MEDICAL NEUROSCIENCE: SENSORY PATHWAYS AND CLINICAL CASES INCLUDING SENSORY AND MOTOR DYSFUNCTION

LEARNING OBJECTIVES: After you completed this assignment you will be able to:

- Draw the DCML and ALS pathways
- Describe motor and sensory deficits when presented with clinical cases
- Identify the location of CNS damage based on patient presentations

INTRODUCTION

The somatic sensation from the body and face can be divided into 2 major components:

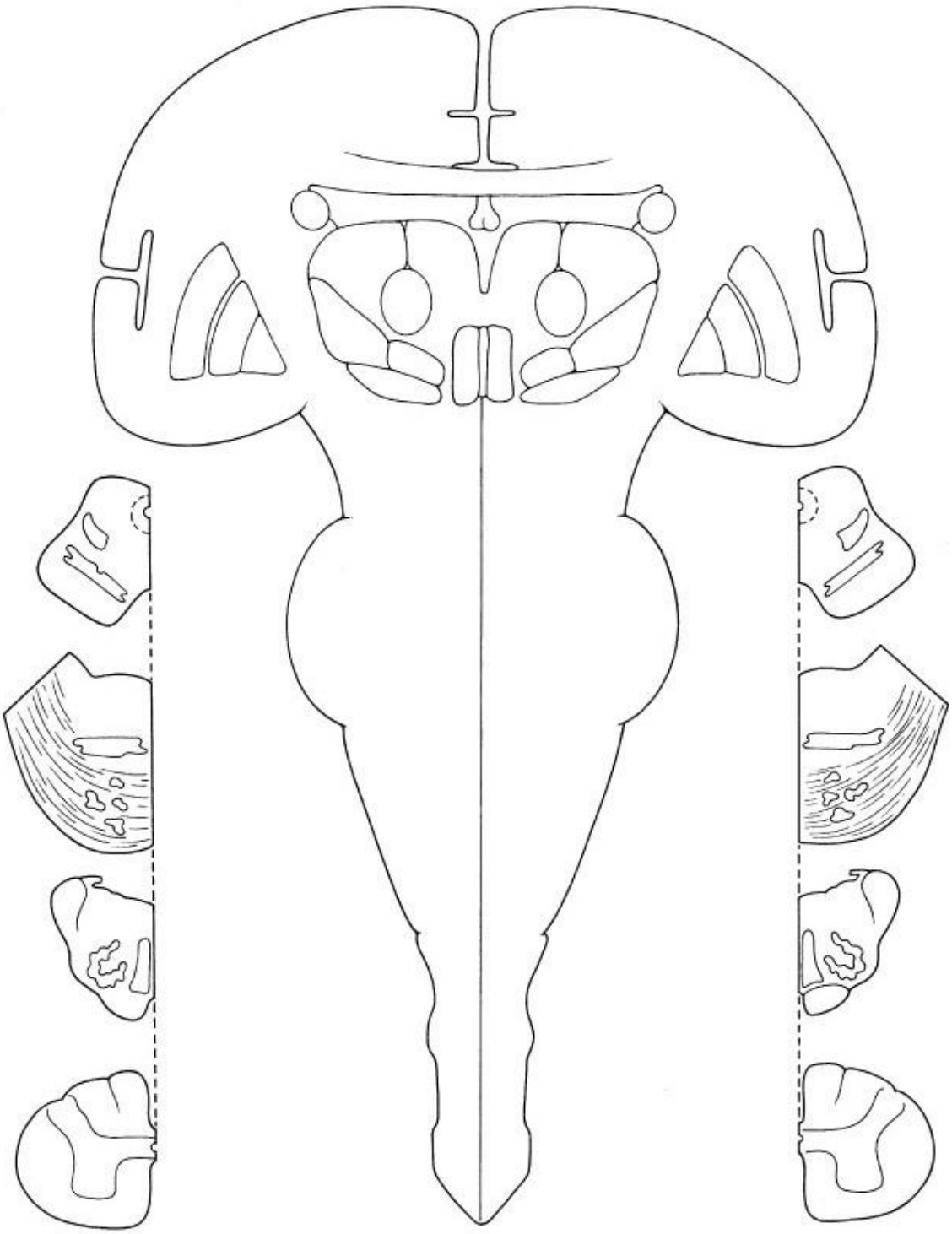
- Detection of mechanical sensation such as: light touch, vibration and proprioception
- Detection of deep touch, noxious (painful) and thermal stimuli

In this exercise, we will review the somatosensory pathways for the body and study some clinical cases including both sensory and motor deficits.

