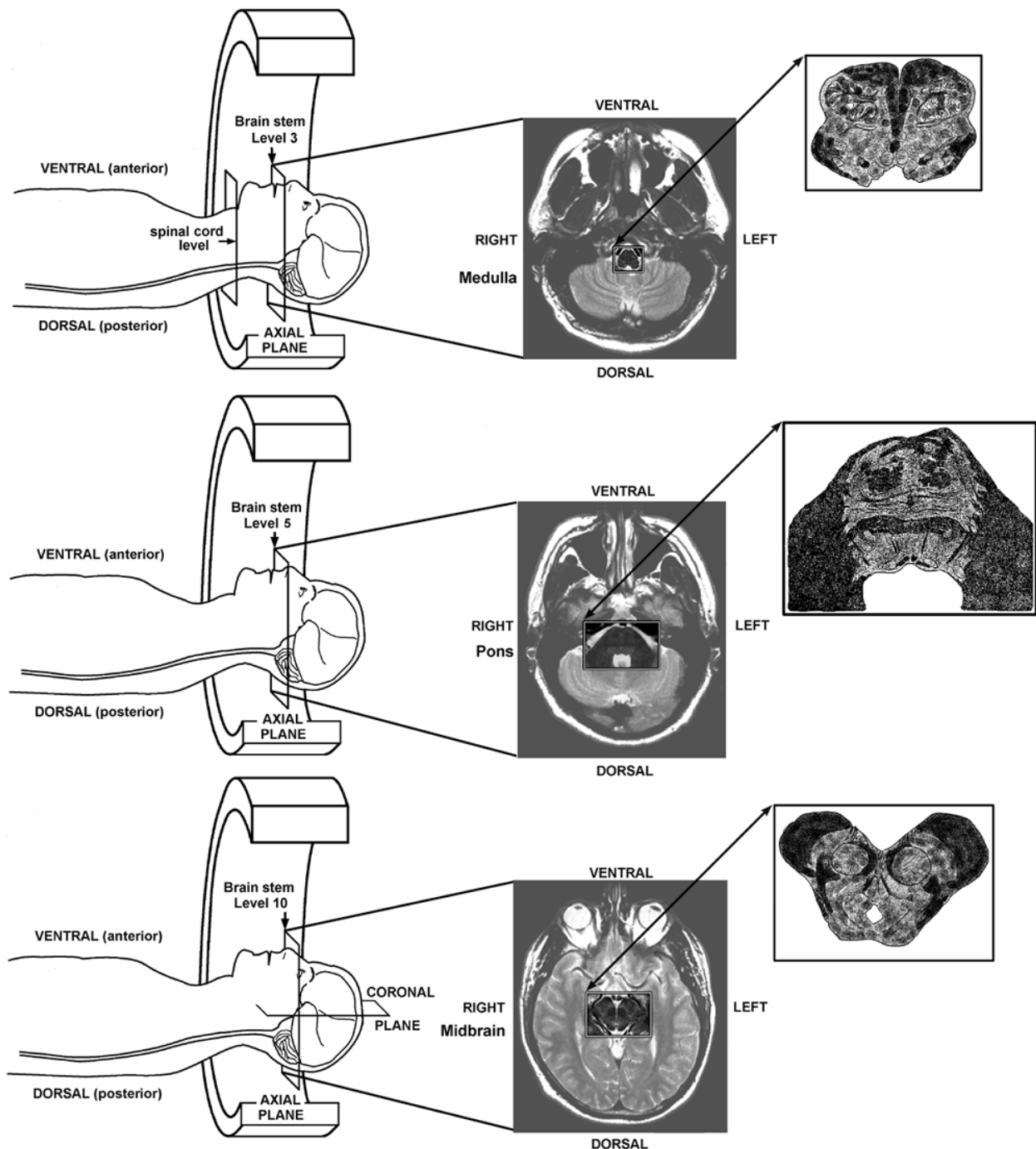
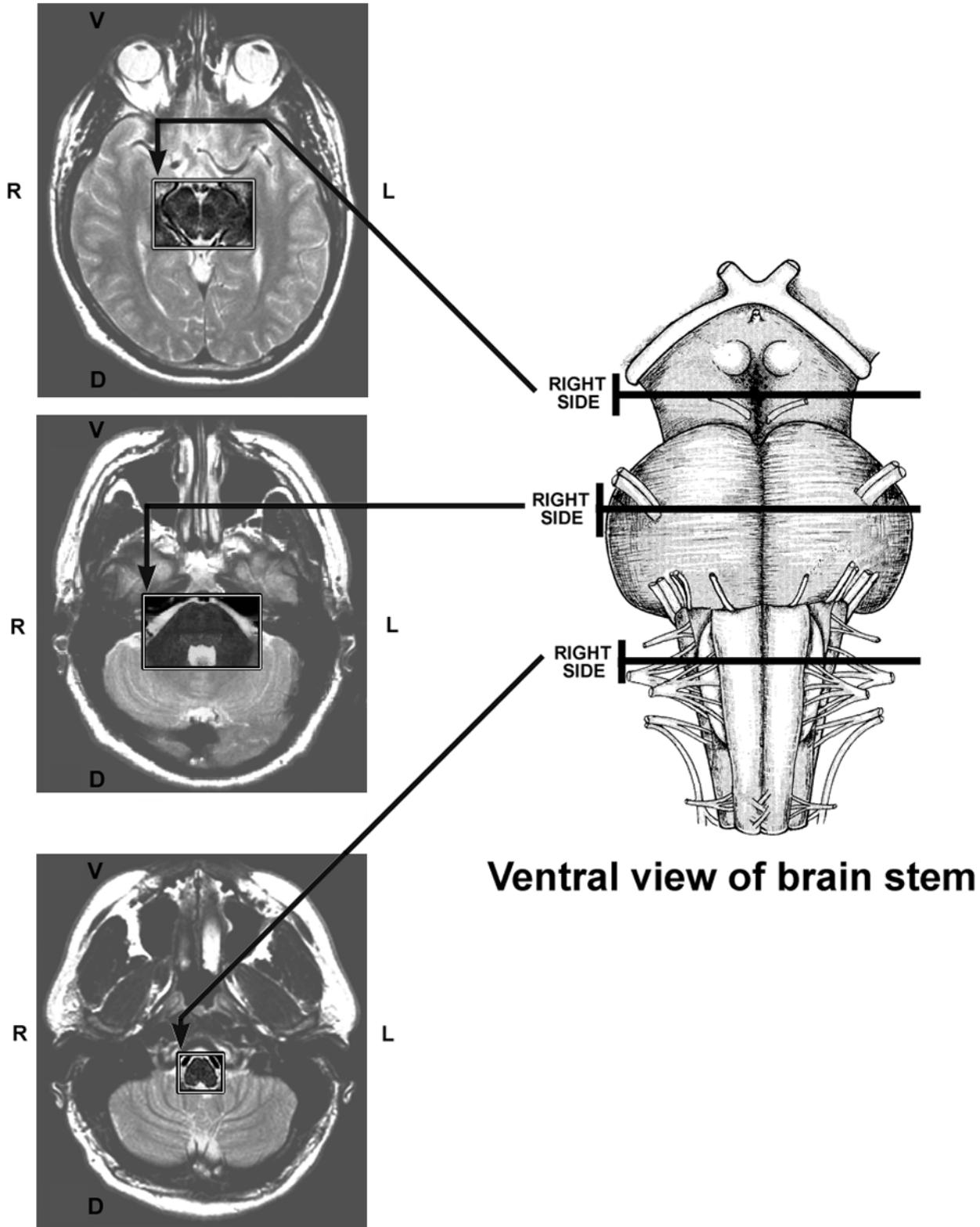


# BRAIN STEM

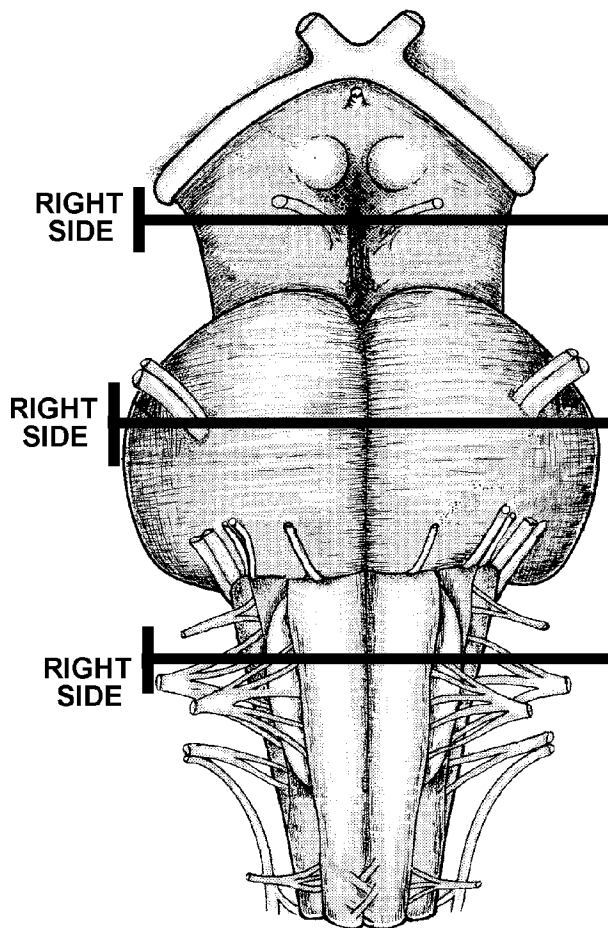
Hopefully, all of you know where the spinal cord is and lots about the organization of the various ascending and descending pathways. Now we will move **rostrally** into the brain stem. If you look at the drawings below you will see three MRIs in the middle column. The poor little brain stem is so dwarfed by other brain structures that I have had to enclose it with a white box and point to it with a white arrow!!!! However, I have added schematic enlargements of the boxed in areas. Again, as in the spinal cord, **ventral is up** and **dorsal is down** and the **right side of the patient's brain is on your left**. The most caudal section (nearer the spinal cord; brain stem level 3) is through the **medulla**. The middle section is through the **pons** (brain stem level 6), while the most rostral is through the **midbrain** (brain stem level 10).



