

ANATOMY

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Number

14

Subject

Spinal cord lesions and blood supply

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Date: 27/02/2017

Price:

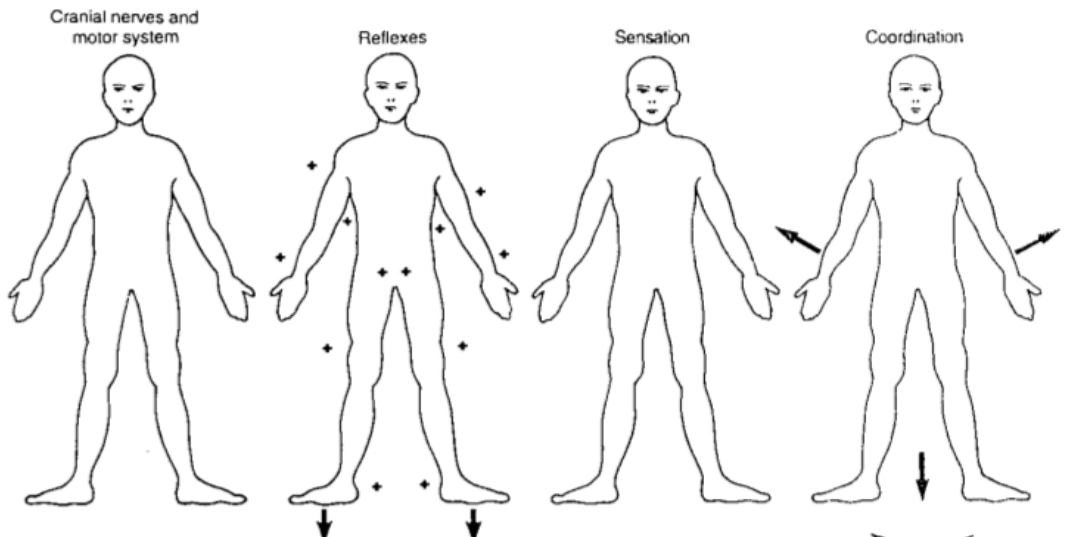
Spinal cord lesions and blood supply

We will be talking about lesions among different levels of the spinal cord whether a hemi section or a complete section.

First when there is a lesion we should take into consideration 2 concepts:

1. What pathway decussates at the level of spinal cord? The spinothalamic tract, if there is a lesion on the left side, effect is seen on the right.
2. What pathways don't decussate at the level of the spinal cord? The dorsal column pathway, and the motor pathway (they decussate at the medulla) , so any lesion in the spinal cord effecting the pyramidal +extrapyramidal the effect is ipsilateral, the spinothalamic lesion effect is contralateral and the dorsal column lesion effect is ipsilateral.

Now, If you had a patient with a spinal cord lesion, there are major anatomical-clinical syndromes noticed after neurological examination, reflexes, sensation and coordination.



Neurological examination:

Test the power(actively) and the tone(passively)

E.g. power test, you suspect weakness in the biceps, ask your patient to hold your hand firmly and compare it with his other hand.

Reflexes:

One(+) is normal, the more pluses the more the reflex is.

Normally when hitting on the patellar tendon for example, reflex happens but within limits.

The (-) means the reflex is absent.

Sensation :

With a pin or a needle, ask the patient if he feels it starting from his feet upwards.