I. THE DORSAL COLUMN-MEDIAL LEMNISCAL PATHWAY

A. Using your notes and the diagram provided, draw the entire dorsal column pathway from its origin to the cerebral cortex. Please label the following structures:

- The dorsal root ganglion
- The dorsal roots
- The nucleus gracilis
- The nucleus cuneatus
- The thalamus, VPL nucleus
- The primary sensory cortex
- The secondary sensory cortex



II. THE ANTEROLATERAL SYSTEM

B. Using your notes and the diagram provided, draw the entire anterolateral system pathway from its origin to the cerebral cortex. Please label the following structures:

- The dorsal root ganglion
- The dorsal root
- The dorsal horn of the spinal cord (in the side sections)
- The anterolateral system in the spinal cord
- The thalamus, VPL nucleus
- The primary sensory cortex
- The secondary sensory cortex

1. What are the sensory modalities transmitted to the brain by the DCML pathway?

2. What modalities are transmitted to the brain by the ALS pathway?

3. Where is the 1st synapse of the DCML pathway? Indicate the CNS location and the name of the nucleus or nuclei.

4. Where is the 1st synapse of the ALS pathway? Indicate the CNS location.

5. Where does the decussation of the DCML fibers occur? Indicate the CNS location as precisely as you can.

6. Where does the decussation of the ALS fibers occur? Indicate the CNS location as precisely as you can.

7. Where is the second and third neuron of the DCML pathway located?

8. Where are the second and third neurons of the ALS pathway located?

9. Where is the primary sensory cortex located? Indicate the lobe of the brain, the name of the gyrus and the Brodmann's areas.

10. What are the morphologic characteristics (type of fiber, name of fiber) of the fibers that transmit the first, sharp pain felt after an injury?

11. What are the morphological characteristic of the fibers that transmit the dull, long-lasting pain?

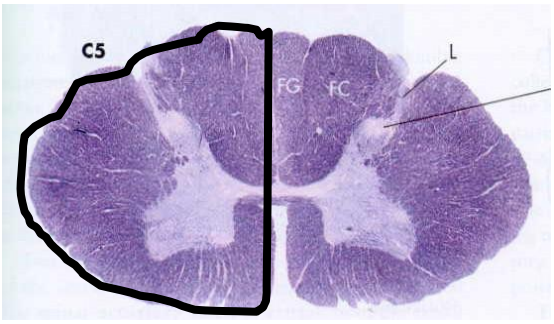
12. What types of sensory receptors are involved in the transmission of pain signals?

13. What types of sensory receptors are involved in the transmission of touch and proprioception?

14. What sensory deficits are found in a patient with a lesion of the right medial lemniscus in the rostral medulla?

15. What sensory deficits are found in a patient with a lesion affecting both posterior columns at lower spinal cord thoracic levels?

16. Describe the sensory deficits produced by damage to the right half of the spinal cord as in the picture below. This is one of the classic spinal cord injury lesions and is called the Brown-Sequard Syndrome.



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17. Describe the symptoms and signs you expect to see in a patient with damage to the somatosensory fibers as shown in the picture below.

