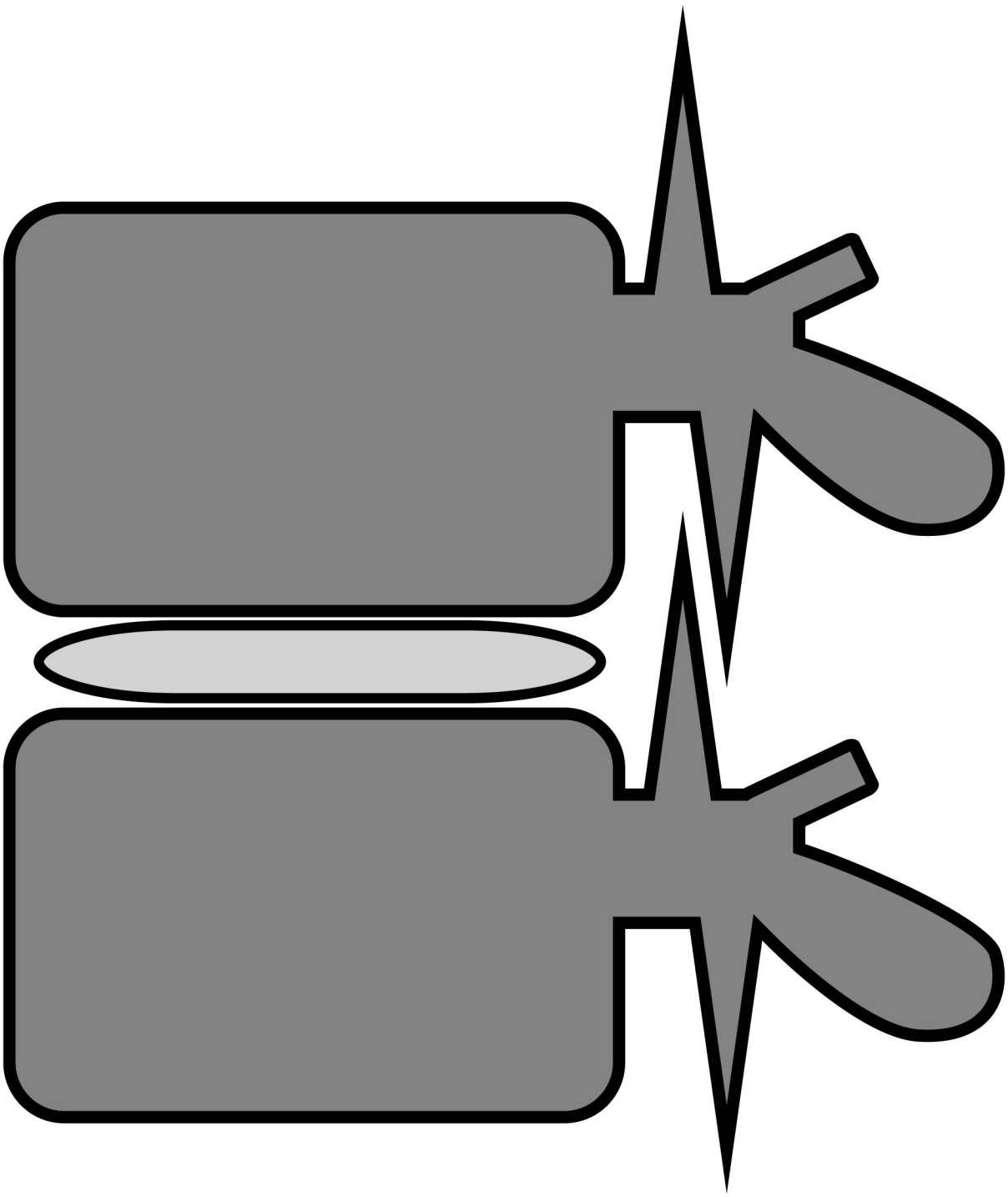
Peristence & Creativity

Anatomy Comics, Objectives 1.1 and 1.2

Simple Comix

1.1 Identify the components of a typical and an atypical vertebra and the specific differences in the cervical, thoracic, lumbar, and sacral regions.