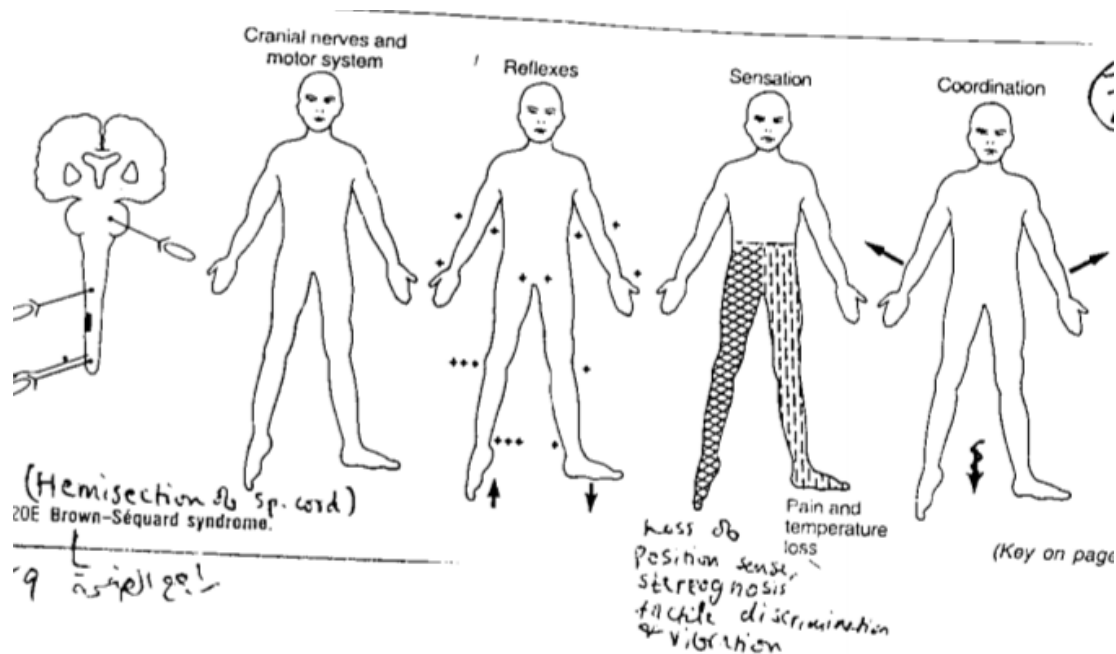
E.g. if he didn't feel it in his knee that could mean a lesion in level L4-L5.

Coordination:

Since the patient is paralyzed, you can't ask him to do finger-nose test or any other tests that detect cerebellar ataxia, but the patient will have sensory ataxia, you move the fingers or toes of the paralyzed limb while his eyes are closed and he can't sense it.

Hemisection of the spinal cord at the thoracic region (bullet injury):

The upper limb is safe.



Symptoms of Upper motor neuron lesion in the lower limb.

Spastic paralysis, positive Babinski, hyperreflexia, ipsilateral to the lesion only presented in the lower limb. Because of the level of the lesion the upper limb is safe.

Why the patient shows spasticity? The patient lost the effect of both the pontine reticulospinal tract and the medullary reticulospinal tract, the main one responsible for the increase of the tone is the medullary reticulospinal tract.

Upper limb present normal reflexes.

Lower limb shows hyperreflexia.

On the same side of the lesion (ipsilateral) and directly below it, mechanoreceptive sensation is lost (2 point discrimination, vibration and sense of position) due to the loss of the dorsal column system.

On the other side (contralateral) loss of pain and simple touch, due to the loss of the spinothalamic tract.

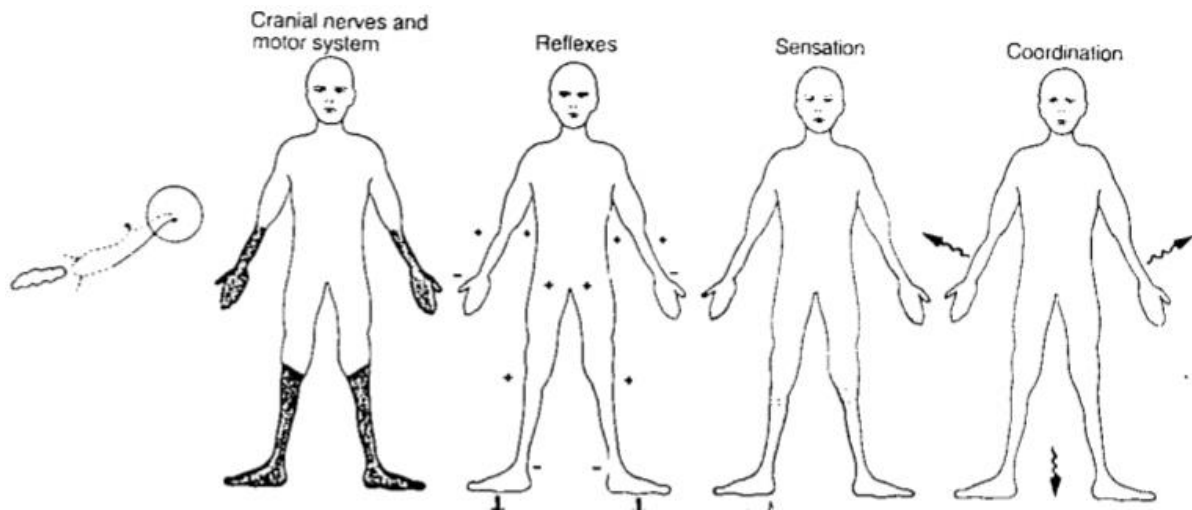
Sensory ataxia is present only at the side of lesion (ipsilateral).