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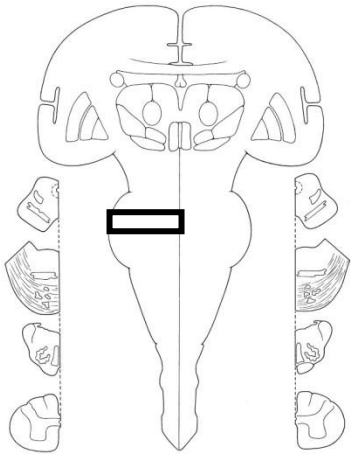
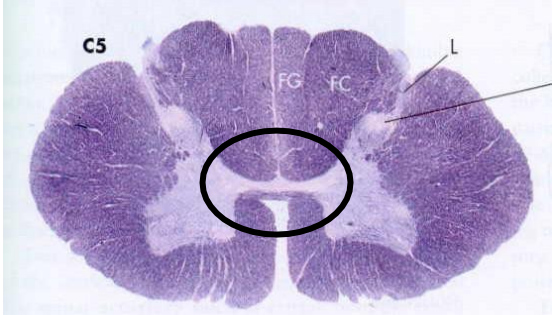
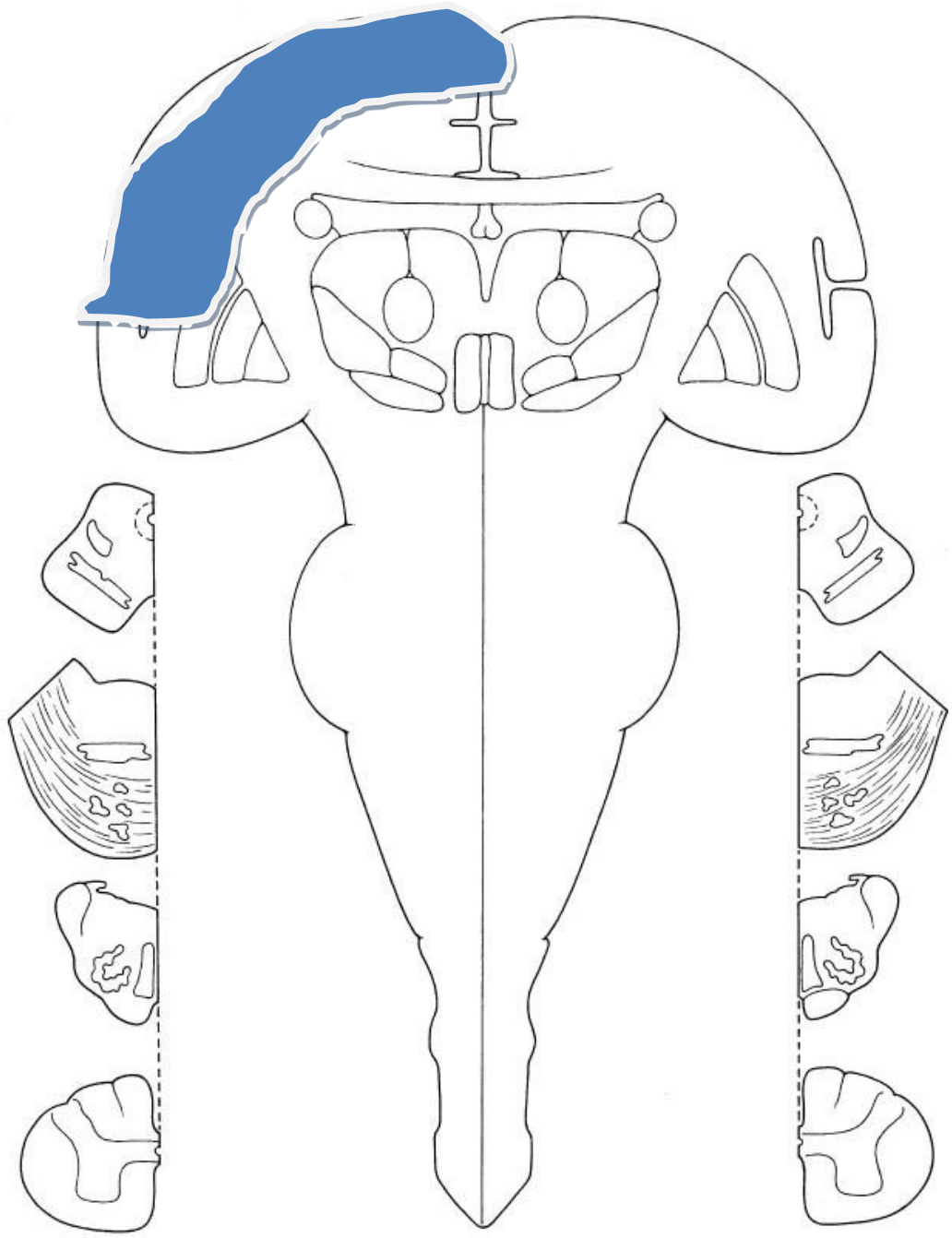


18. Describe the sensory deficits produced by damage to the spinal cord as shown in the picture below. This is a classic spinal cord injury lesion named central spinal cord syndrome.





19. Indicate the sensory deficits produced by a cortical lesion as shown in the diagram above. Assume the encircled area is the sensory cortex. Assuming a vascular event, which artery would be involved in this lesion?