1.2 Identify typical intervertebral articulations and the motions they allow. Identify the major ligaments connecting the vertebrae and the movements that they limit.

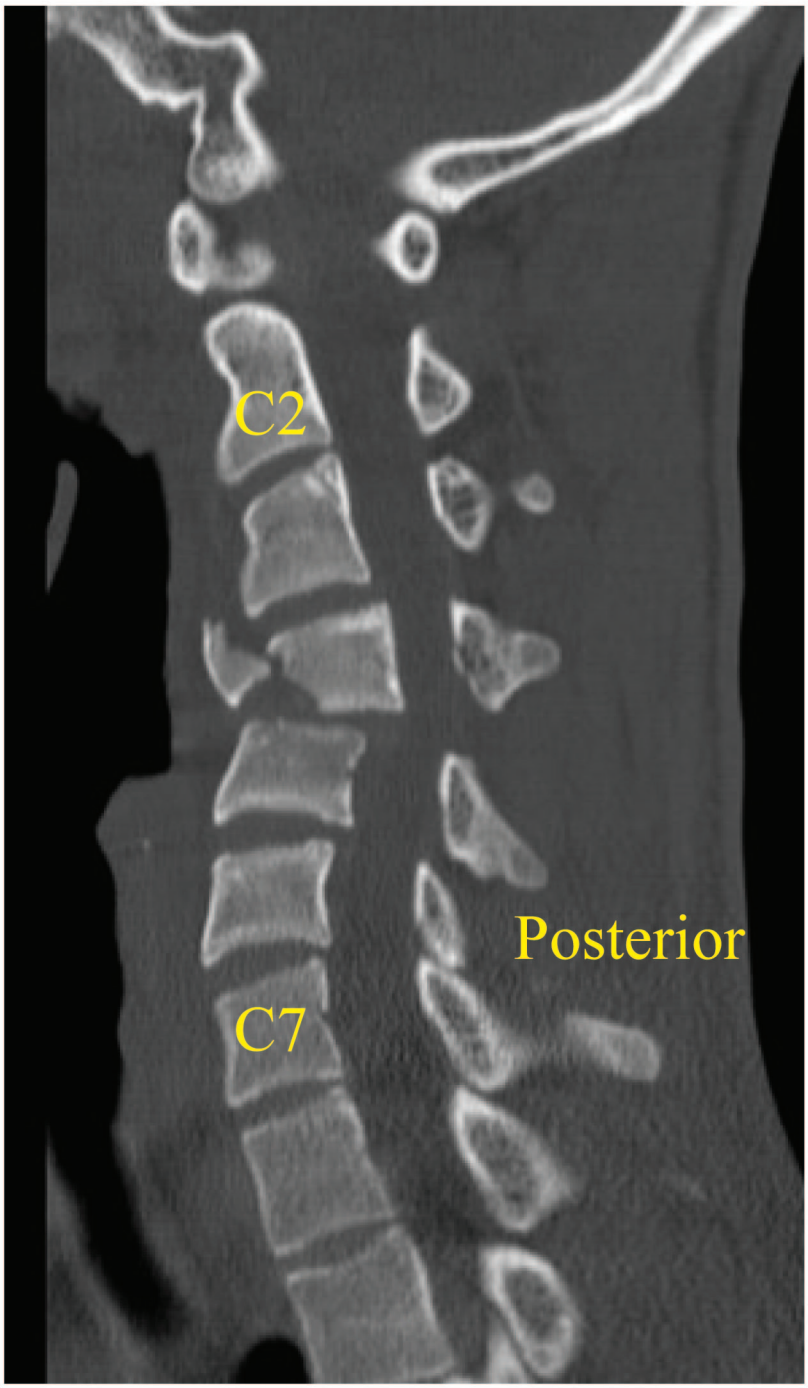


1. A 25 year old man presents with neck pain after a motor vehicle collision and has the sagittal CT scan below showing a fracture of the anterior body of C4. What ligaments are torn at the C4/C5 level?

