It is accompanied by the superior gluteal artery and vein for much of its course.
- Roots: L4, L5, S1.
- Motor Functions: Innervates the gluteus minimus, gluteus medius and tensor fascia lata.
- Sensory Functions: None.

Sacral Nerves Spinal Nerves

- The inferior gluteal nerve leaves the pelvis via the greater sciatic foramen, entering the gluteal region inferiorly to the piriformis muscle.
- It is accompanied by the inferior gluteal artery and vein for much of its course.
- Roots: L5, S1, S2.
- Motor Functions: Innervates gluteus maximus.
- Sensory Functions: None.
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Sacral Plexus - Sciatic Nerve

- Roots: L4, L5, S1, S2, S3
- Motor Functions:
- Tibial Portion – Innervates all of the muscles in the posterior compartment of the thigh, including the hamstring portion of adductor magnus, apart from the short head of the biceps femoris. All muscles in the posterior compartment of the leg. All muscles in the sole of the foot.
- Common Fibular Portion – Short head of biceps femoris, all muscles in the anterior and lateral compartments of the leg and extensor digitorum brevis.

Sacral Plexus – Sciatic Nerve

- Sensory Functions:
- Tibial Portion: Innervates the skin on the posterolateral and medial surfaces of the foot as well as the sole of the foot.
- Common Fibular Portion: Innervates the skin on the anterolateral surface of the leg and the dorsal aspect of the foot

Sacral Plexus Nerves Continued

- The posterior cutaneous nerve of thigh leaves the pelvis via the greater sciatic foramen, entering the gluteal region inferiorly to the piriformis muscle. It descends deep to the gluteus maximus and runs down the back of the thigh to the knee.
- Roots: S1, S2, S3
- Motor Functions: None
- Sensory Functions: Innervates the skin on the posterior surface of the thigh and leg. Also innervates the skin of the perineum.

Sacral Plexus Nerve Continued

- The Pudendal Nerve leaves the pelvis via the greater sciatic foramen, then re-enters via the lesser sciatic foramen. It moves anterosuperiorly along the lateral wall of the ischiorectal fossa, and terminates by dividing into several branches.
- Roots: S2, S3, S4
- Motor Functions: Innervates the skeletal muscles in the perineum, the external urethral sphincter, the external anal sphincter, levator ani.
- Sensory Functions: Innervates the penis and the clitoris and most of the skin of the perineum.

Sacral Nerve Plexus Continued

- Other Branches
- In addition to the five major nerves of the sacral plexus, there are a number of smaller branches. These tend to be nerves that directly supplying muscles (with the exception of the perforating cutaneous nerve, which supplies the skin over the inferior gluteal region and the pelvic splanchnic nerves, which innervate the abdominal viscera):
 - Nerve to piriformis
 - Nerve to obturator internus
 - Nerve to quadratus femoris

