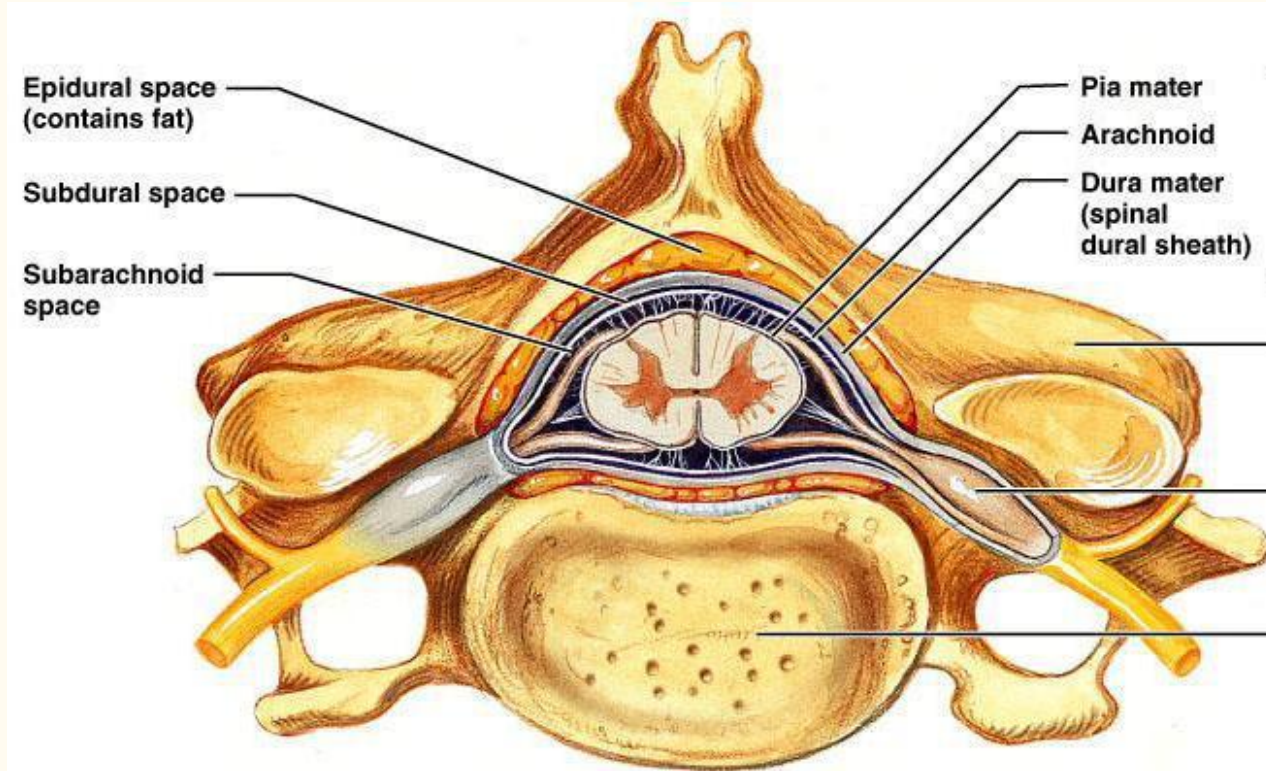


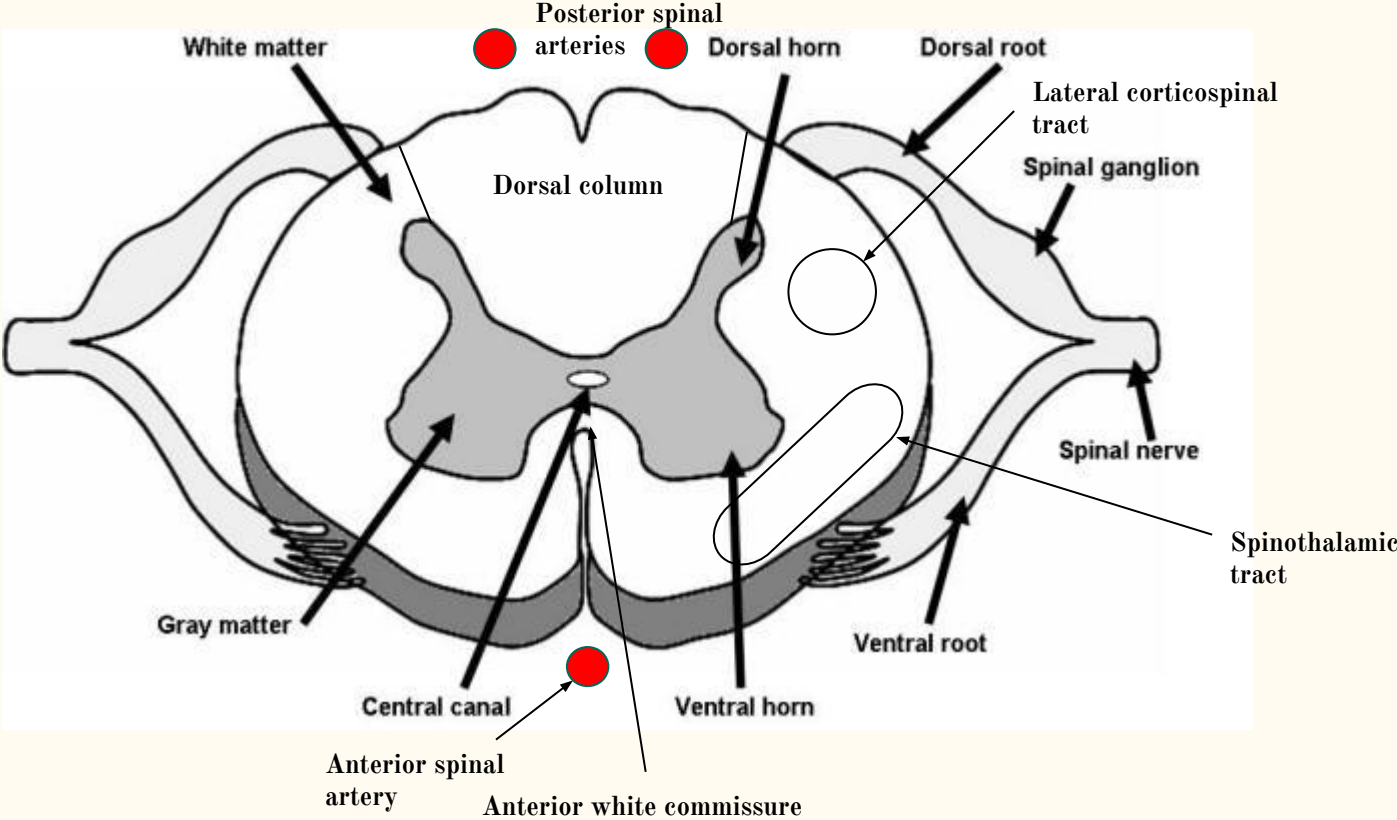
Spinal Cord