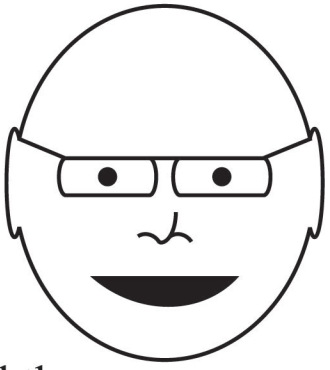
A. Posterior longitudinal
B. Ligamentum flavum
C. Interspinous ligament
D. All of the above

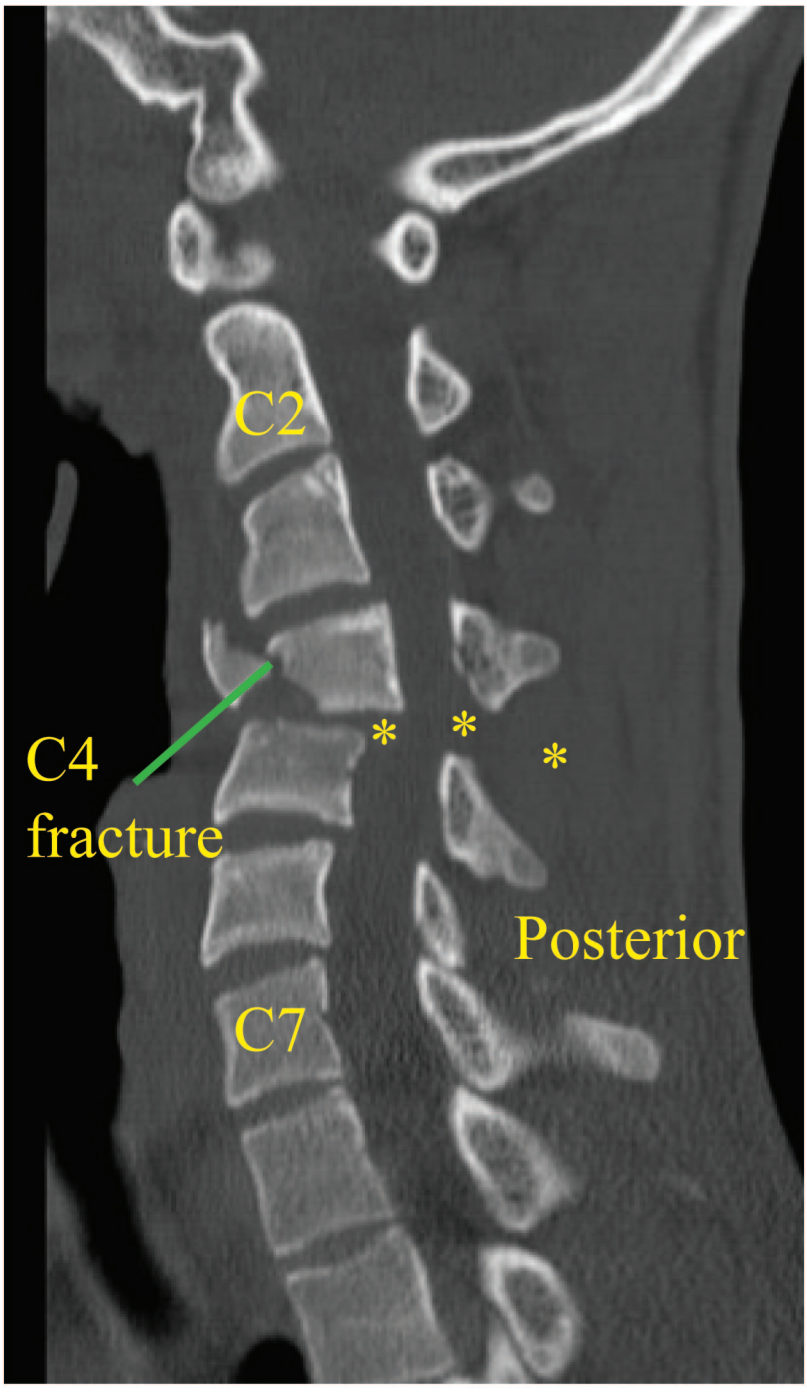
2. What type of force is most likely responsible for this pattern of injury?