Peripheral sensorimotor neuropathies (Ulnar, tibial, sciatic..)

Degenerative disease commonly chronic diabetes, degeneration in myelin sheath or axons.

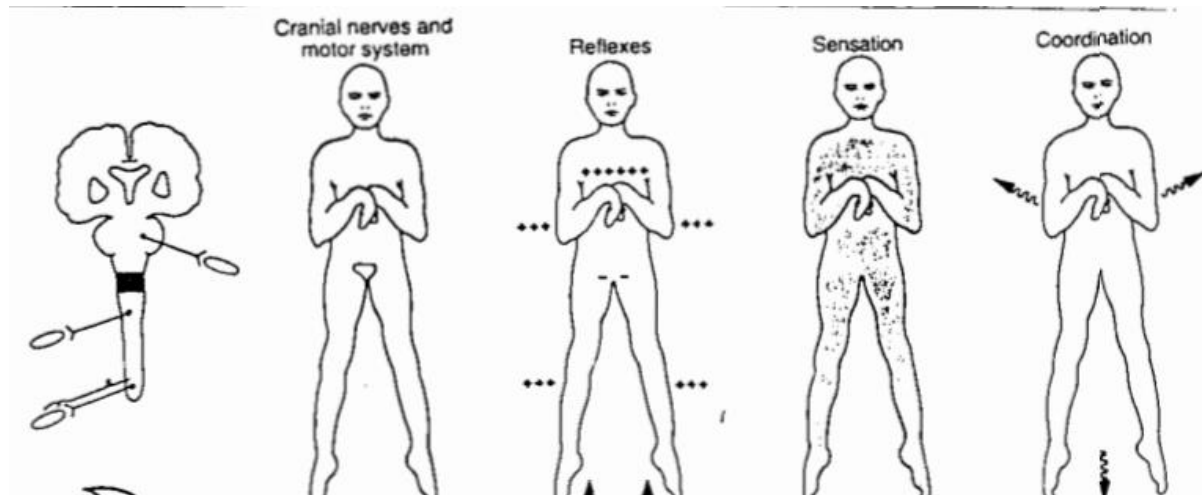
The peripheral nerve has sensory, motor and sympathetic functions.

Motor loss: Presents a lower motor neuron lesion showing flaccid paralysis and atrophy of the muscles innervated by the affected nerve.	Sensory loss: Most commonly causes glove and stocking anesthesia.	Sympathetic loss: The skin on the affected site, shows dryness due to loss of sweating and redness due to vasodilation, that were both controlled by the sympathetic (vasoconstriction and sweating is lost).
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Complete section in the upper cervical lesion (C4/C5):

Bullet injury or fracture can cause a lesion in more than one segment.



Symptoms of Upper motor neuron lesion in upper and lower limbs because the lesion is above the level of their nerves.