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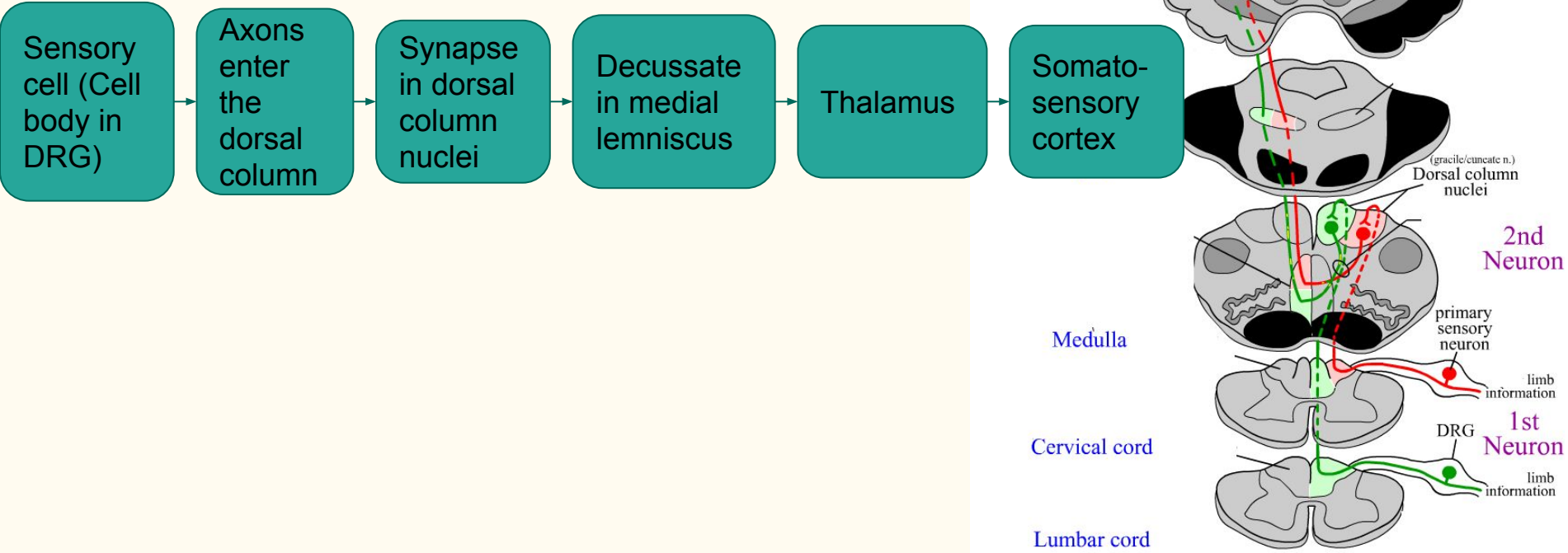
Anatomy of the Spinal Cord