A. Hyperflexion
B. Hyperextension
C. Excessive lateral bending
D. Excessive rotation



This is a difficult case, but we'll explain the findings on the CT scan, then we will use a combination of images from the visible human project and some simple line drawings that we want you to draw yourselves to learn the anatomy. The answer to the first question is that all of these ligaments are torn. I've placed asterixes where the posterior longitudinal ligament, the ligamentum flavum and the interspinous ligaments run. Ligaments keep bones properly aligned, so when we see misalignment, then the ligaments responsible for proper alignment must be torn. The easiest place to see this is at the back of the body of C4: it is posteriorly displaced compared to the back of the body of C5, meaning that at the C4/C5 level, the posterior longitudinal ligament is torn.

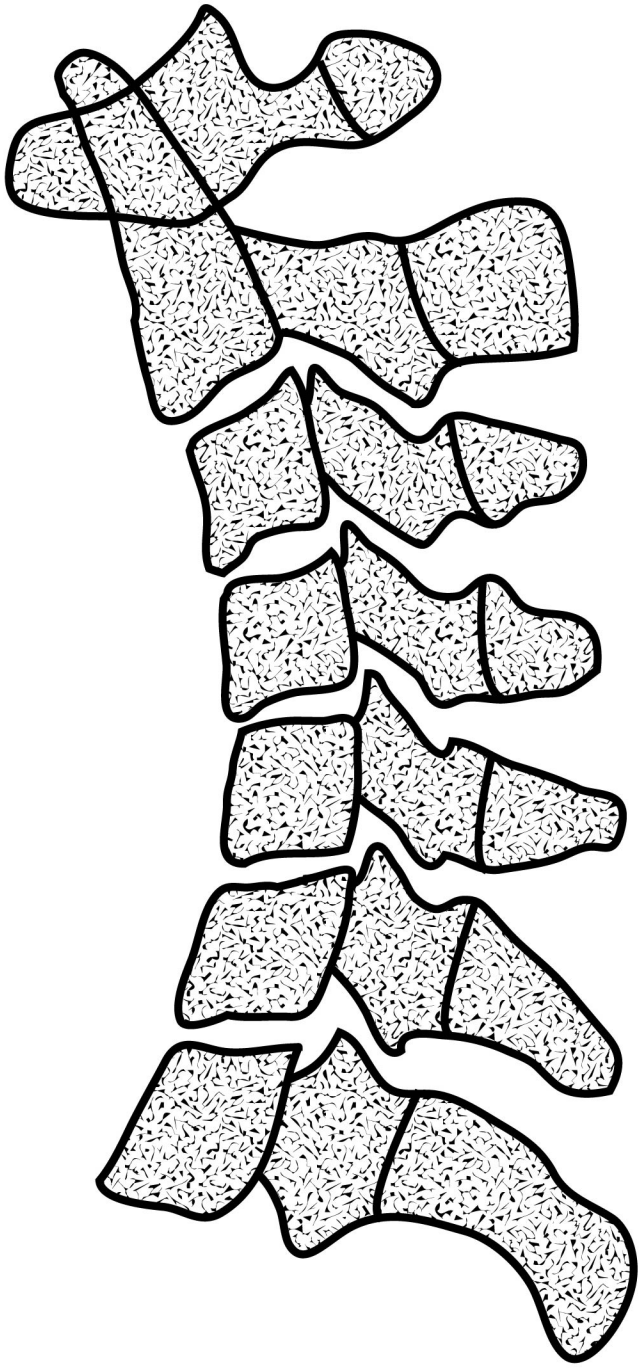




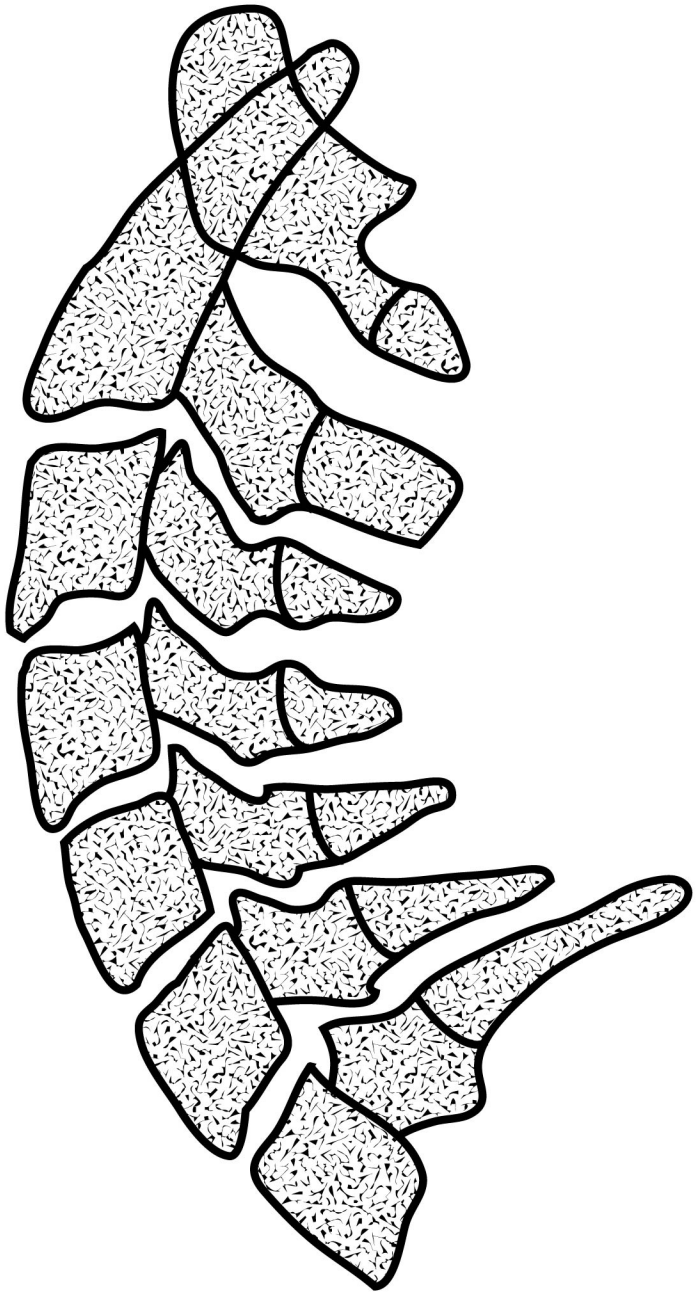
Comment puis-je vous aider, monsieur?

The answer to question 2 is hyperflexion. The drawings below are labeled “flexion” and “extension”. Hopefully, you can tell from looking at the drawings that flexion produces compression anteriorly and tension posteriorly. Ligaments are relatively resistant to compression, but tear with excessive tension. With hyperflexion, the compressed anterior vertebral body fractures. The opposite (natch) occurs with hyperextension.