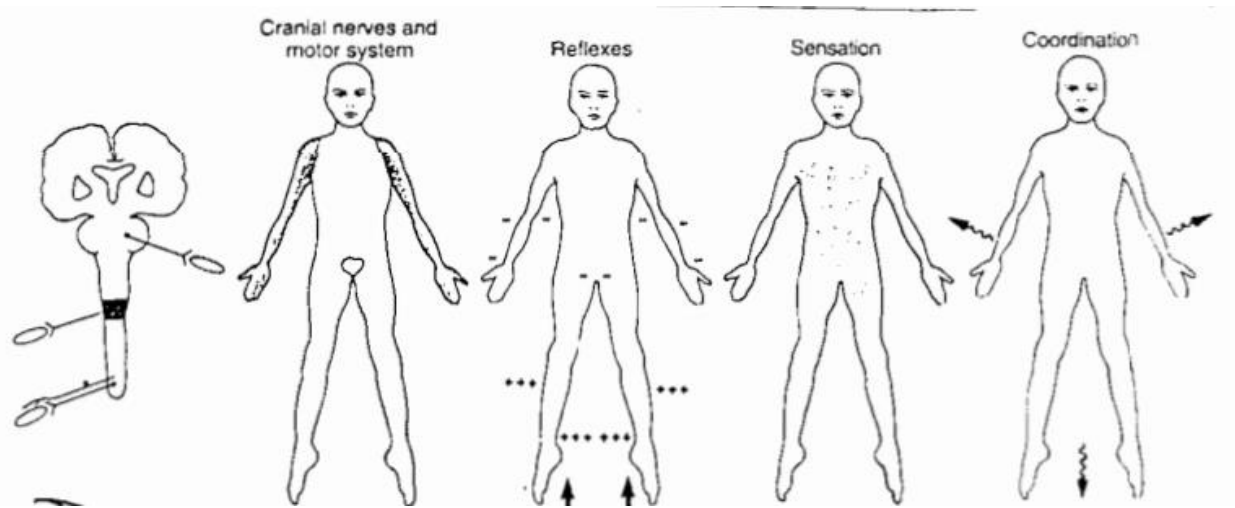
Quadriplegia or tetraplegia, Babinski, hyperreflexia in upper and lower limbs.

Loss of sensation from the level of the neck down below.

Sensory ataxia in the upper and lower limbs.

- ➔ Any lesion above S2-S3-S4, the urinary bladder loses its function, showing either urinary incontinence or retention. Due to that, the patient needs a catheter in order to get urine out. Back in the past when strong antibiotics weren't yet known, the catheter caused infections that spread to the ureter up to kidneys causing renal failure and death.

Complete section in the Lower cervical lesion (C6/C7/C8/T1):



Since the upper limb lost its gamma and alpha it will show symptoms of Lower motor neuron lesion, flaccid paralysis and no reflexes.

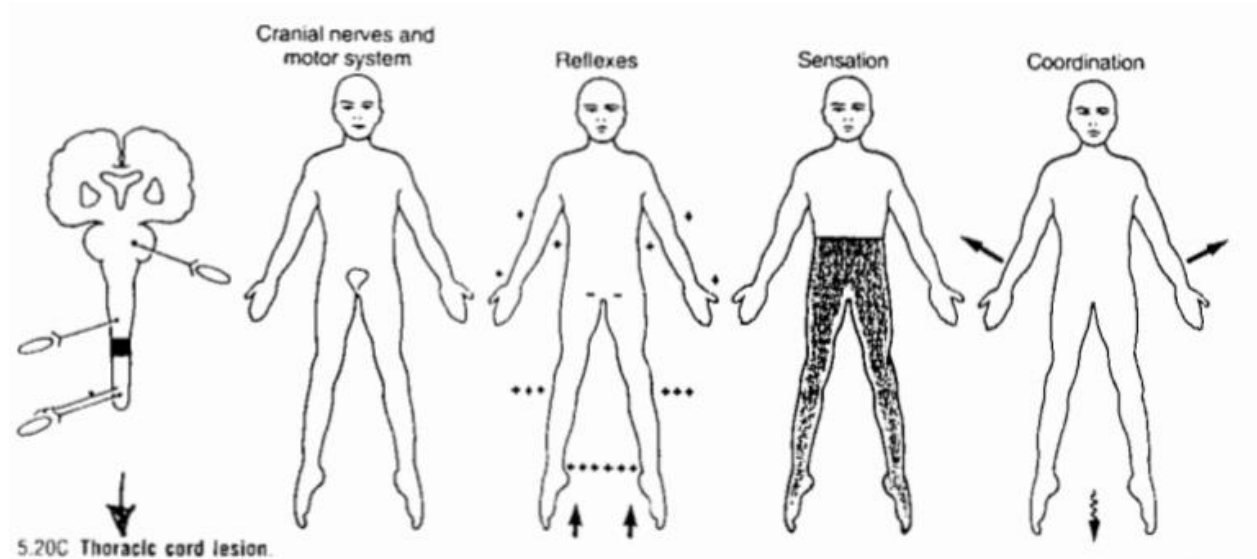
The lower limb lost its pyramidal and extrapyramidal tracts so it shows symptoms of upper motor neuron lesion, and urinary problems.