Plexuses Summary

● Cervical Plexus

- C1 – C4 Nerve roots innervate diaphragm, shoulder and neck

● Brachial Plexus

- C5 – T1 Nerve roots innervate the upper limbs

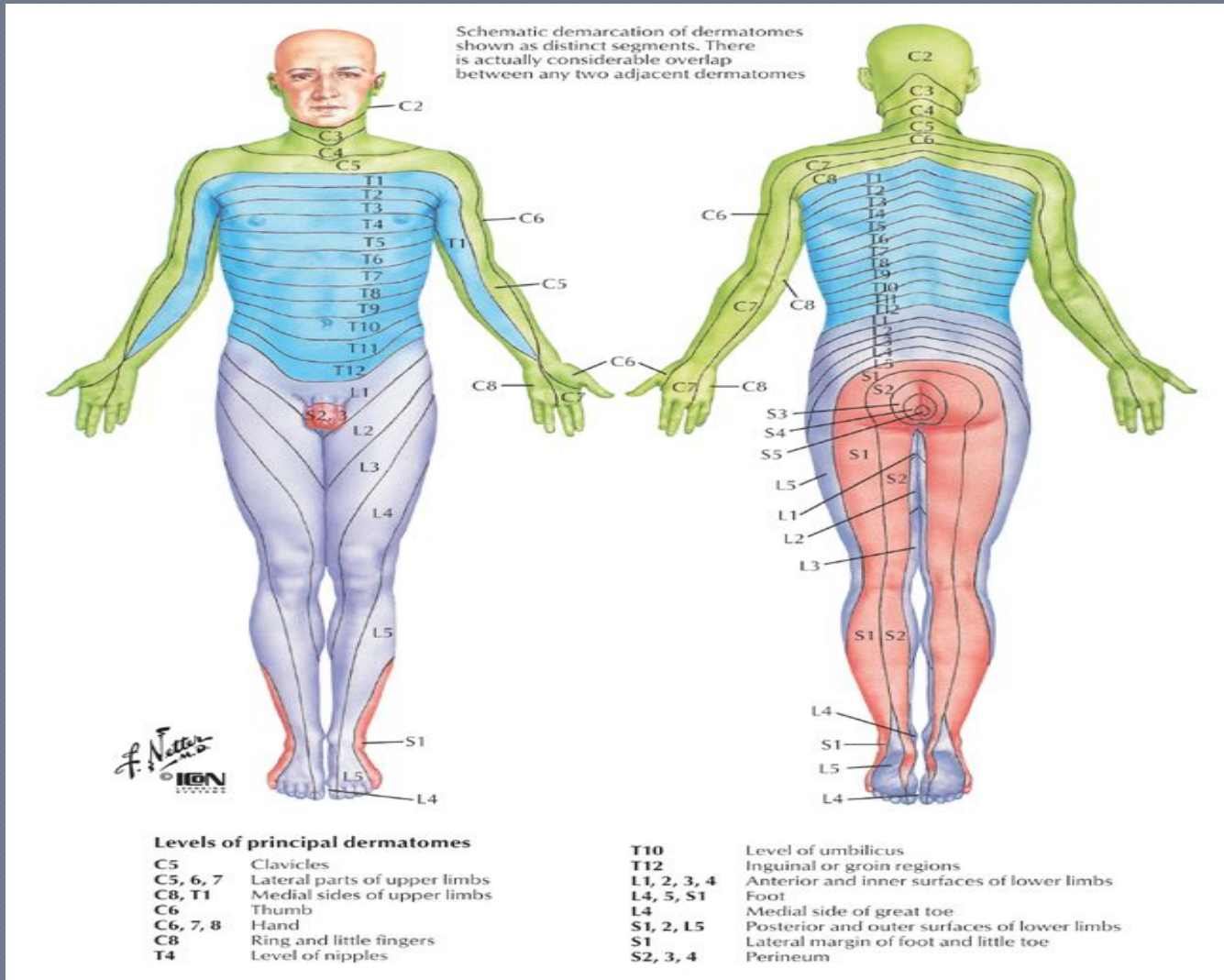
● Lumbosacral Plexus

- L1 – L5, S2 Nerve roots innervate the lower limb

Dermatomes

- Each of the spinal nerves exits the spinal canal between two of the vertebra. Each then goes to a particular area of the body. The area of skin served by each of these nerves is called its dermatome.

Dermatome Map of the Body



Main Dermatome Levels

- C5 Clavicles
- C5, 6 Lateral sides of upper limbs
- C8, T1 Medial Sides of Upper Limbs
- C6 Thumb
- C6, 7 and 8 Hand
- C8 Ring and Little Finger
- T4 Level of Nipples
- T10 Level of umbilicus

Continued

- L1 Inguinal region
- L1, 2, 3, 5 Anterior and inner surfaces of lower limbs
- L4, 5, S1 Foot
- L4 Medial side of the Great Toe
- L5, S1, 2 Lateral and posterior side of lower limbs
- S1 Lateral margin of Foot and Baby toe
- S2, 3, 4 Perineum

What is a Dermatome Test

- There are two types

- Pain sensations (pin prick) Test
- Light touch Sensation (cotton ball) Test

The pin prick test involves touching the clients skin with the sharp or blunt part of a needle and asking what the feel

- The Light Touch test involves lightly touching the clients skin with the cotton wool