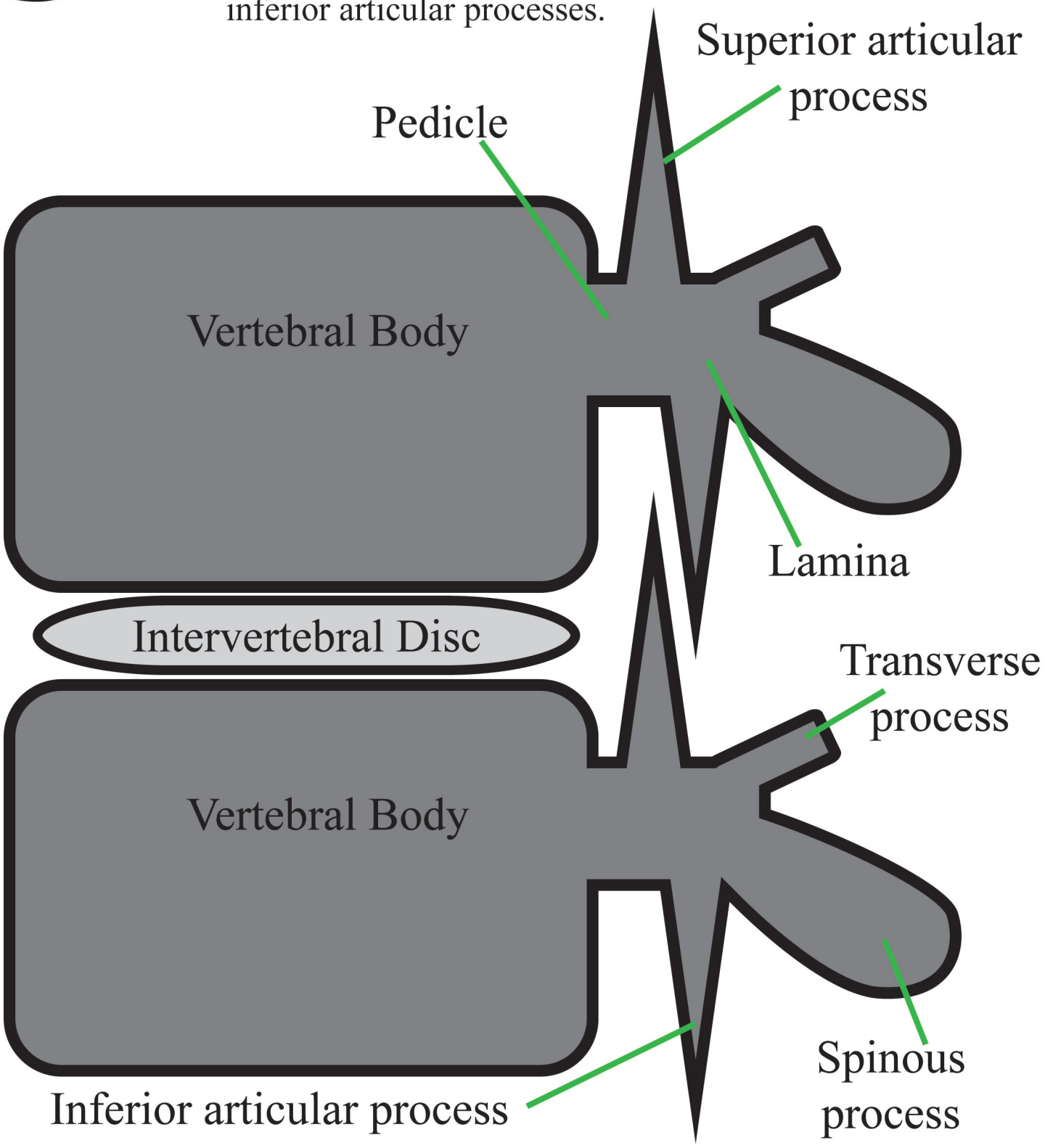
Flexion

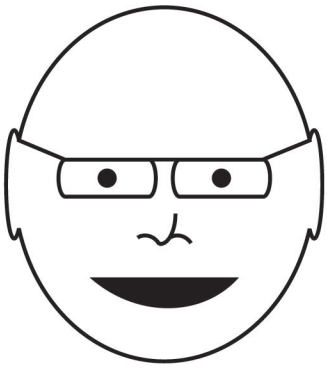


Extension

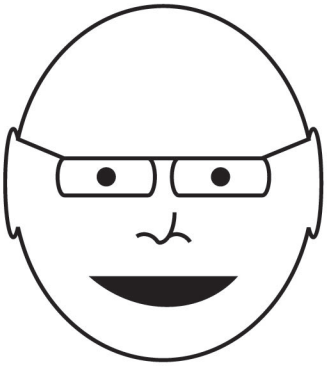


Let's look at some drawings and images from the visible human project to learn this anatomy. We'll start by learning the parts of a typical vertebra as seen from the side. The lumbar vertebrae are the biggest, so we'll use them. A typical vertebra has a body, a spinous process and 2 (each, left and right sided) pedicles, laminae, transverse processes, superior articular processes and inferior articular processes.