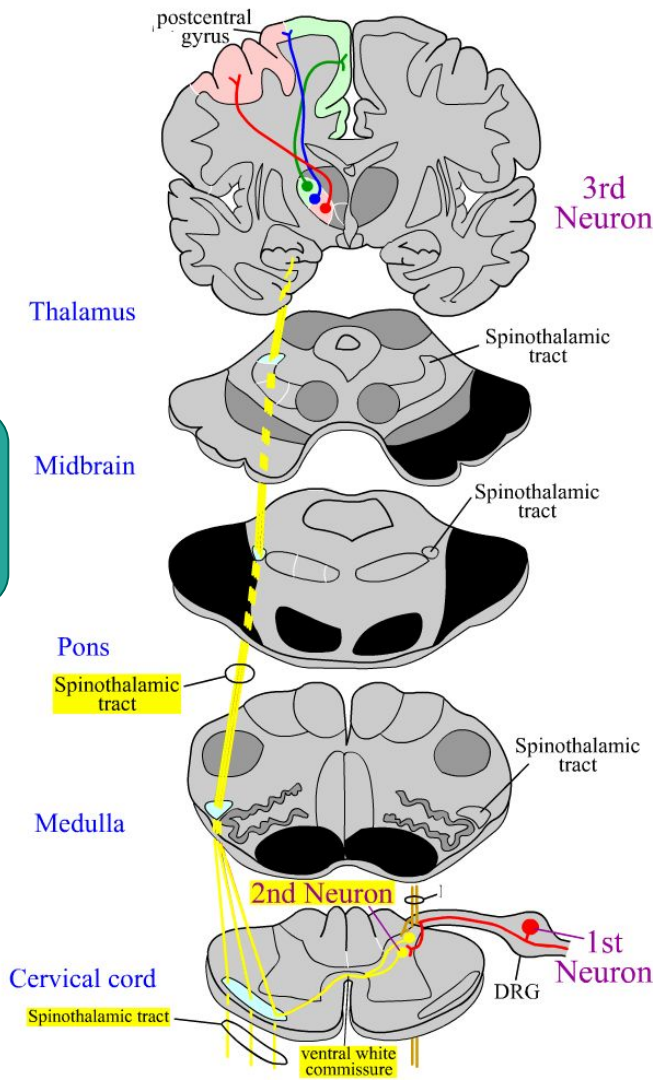
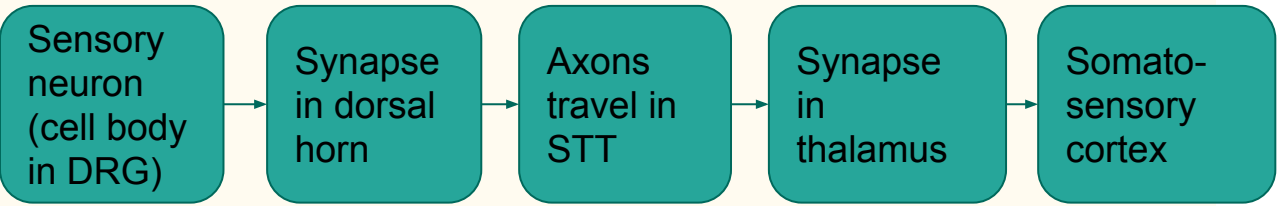
Anatomy of the Spinal Cord