Reflexes are lost in the upper limb due to the loss of alpha and gamma that are responsible for stretch reflex but, Hyperreflexia is Present in the lower limb

Sensation is lost under level of lesion (complete anesthesia) and sensory ataxia in all limbs.

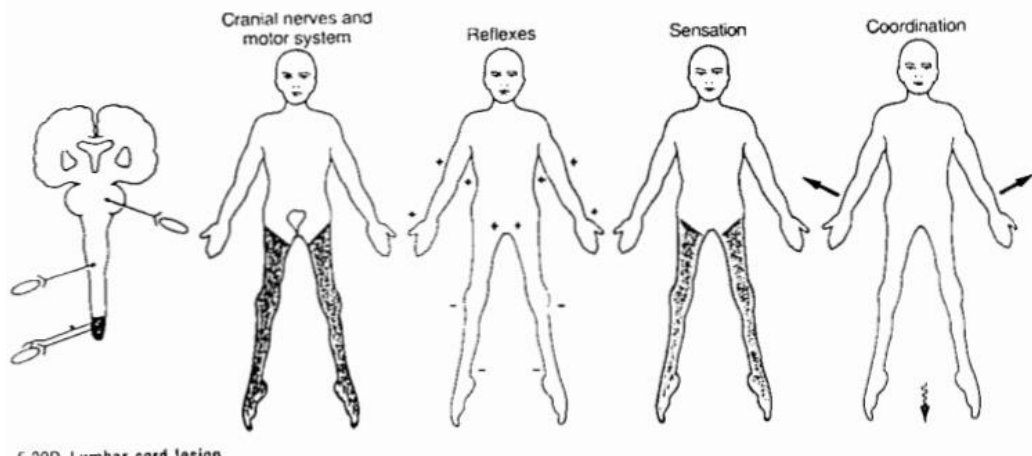
Complete section in the thoracic region:

The upper limb is safe. The lower limb shows upper motor neuron lesion symptoms (hyperreflexia, spastic paralysis, Babinski) and sensory ataxia.



Destruction of the lumbosacral region:

Which means destruction of the alpha and gamma motor neurons, causing symptoms of lower motor neuron lesion in the lower limb. However, the patient will show no symptoms of upper motor neuron lesions because there is no alpha or gamma for the pyramidal and extrapyramidal to synapse with and control and prevent from being hyperactive (remember that the pyramidal and extrapyramidal tracts control the alpha and gamma motor neurons, and since alpha and gamma are destroyed already, there is nothing for the pyramidal and extrapyramidal tracts to control). Paralysis and atrophy are present in the lower limb, also sensory ataxia and disturbances of bladder functions.



- ➔ Now we move to the blood supply. Remember from the lab sections where we talked about angiography and parts of the internal carotid artery and its two main branches, the middle and the anterior cerebral arteries. Which is more important clinically, the middle cerebral or the anterior cerebral? The middle cerebral artery is more important, because it has a wide diameter and it's more in line with the internal carotid which makes it more prone for emboli, if it is obstructed by an embolus it causes monoplegia in the upper limb **only** because the lower limb is supplied by anterior cerebral (Keep in mind the representation of the human body on area 4, the face and the upper limb are represented on the lateral surface and the lower limb is represented on the medial surface, which is supplied by the anterior cerebral).