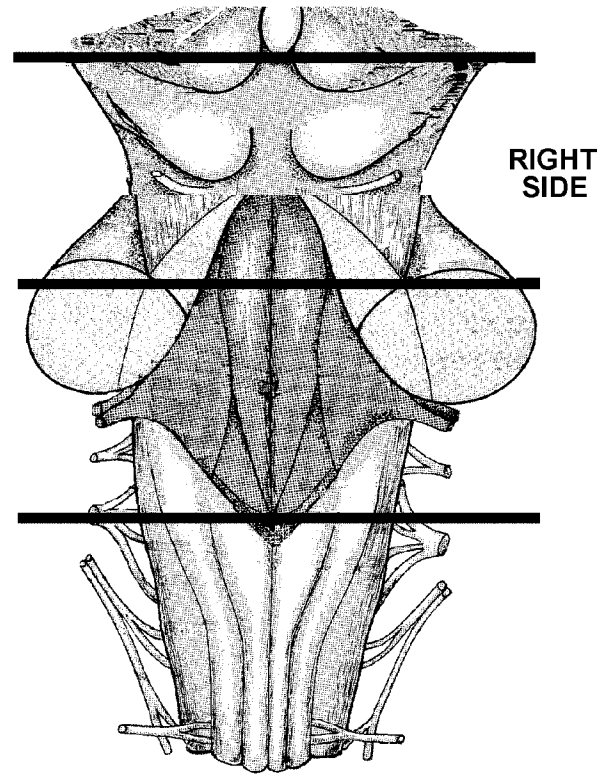
The figure below on the right shows the entire ventral surface of the brain stem. The lines and arrows connecting the ventral view with the three MRI images are to help you understand what is left and right. Do not worry about the bumps, grooves and nerves shown on this ventral view, that will come later. Right now just orient yourself!!



Both the dorsal and ventral surfaces of the brain stem are shown below. We already know what is right and left on the ventral view. Now, take the page out of your notebook and fold it along the dotted line (yes, this is medical school!) and you can see that what lies beneath (is dorsal) the right side of the ventral aspect of the brain stem is the right side of the dorsal aspect of the brain stem, and what lies below the left side of the ventral aspect of the brain stem is left side of the dorsal aspect of the brain stem.

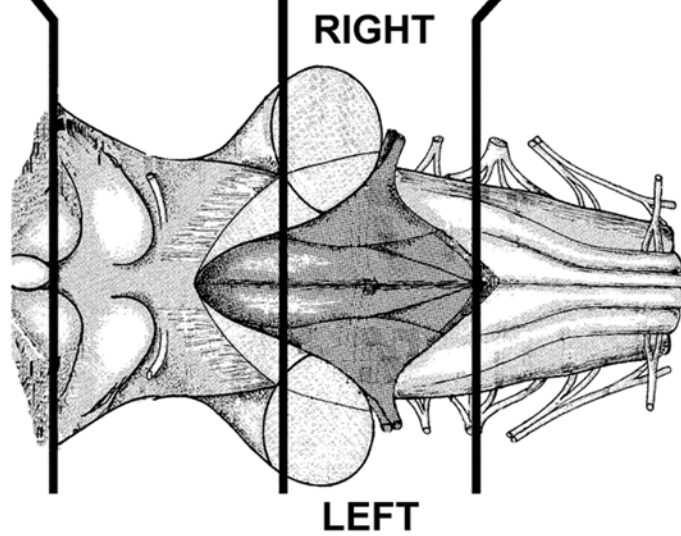
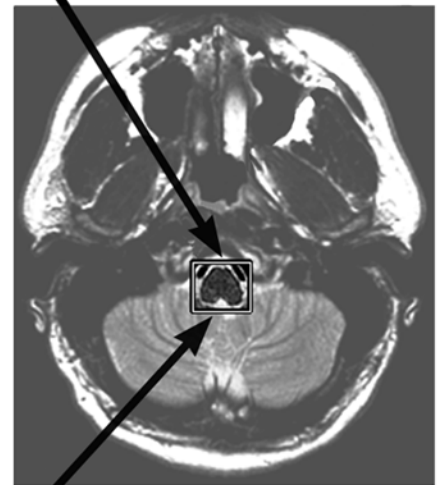
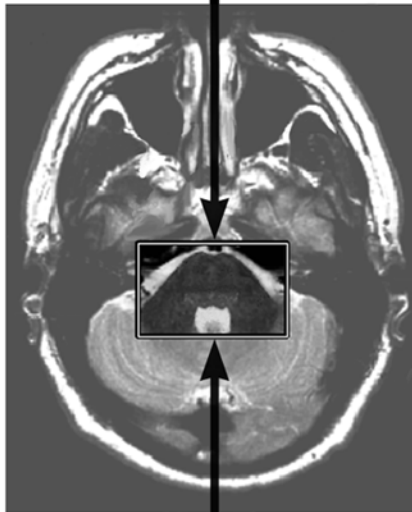
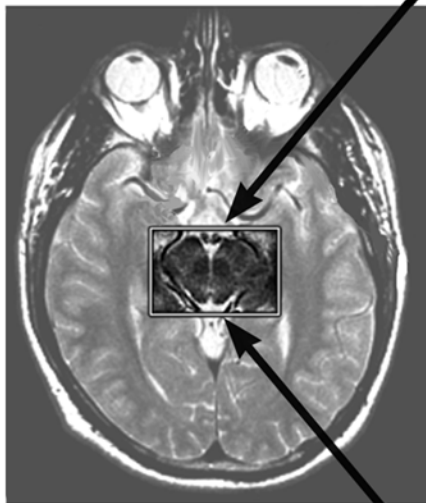
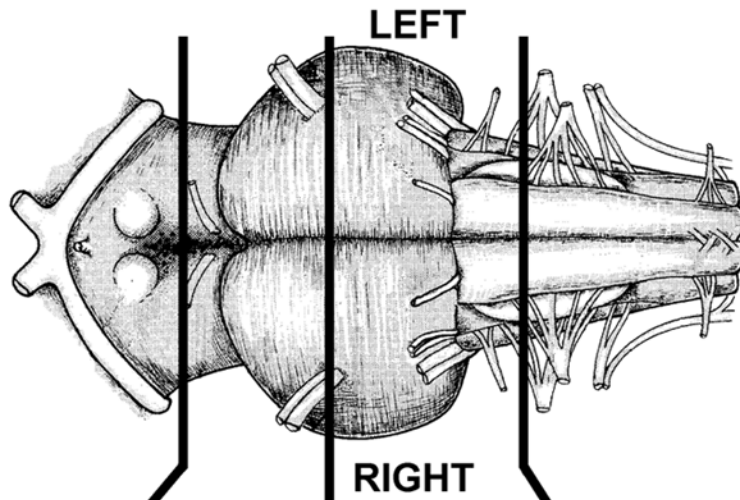