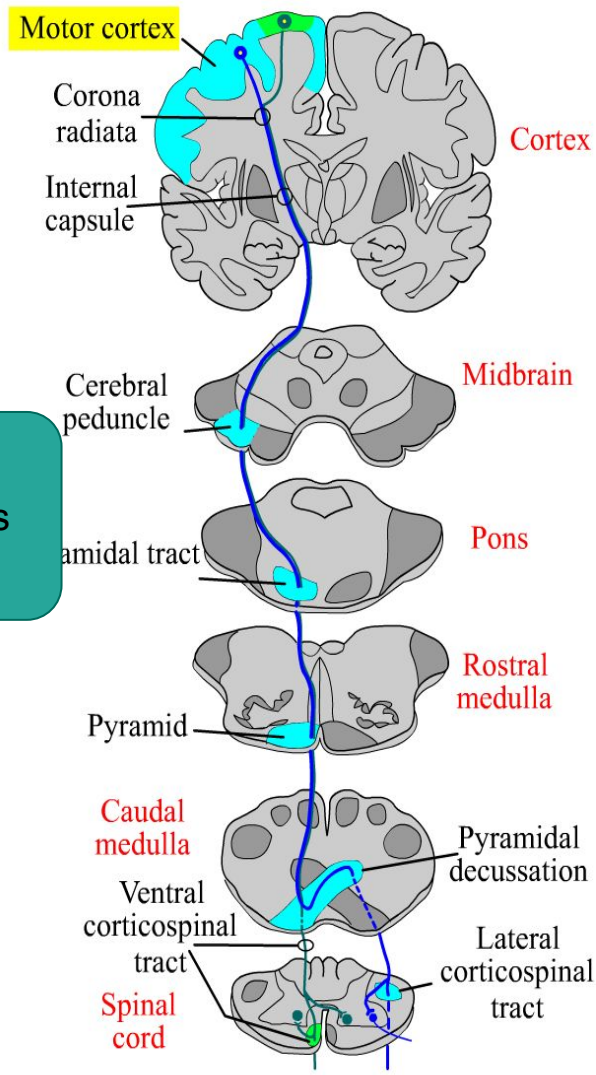
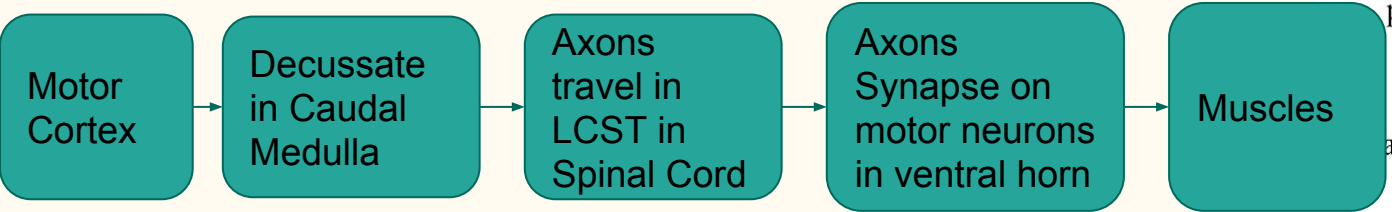
Dorsal Column