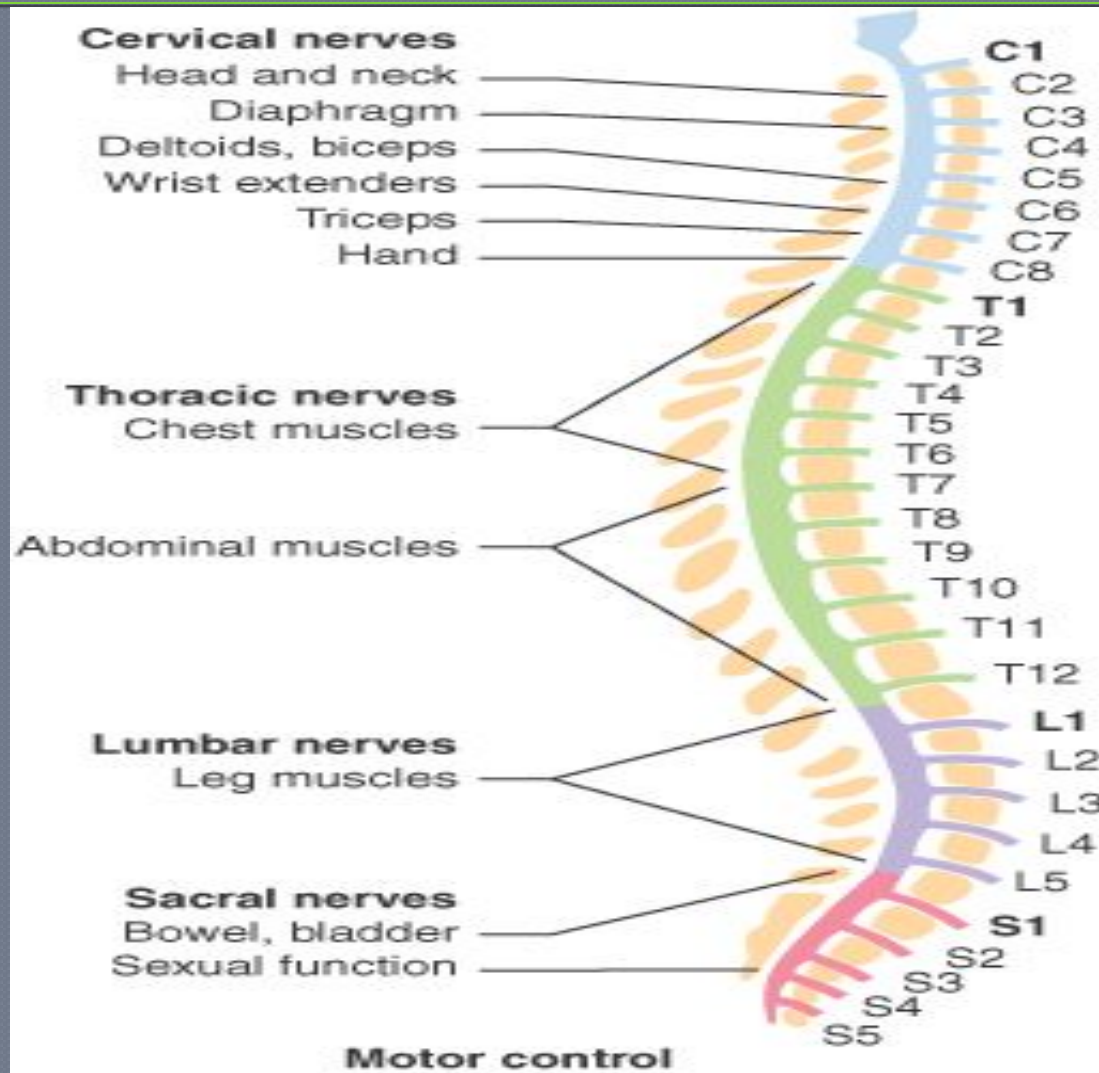
Procedure

- Used when there is an abnormal feeling in the skin
- Test patient with pin and cotton
- Test should be shown to client prior to performing
- The Client will then close their eyes as the examiner performs the tests. The patient will supply information about what they feel

Continued

- Test should be performed in a specific dermatome and completed bilaterally
- Should be Tested distally moving proximally

Myotomes



Myotomes

- What are they?
 - Myotomes correspond to muscles that are controlled by a specific nerve root from the spinal cord

Myotomes and Differentiating Nerve Lesions

C1 Myotome Upper cervical flexion

C2 Myotome Upper cervical extension/ Neck Rotation

C3 Myotome Cervical lateral flexion

C4 Myotome Shoulder shrugs (upper trapezius)

C5 Myotome Shoulder abduction and external rotation (infraspinatus)

C6 Myotome Elbow flexion and wrist extension

C7 Myotome Elbow extension and wrist flexion

C8 Myotome Thumb extension and ulnar deviation

T1 Myotome Finger adduction and abduction

L1 Myotome Hip flexion

L2 Myotome Hip flexion (also adduction and medial rotation)

L3 Myotome Leg/knee extension

L4 Myotome Dorsiflexion

L5 Myotome Great/Big toe extension

S1 Myotome Ankle plantar flexion and eversion/knee flexion

S2 Myotome Ankle plantar flexion and knee flexion

S3 Myotome None

S4 Myotome Bladder and rectum

When to use Myotome Testing

- Note the position the client assumes, often paralysis or weakness shows when the client takes on abnormal positions
- Appearance of musculature – signs of muscle wasting or atrophy
- Feel of muscle tone
- These are all signs we may want to perform a myotome test

Myotome Tests

Upper Extremity Nerve Routes

- C4** tested with resisted shoulder shrugs/elevation
- C5** tested with resisted shoulder abduction
- C6** tested with resisted elbow flexion/ wrist extension
- C7** tested with resisted wrist flexion
- C8** tested with resisted thumb extension
- T1** fingers abduction & adduction

Lower Extremity Nerve Routes

The quick test for the lower extremity, to rule out a nerve root injury is to have the athlete do a squat.

- L1-L2** tested with resisted hip flexion
- L3** tested with resisted knee extension
- L4** tested with resisted foot dorsi flexion
- L5** tested with resisted great toe extension
- S1/S2** tested with plantar flexion