**Ventral surface**



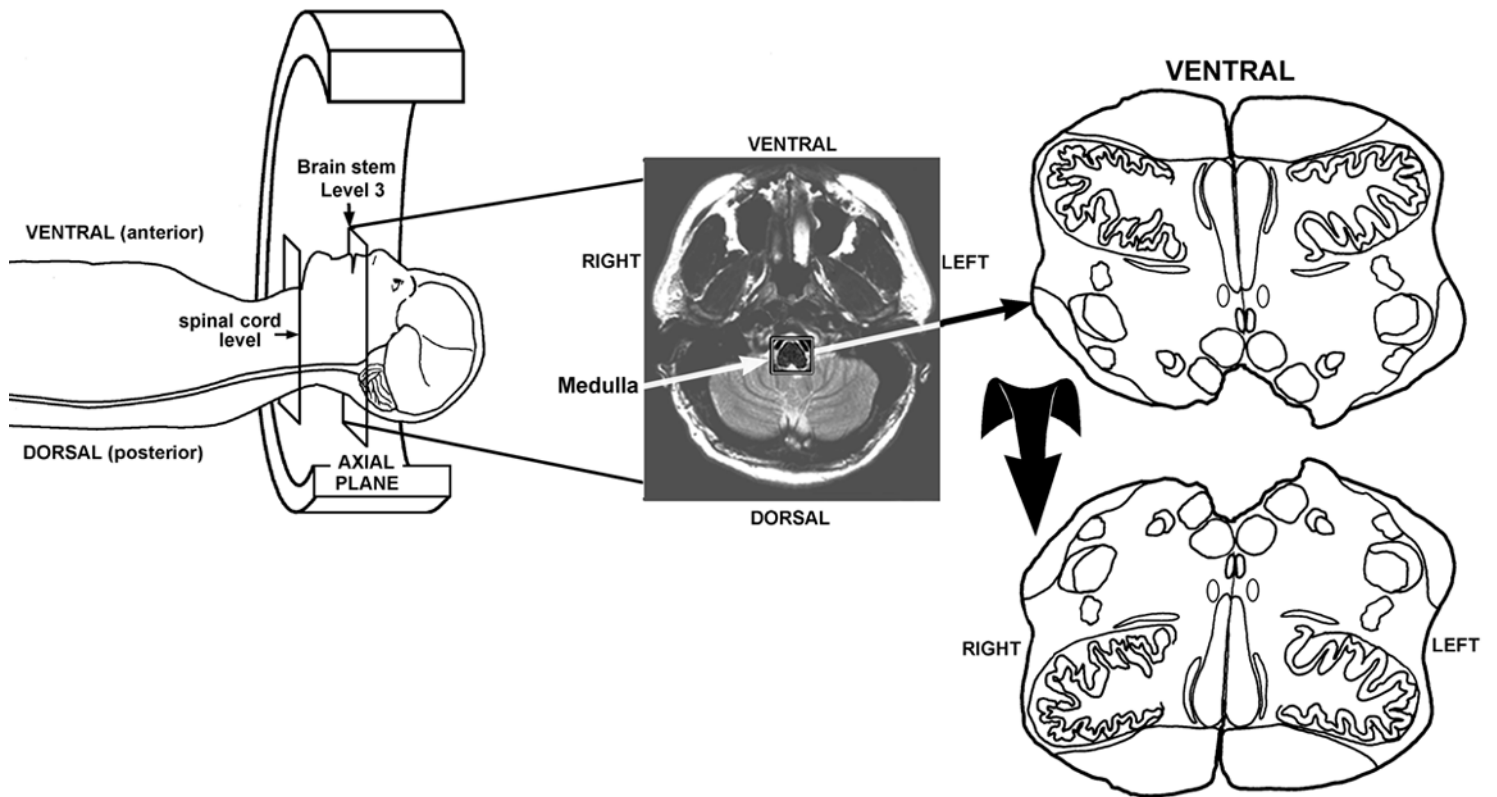
**Dorsal surface**

### Ventral view of brain stem



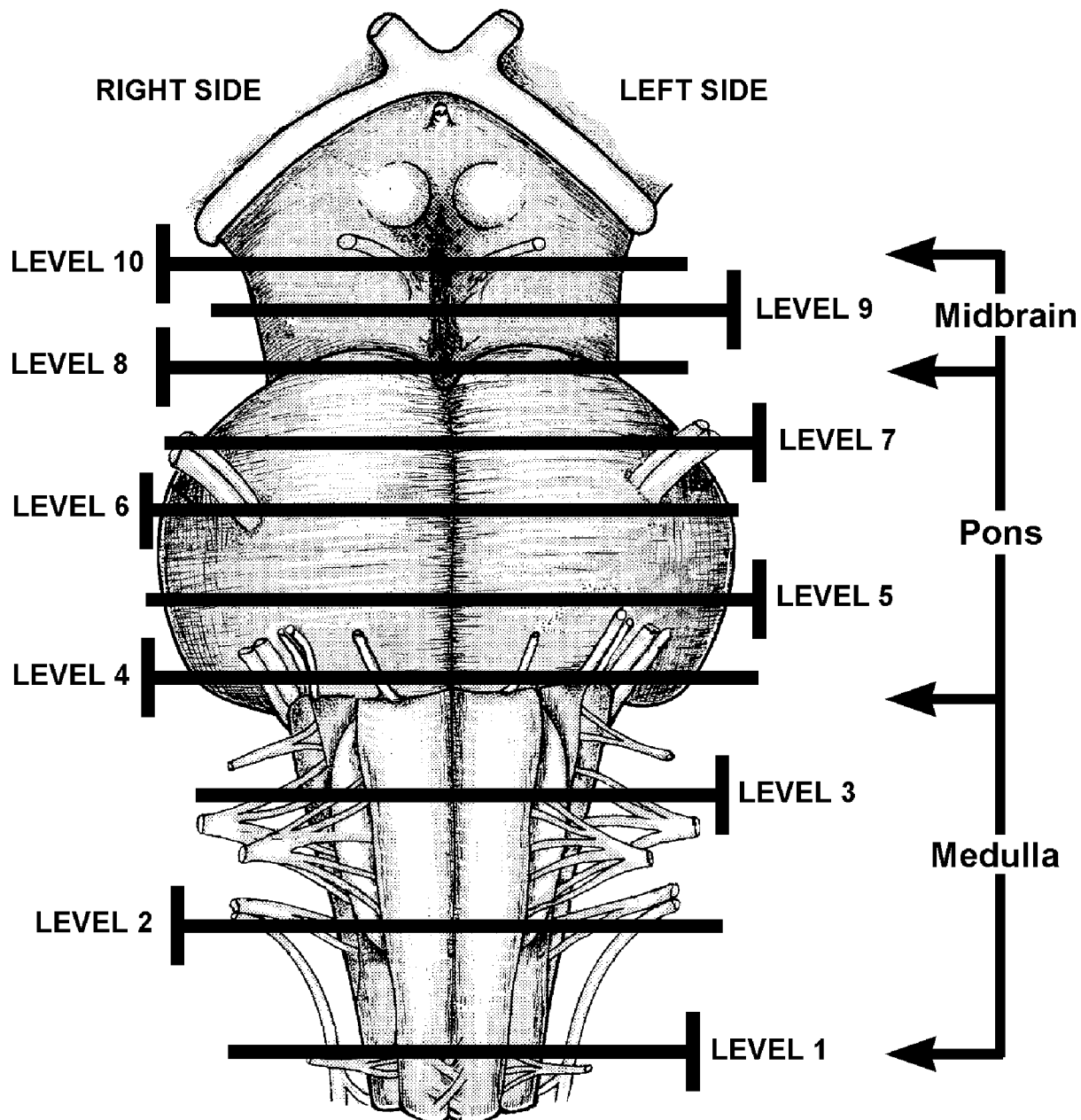
### Dorsal view of brain stem

Like in the spinal cord, in an axial MRI section of the brain stem **ventral is up** and **dorsal is down**. Again we will follow tradition (all neuro textbooks!) and “flip” the section so ventral is down and dorsal up. However, make sure to keep the right/left designation of the axial section MRI. That is, **the right side of the patients brain is on your left**.

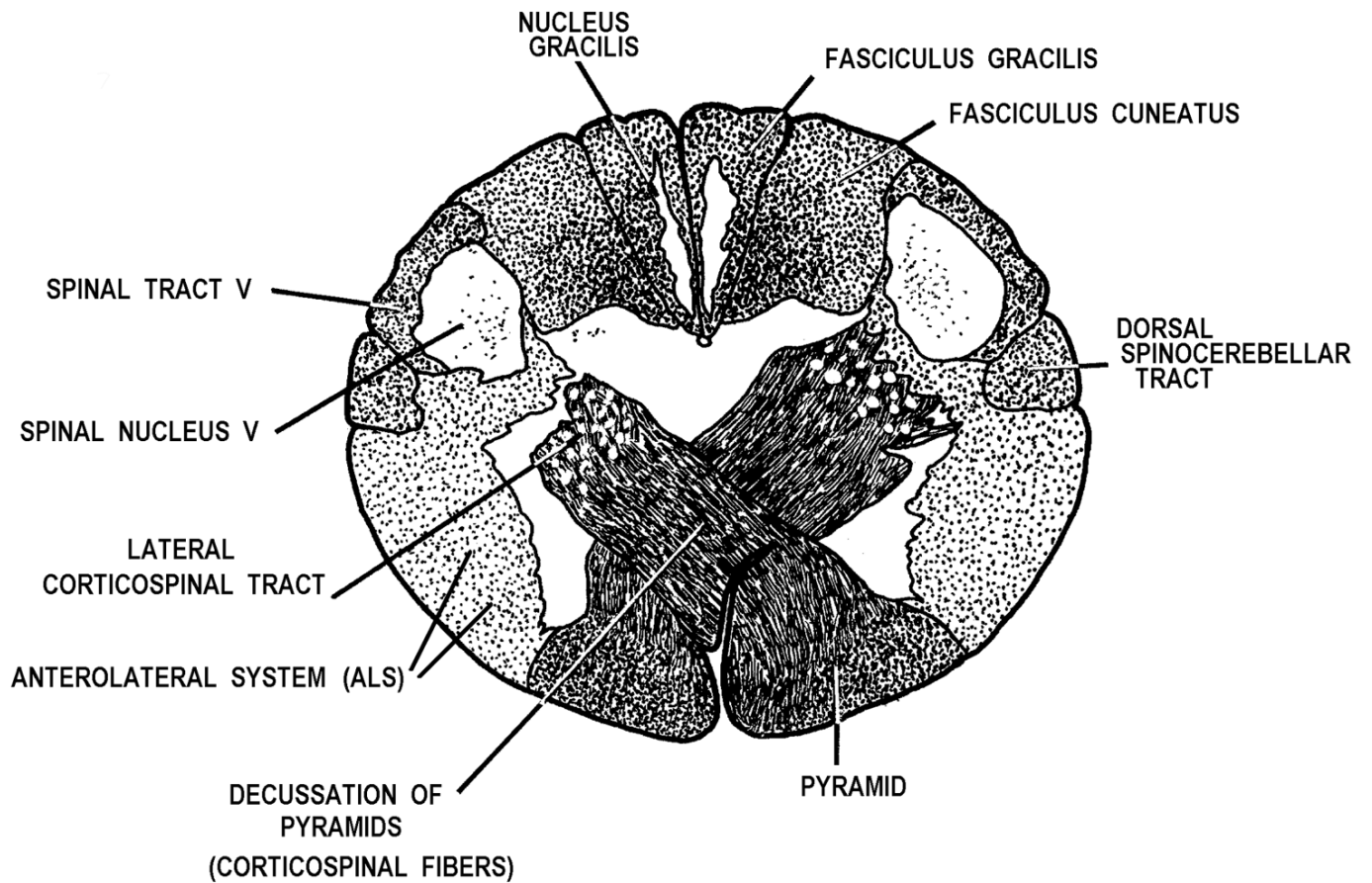
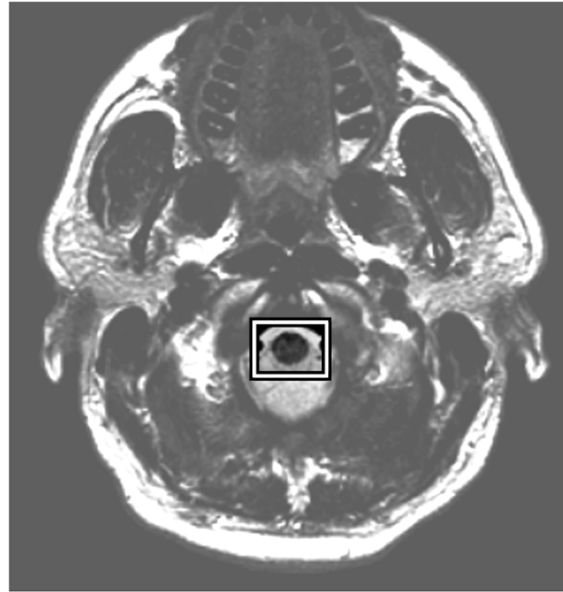