Spinothalamic Tract (STT)



Lateral Corticospinal Tract (LCST)



Damage of the Spinal Cord

- **Dorsal Column Damage**
 - Contralateral loss of proprioception, vibratory, and fine touch at and below level of injury
- **STT Damage**
 - Contralateral loss of pain and temperature one level below level of injury
- **LCST Damage**
 - Ipsilateral loss of control of limb muscles below level of lesion
 - Hypertonic paralysis
- **Ventral Horn Damage**
 - Ipsilateral loss of control of limb muscles at level of lesion
 - Hypotonic paralysis
- **Dorsal Root Ganglion Damage**
 - Ipsilateral loss of all tactile sensation and proprioception from the body at the level of injury

Case Review #1

58 year old male with history of hyperlipidemia presents with chronic burns and scars on his bilateral hands for the past 4 weeks. Patient states that he is a chef in a busy Chinese restaurant. He notes that he does not specifically remember burning himself at any time while working, but notices at the end of the day, he has often acquired new burns. Patient denies all other symptoms. Patient had a normal physical exam. However, patient was determined to have no sensation to pin prick or temperature stimuli on his bilateral hands.

Case Review #1

Cervical T2 MRI was performed:

Notice the gray area in the dark spinal cord



Syringomyelia

A cyst developed in the spinal cord of the patient and it is destroying the anterior white commissure of the spinal cord.

The anterior white commissure is the site of decussation for STT fibers. When it is damaged, the fibers from both sides of the spinal cord which are crossing are also damaged. Therefore, pain and temperature information from the bilateral limbs cannot ascend to the brain and be perceived.

Case Review #2

24 year old male medical student presents status post multiple stab wounds to his back sustained just prior to arrival. Patient states that he and his sister were in a heated argument when she allegedly attacked him with a knife, stabbing him multiple times in the back on his left side. Patient reports that he has decreased sensation and movement in his left leg and decreased sensation of his right leg. On exam, patient is noted to have several lacerations that are subcutaneous in depth and a deeper left paraspinal laceration that penetrates the muscles at about T6-T7. Patient was found to have no sensation to fine touch in his left lower extremity, hypertonic paralysis of his left lower extremity, and no response to pain in his right lower extremity. Patient is otherwise neurologically intact including normal movement of his right leg, intact sensation of pain in his left leg, and intact sensation of fine touch in his right leg.

Case Review #2



Left Spinal Cord Hemisection

Patient had a hemisection of his left spinal cord, severing the left LCST causing ipsilateral hypertonic paralysis. There is contralateral pain deficit because of the left STT fibers are also severed. There is no hypotonic paralysis of the limbs because at T6-7, there are no ventral horn motor neurons that synapse on limb muscles.

Case Review #3

78 year old female with history of diabetes type II, hyperlipidemia, and hypertension presents with bilateral lower extremity hypotonic paralysis since 5 hours ago.