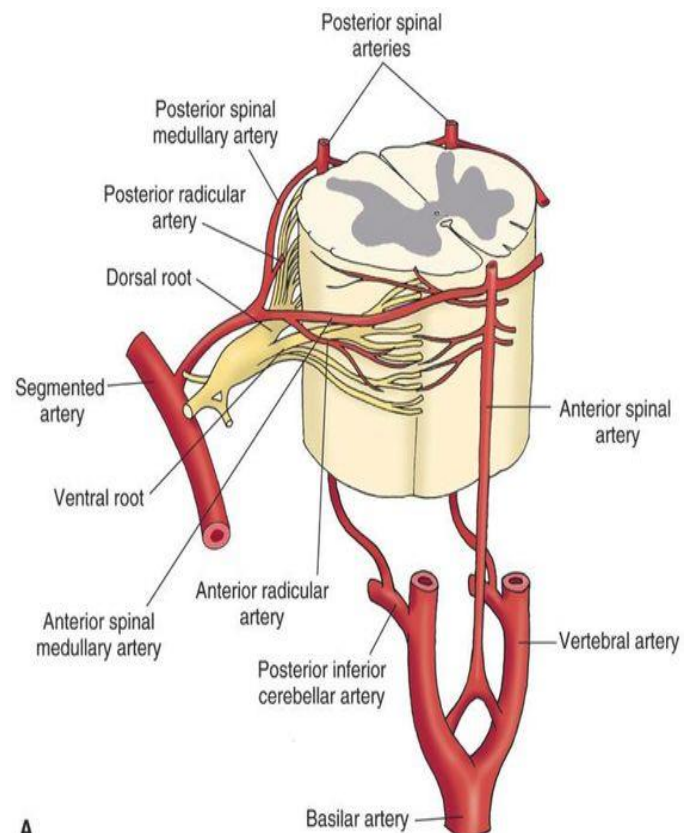
Spinal cord blood supply:

The spinal cord receives blood supply from the vertebral artery, before entering the foramen magnum it gives 2 anterior branches, together they become **the anterior spinal artery** and it gives **2 posterior spinal arteries** on both sides.

The anterior spinal artery supplies the anterior horn, the pyramidal tract, the extrapyramidal tract and the spinothalamic tract, while the posterior spinal supplies the dorsal column.

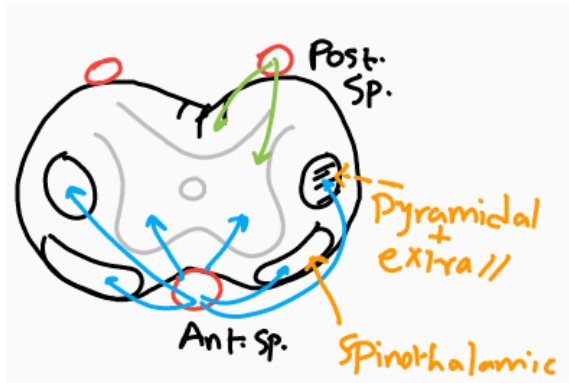
If a thrombus blocks the ant. spinal artery, the anterior horn will lose its blood supply causing symptoms of LMN lesion **at the level** of the thrombus. **Below its level** pain and temperature are lost on both sides due to loss of blood supply to the spinothalamic tract, and finally symptoms of UMN lesion also present below the level of the thrombus. The patient will still feel vibration, position sense and other mechanoreceptive sensations because the dorsal column is not effected (Supplied by the post. Spinal artery).

The Ant. spinal artery alone doesn't provide enough supply, so other arteries contribute to the blood supply of the spinal cord like the **intercostals** from the aorta and the **lumbar arteries**. These together are called **Radicular Arteries**.



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Sorry for the picture but I tried to draw it as close as possible to dr. Faraj's.

That's it for the midterm material, good luck all.

"You survived so many hardships. What makes you think you won't survive now? Don't let your mind play tricks on you. You can make it again."

Special thanks to Raghad Bataineh :D