As mentioned earlier, the brain stem includes the (1) **medulla**, the (2) **pons** and the (3) **midbrain**. The brain stem contains 10 cranial nerves, and most of the motor and sensory systems pass through this important region. It is a relatively small region (approximately 7 cm long) that links the forebrain (i.e., cerebral cortex) and the spinal cord and all messages going between the two areas must go through the brain stem.

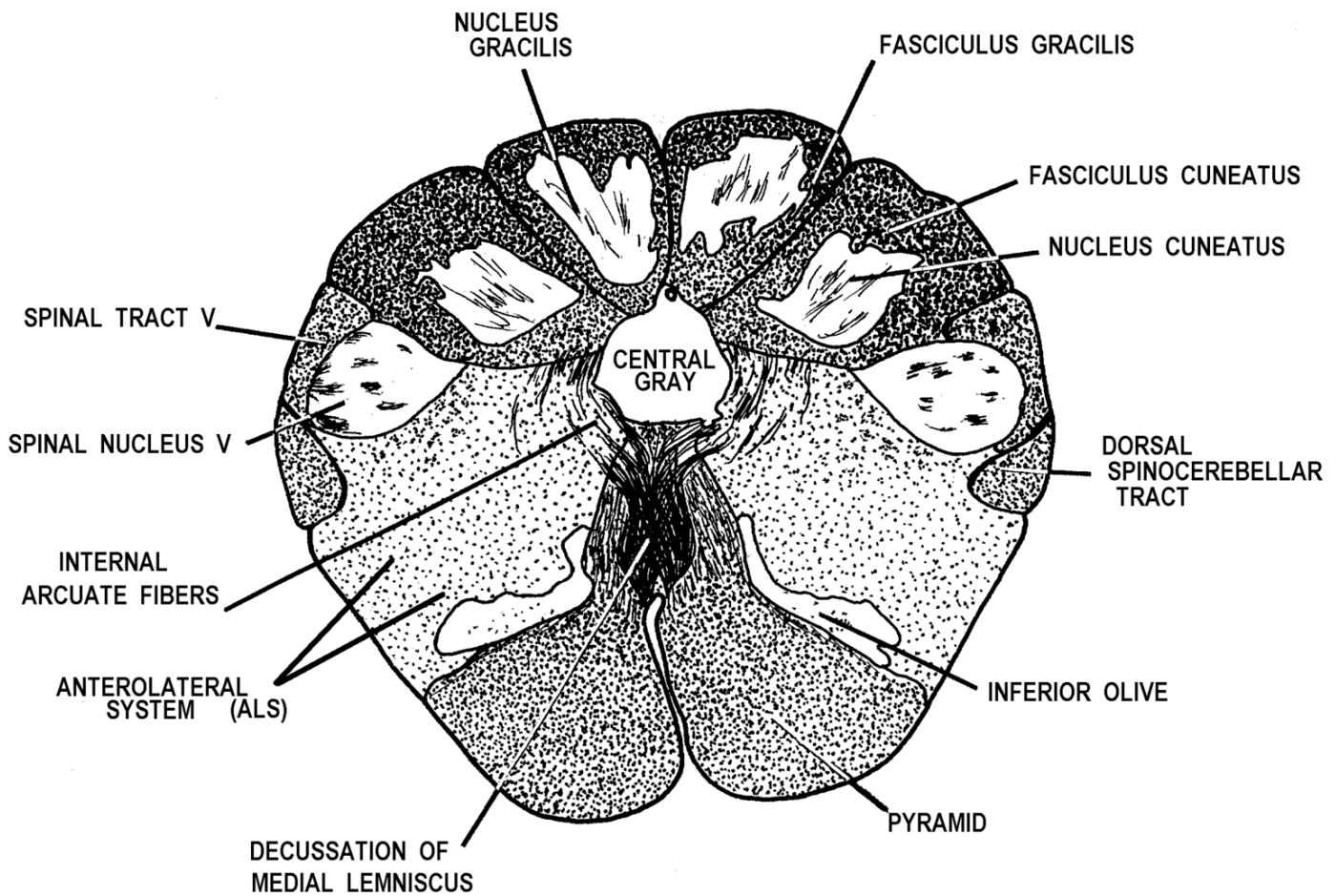
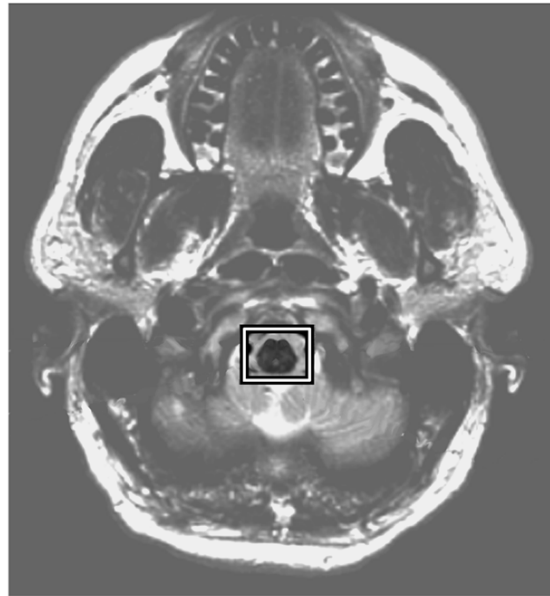
Details regarding the organization of the brain stem will be presented by discussing the nuclear groups and fiber tracts that are present at 10 different caudal to rostral levels. In each of the ten levels, the tracts (fibers) are drawn in black. Therefore, the *nuclei* (cell bodies) are the clear spaces. The drawing below shows a rough approximation of the location of where the 10 levels are cut on a ventral view of the brain stem. The following ten pages show drawings of these levels and above each level is the appropriate MRI image.



**Ventral surface**

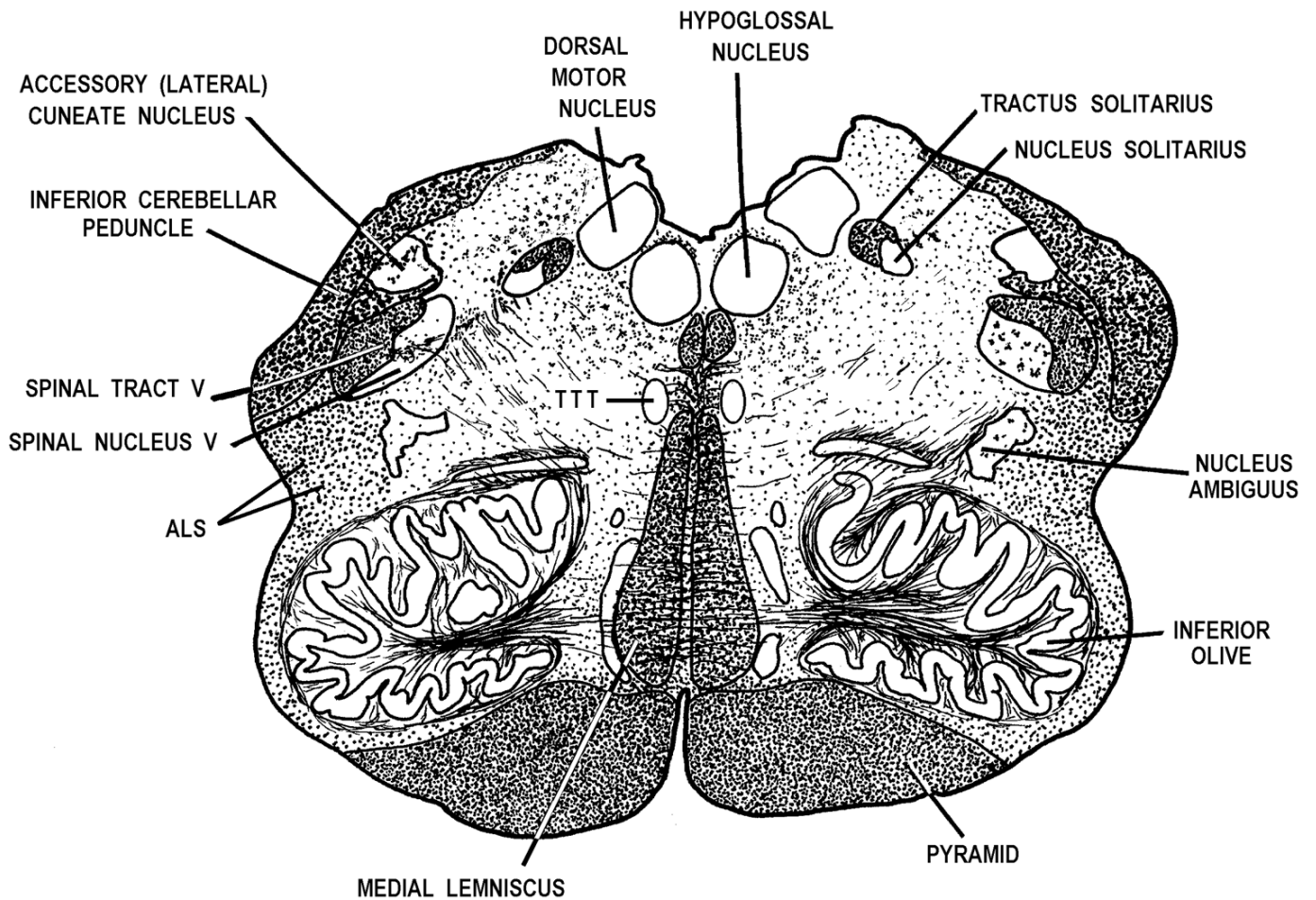
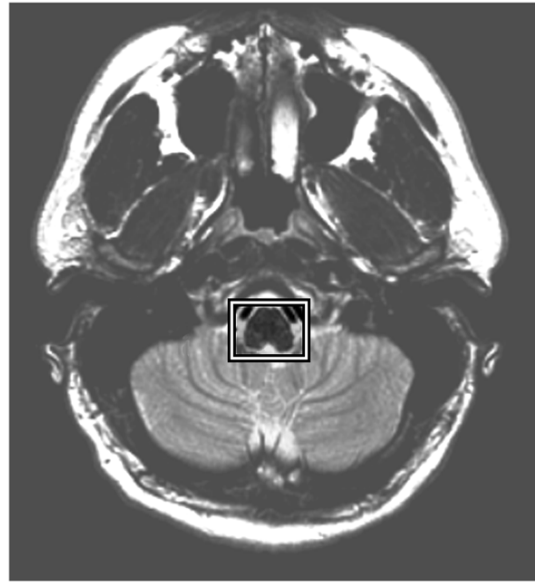