Patient also complains of decreased sensation in her bilateral lower extremities. She reports that she woke up this morning with her symptoms and could not get out of bed because of her lower extremity paralysis. Pertinent exam findings include 0/5 strength in bilateral lower extremities and no sensation to pain in bilateral lower extremities. Patient was found to have fine touch sensation intact in bilateral lower extremities.

Patient had an MRI performed



Notice the dark area in the dorsal spinal cord area

Anterior Spinal Artery Syndrome

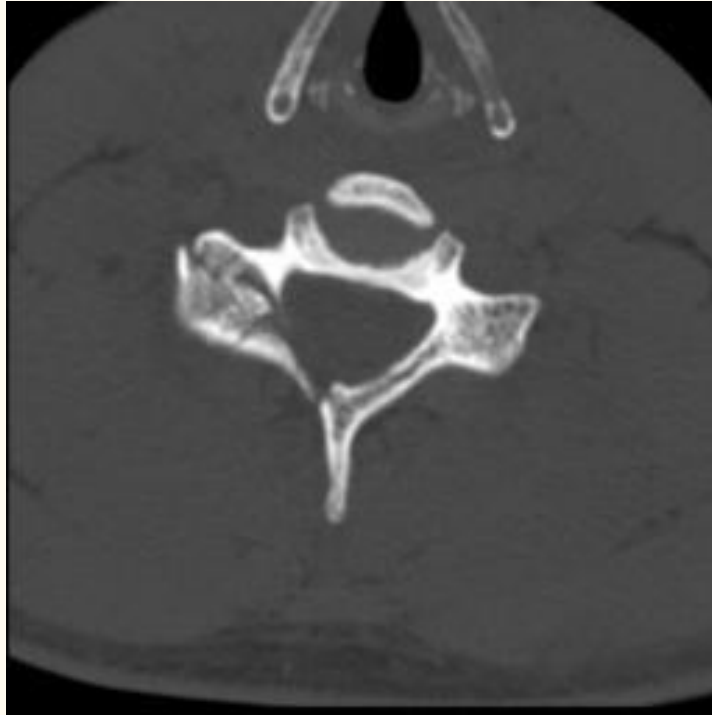
Patient has a clot of the anterior spinal artery at the lumbar levels, causing death of certain areas of the spinal cord due to ischemia (lack of blood flow). The anterior spinal artery is responsible for supplying the lateral, ventral, and gray matter portions of the spinal cord, so the STT, LCST, and gray matter are all damaged. The damage to the STT causes the deficits in pain/temperature and damage to the lower motor neurons in the ventral horn causes hypotonic paralysis. Since there is only one anterior spinal artery, the spinal cord is affected bilaterally.

There is LCST damage, but it is not apparent in this case (hypertonic paralysis) because the damage to the lower motor neurons masks symptoms of upper motor neuron damage.

Case Review #4

22 year old female neuroscientist without significant past medical history was walking home in Hyde Park when she was hit by the 172 bus. Patient was found badly bruised but still conscious. Patient reports that she cannot feel anything on the lateral side of her left upper extremity from her shoulder to her thumb. On exam, patient has obvious bruising and bony tenderness overlying the C6 vertebra. Neurologically, the patient is normal except for complete loss of sensation overlying the C6 dermatome. Patient has no loss of strength despite the lack of sensation.

Patient had a cervical CT performed



Dorsal Root Ganglion Laceration

When the patient was hit by the bus, she sustained a laminal fracture of the C6 vertebra. The fracture then lacerated the dorsal root ganglion. Since the dorsal root ganglion contains the cell bodies of all the sensory neurons, damage will cause the loss of sensation of heat, pain, vibration, proprioception, and fine touch. There is no loss of muscle strength because axons of the motor neurons in the ventral horn send their axons via the ventral root to synapse on their respective muscles.

Since the fracture only injured the dorsal root, the spinal cord is intact.

Thank you!

Thank you to Ms. McQuade for allowing us to teach.

Thank you to Adriana for helping put together this presentation.

Thank you to the neuroscience class for your engagement and participation!