## LEVEL 1. PYRAMIDAL DECUSSATION



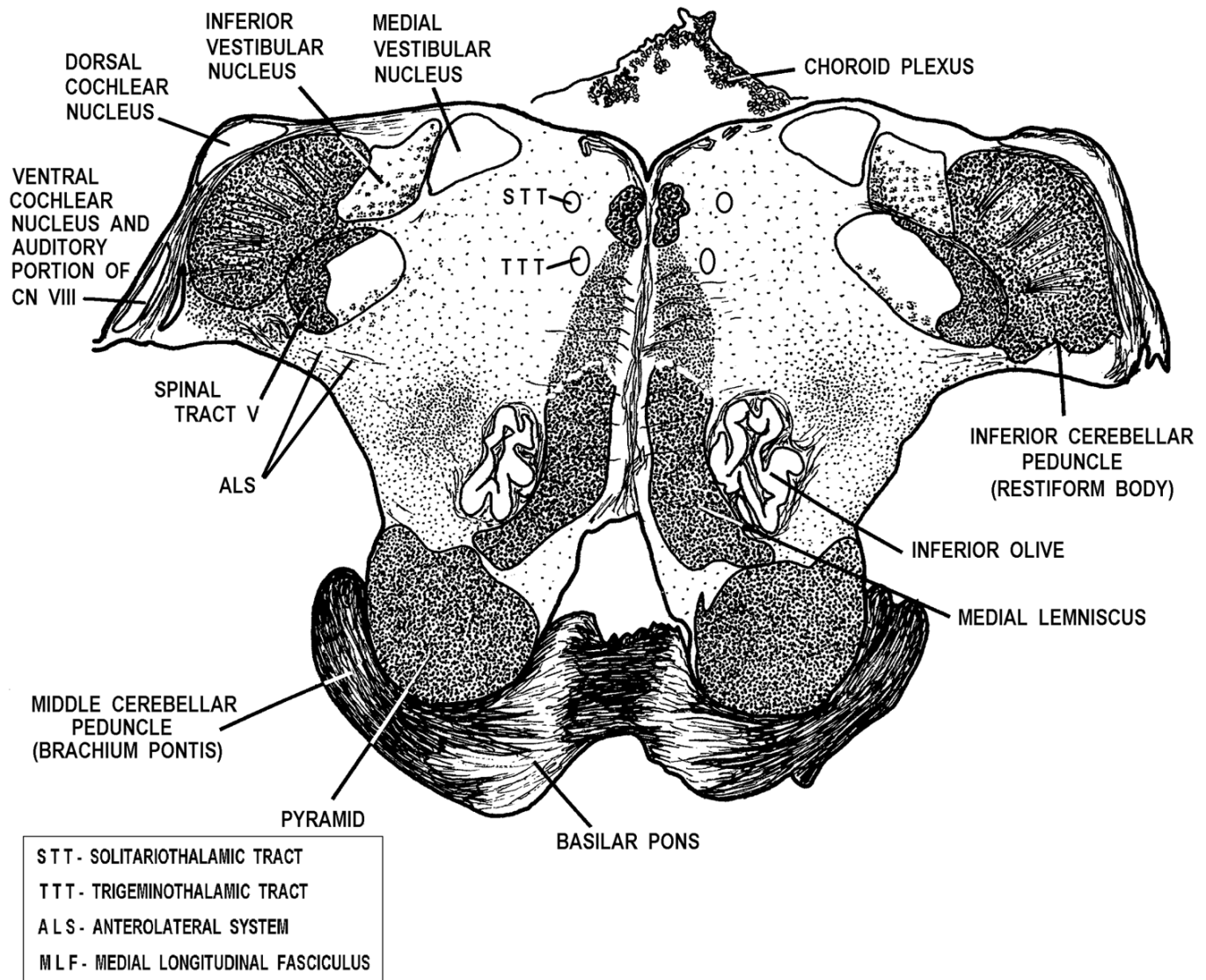
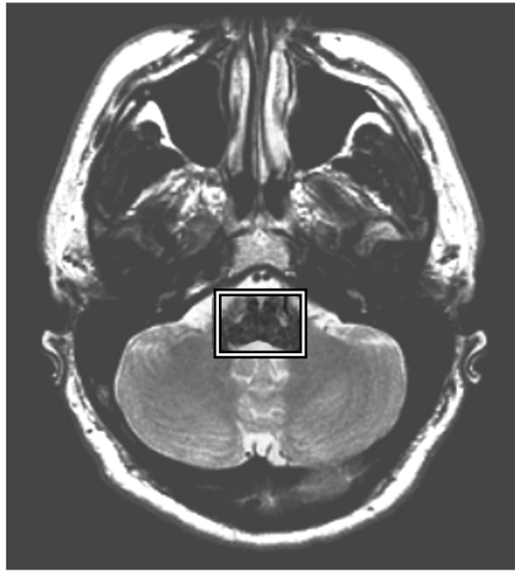
## LEVEL 2. DECUSSATION OF MEDIAL LEMNISCUS



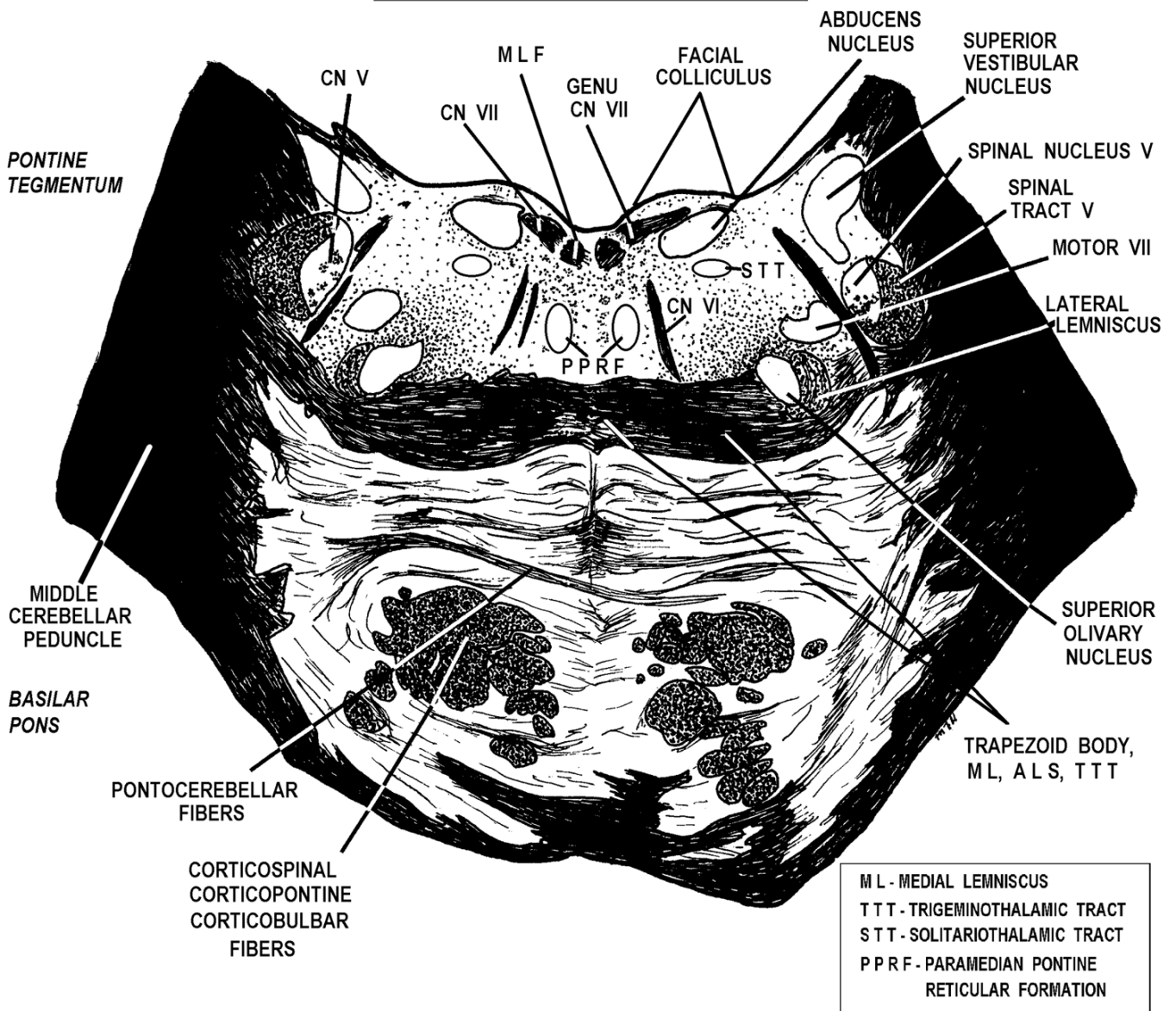
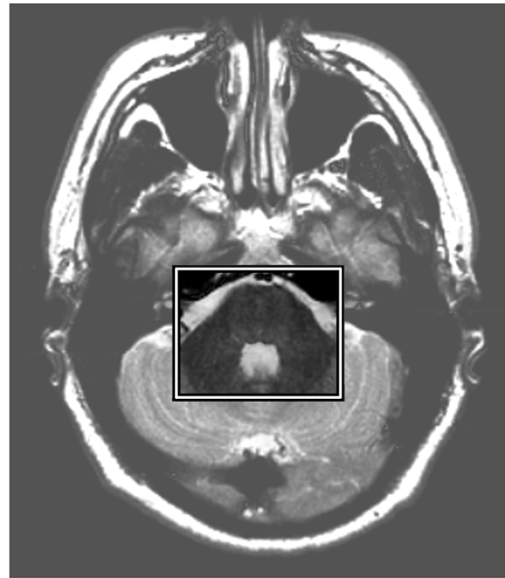


TTT - TRIGEMINOTHALAMIC TRACT  
 MLF - MEDIAL LONGITUDINAL FASCICULUS  
 ALS - ANTEROLATERAL SYSTEM

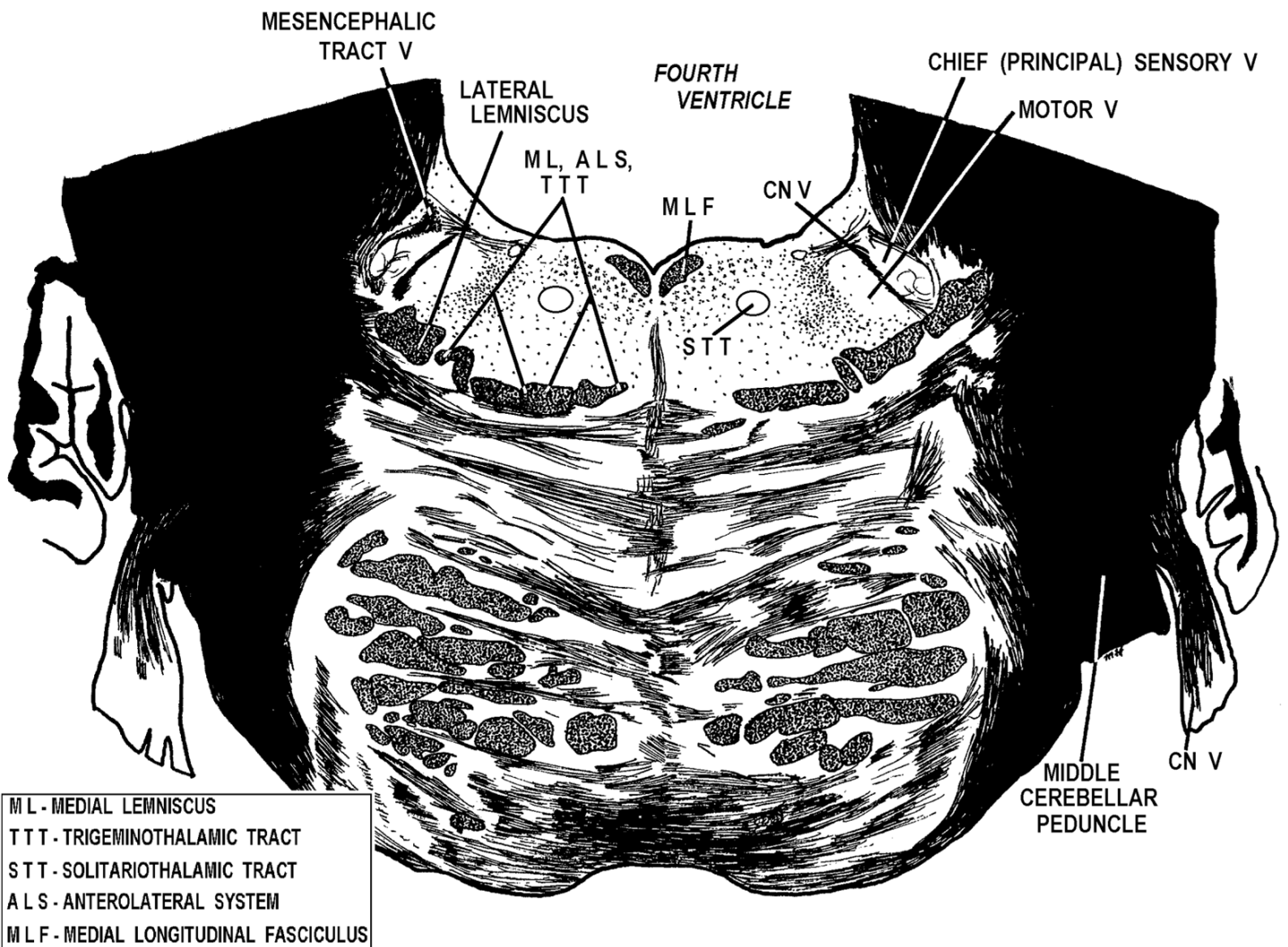
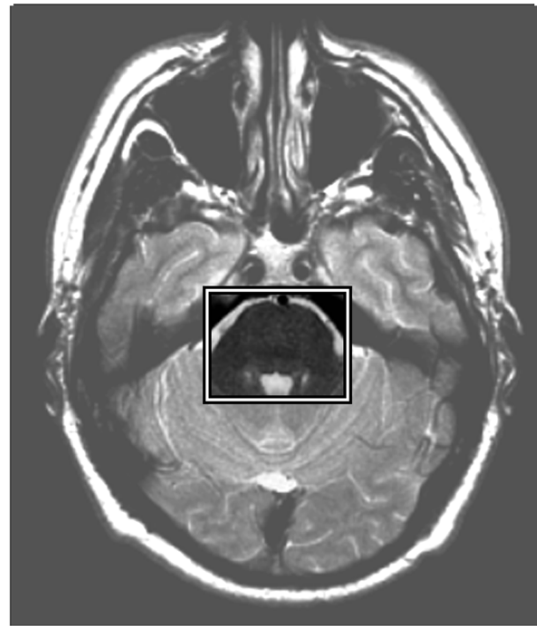
**LEVEL 3. MIDDLE OF INFERIOR OLIVARY COMPLEX**



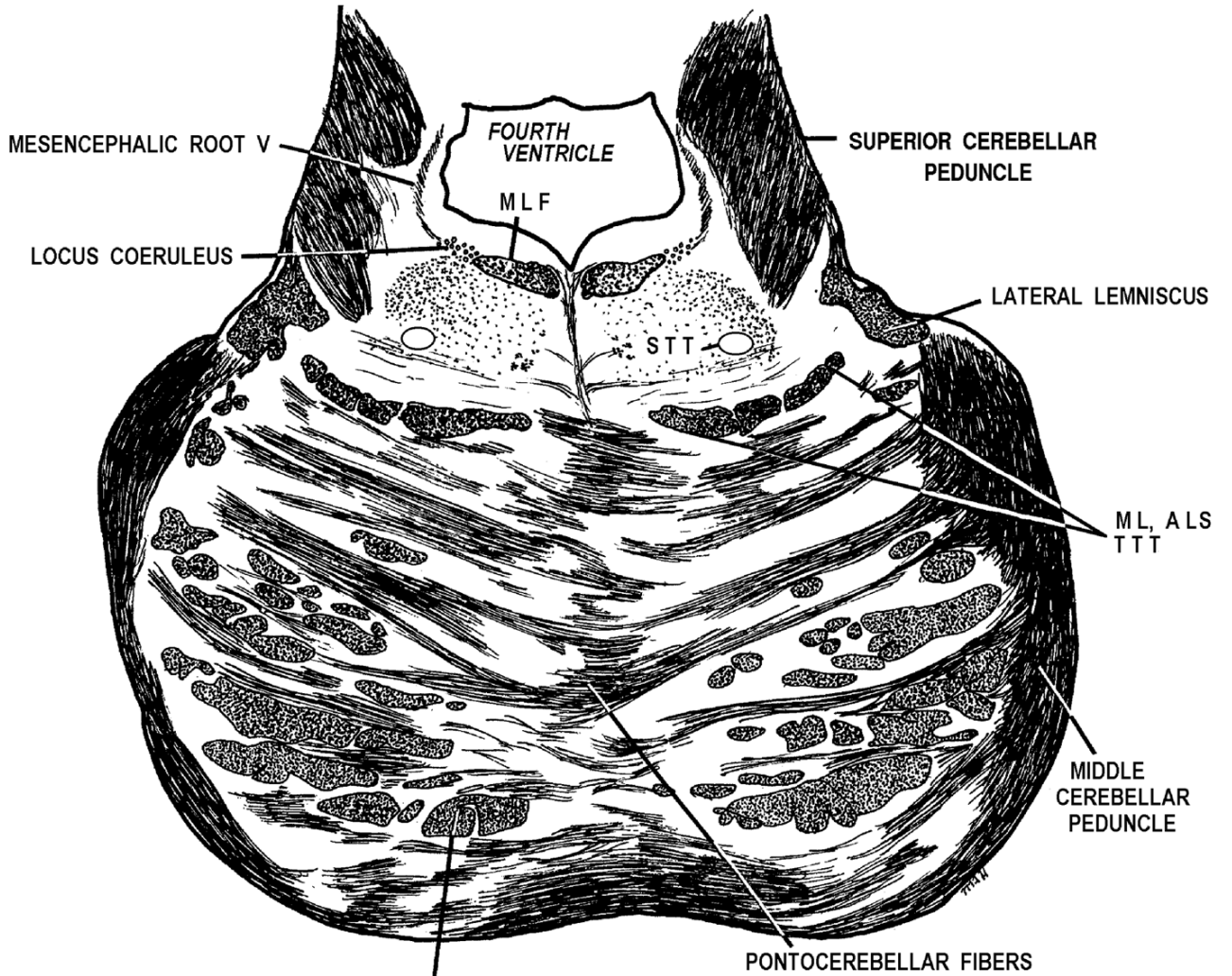
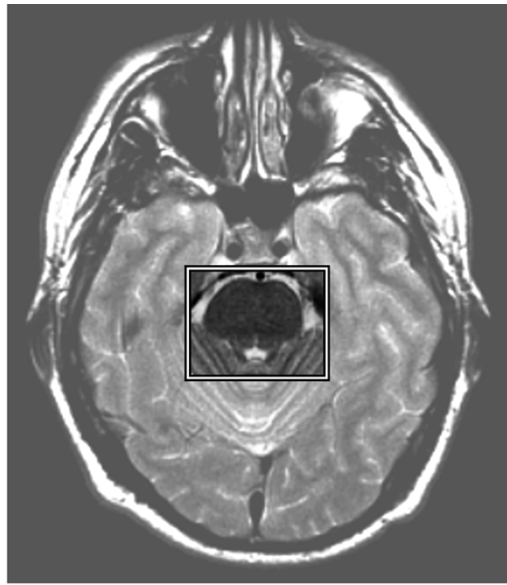
**LEVEL 4. ROSTRAL MEDULLA**



**LEVEL 5. MIDDLE PONS - FACIAL COLLICULUS**



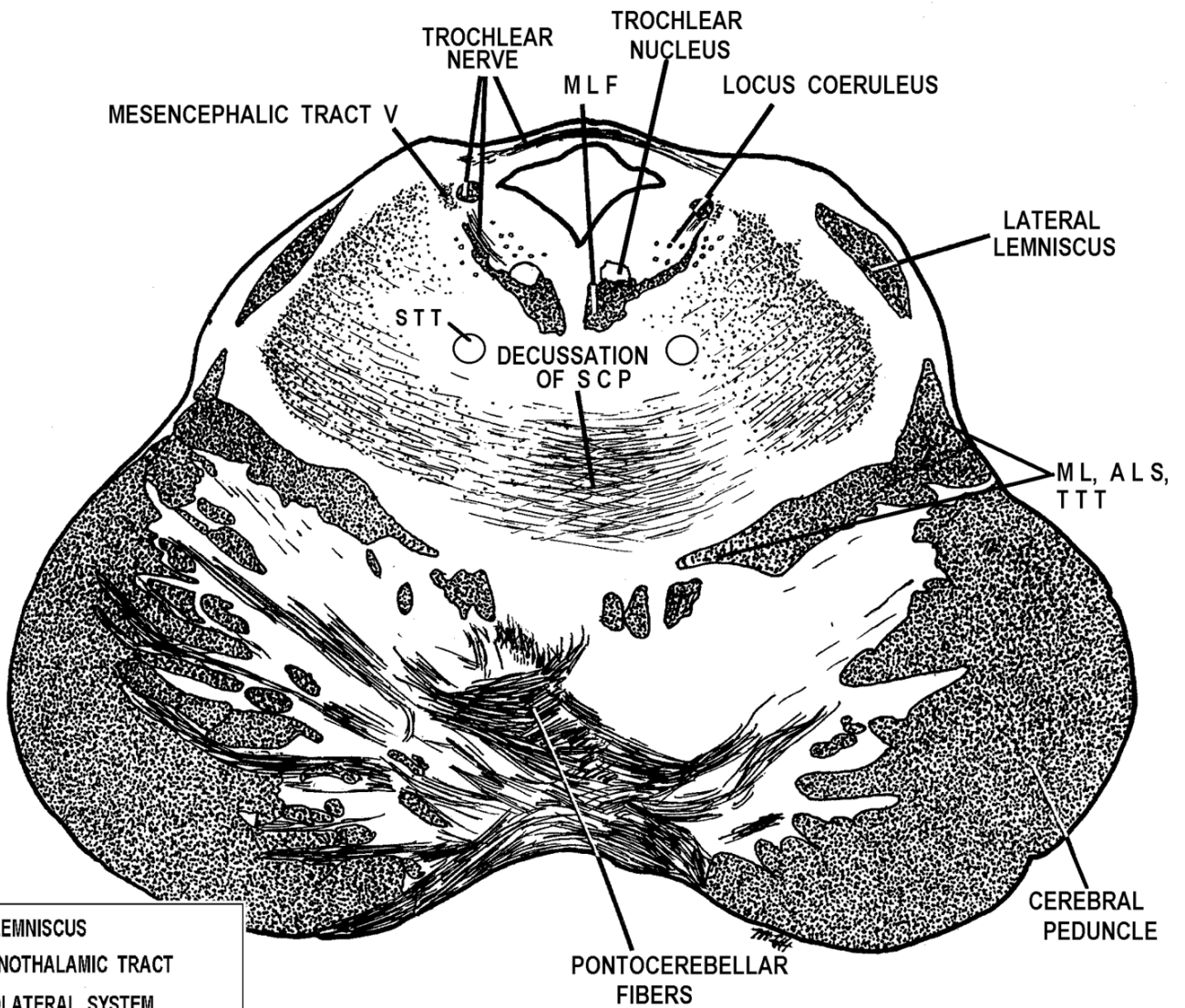
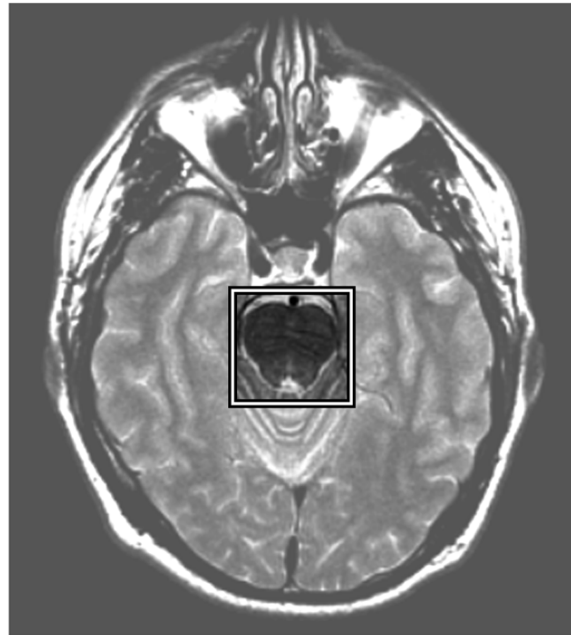
**LEVEL 6. PONS—LEVEL OF MOTOR V  
AND CHIEF SENSORY V**



M L - MEDIAL LEMNISCUS  
 T T T - TRIGEMINOTHALAMIC TRACT  
 S T T - SOLITARIOTHALAMIC TRACT

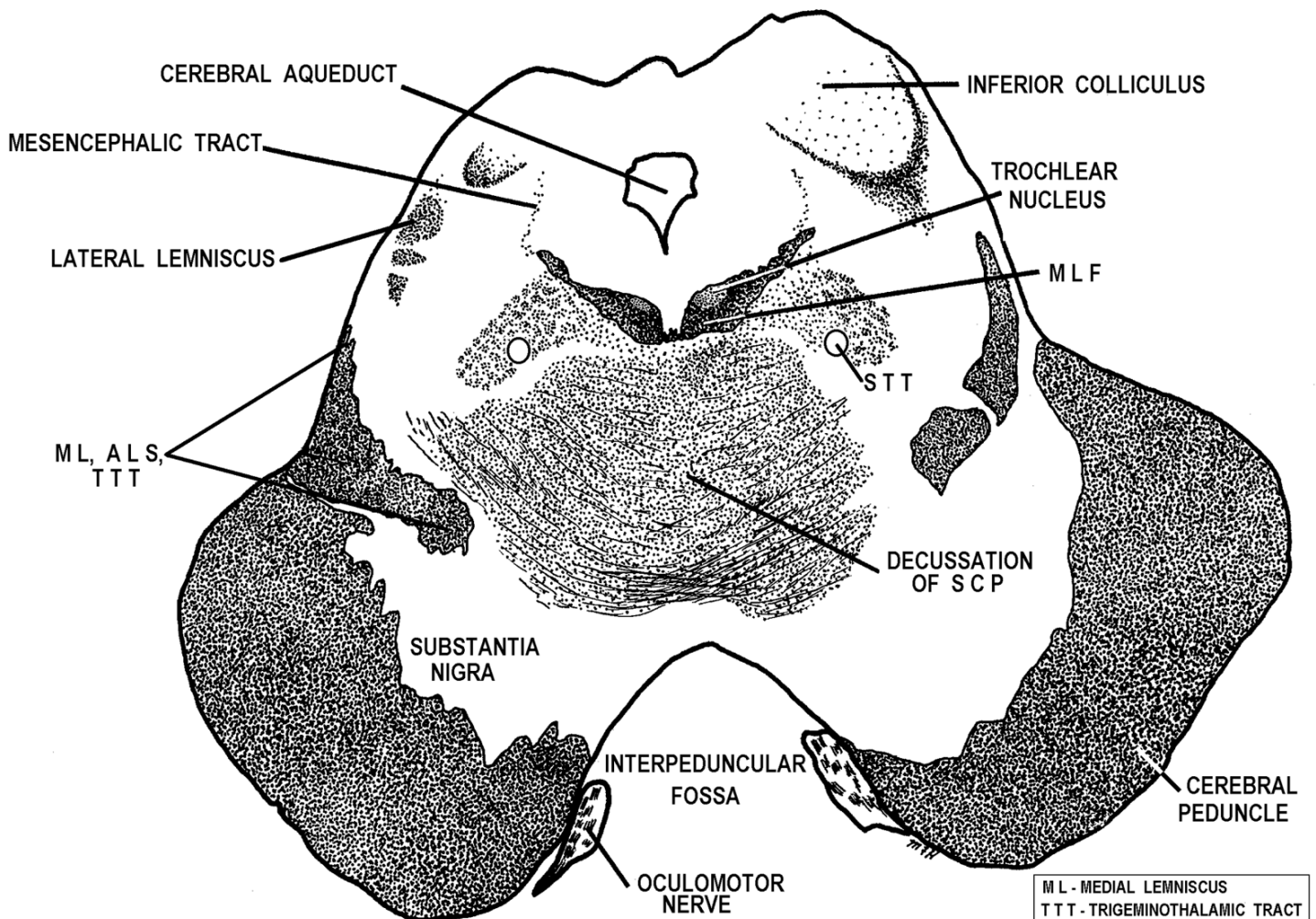
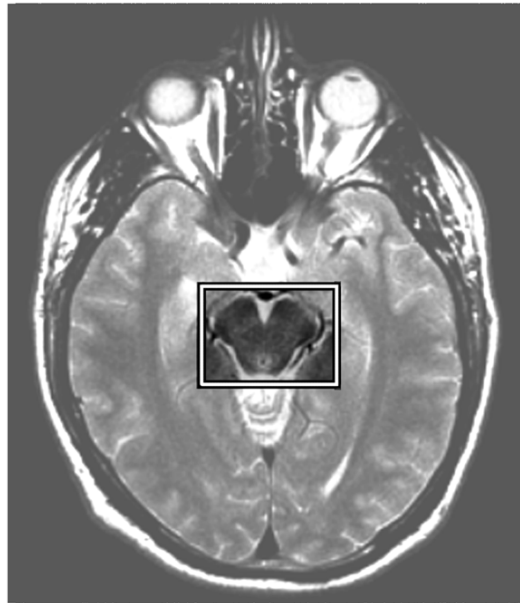
CORTICOSPINAL  
 CORTICOPONTINE FIBERS  
 CORTICOBULBAR

**LEVEL 7. ROSTRAL PONS**



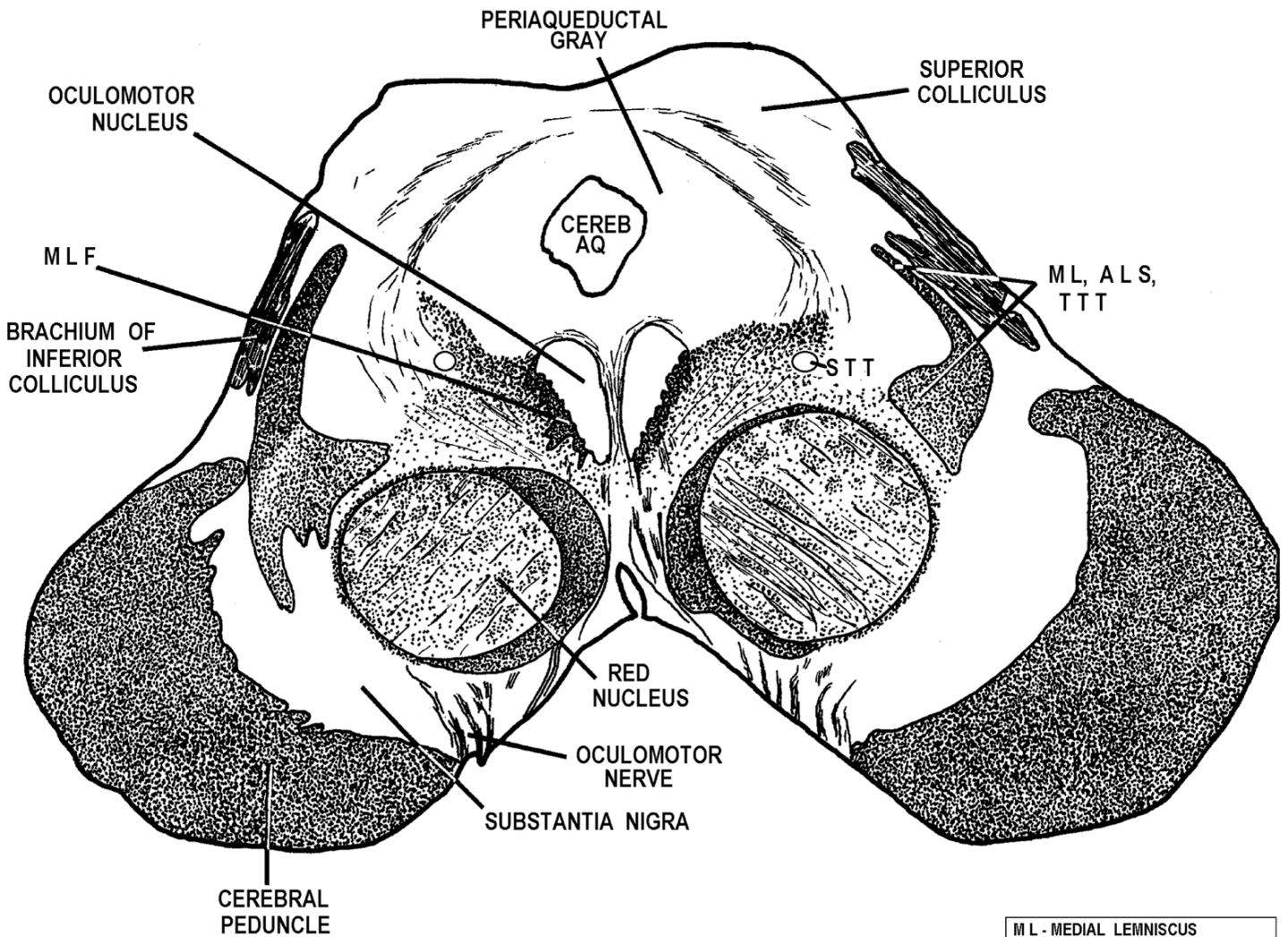
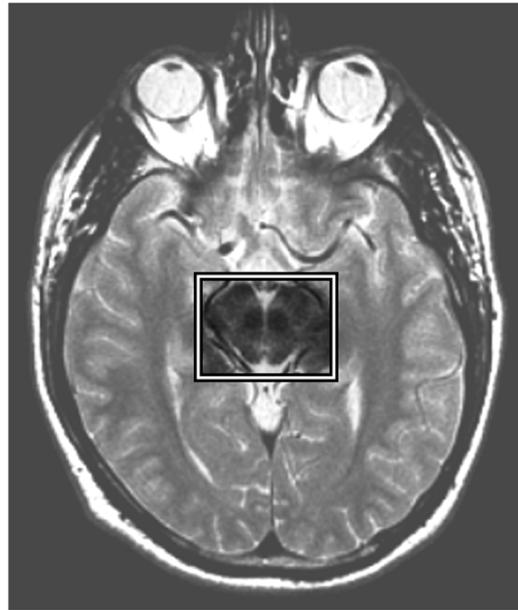
ML - MEDIAL LEMNISCUS  
TTT - TRIGEMINOTHALAMIC TRACT  
ALS - ANTEROLATERAL SYSTEM  
SCP - SUPERIOR CEREBELLAR PEDUNCLE

### LEVEL 8. TRANSITION BETWEEN PONS AND MIDBRAIN



**LEVEL 9. MESENCEPHALON AT LEVEL OF  
INFERIOR COLLICULUS**

M L - MEDIAL LEMNISCUS
T T T - TRIGEMINOTHALAMIC TRACT
S T T - SOLITARIOTHALAMIC TRACT
S C P - SUPERIOR CEREBELLAR PEDUNCLE



ML - MEDIAL LEMNISCUS  
TTT - TRIGEMINOTHALAMIC TRACT  
STT - SOLITARIOTHALAMIC TRACT

**LEVEL 10. MESENCEPHALON AT LEVEL  
OF SUPERIOR COLLICULUS**