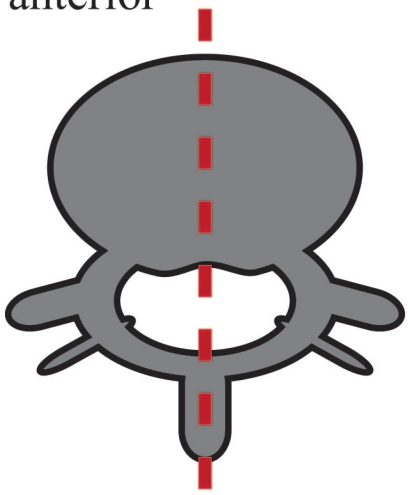


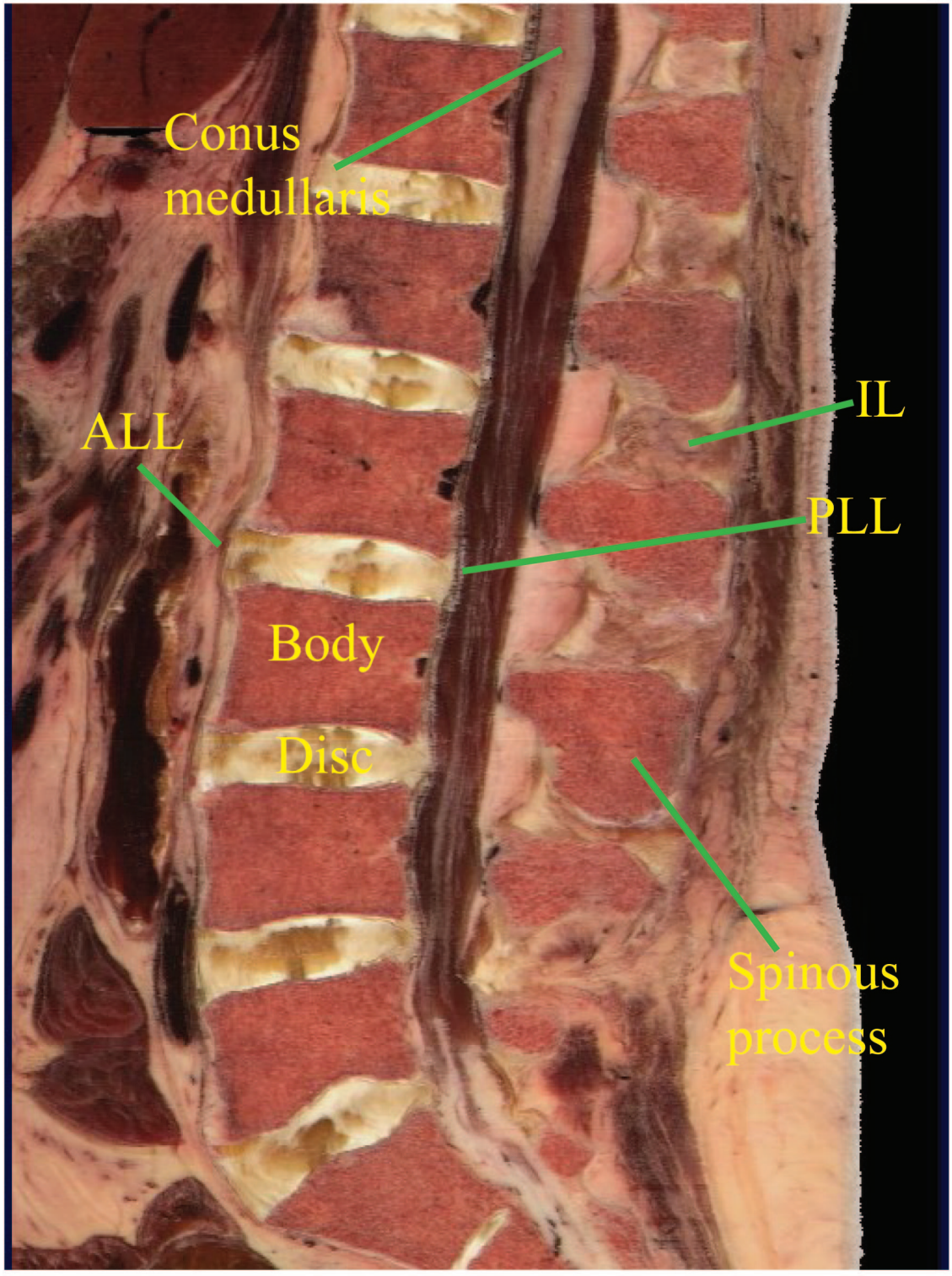


Next we'll look at the same anatomy from above. Since we are looking at the top of the vertebra, we cannot see the inferior articular processes coming off the inferior part of the vertebra. The vertebral foramen is where the spinal cord or cauda equina lives.

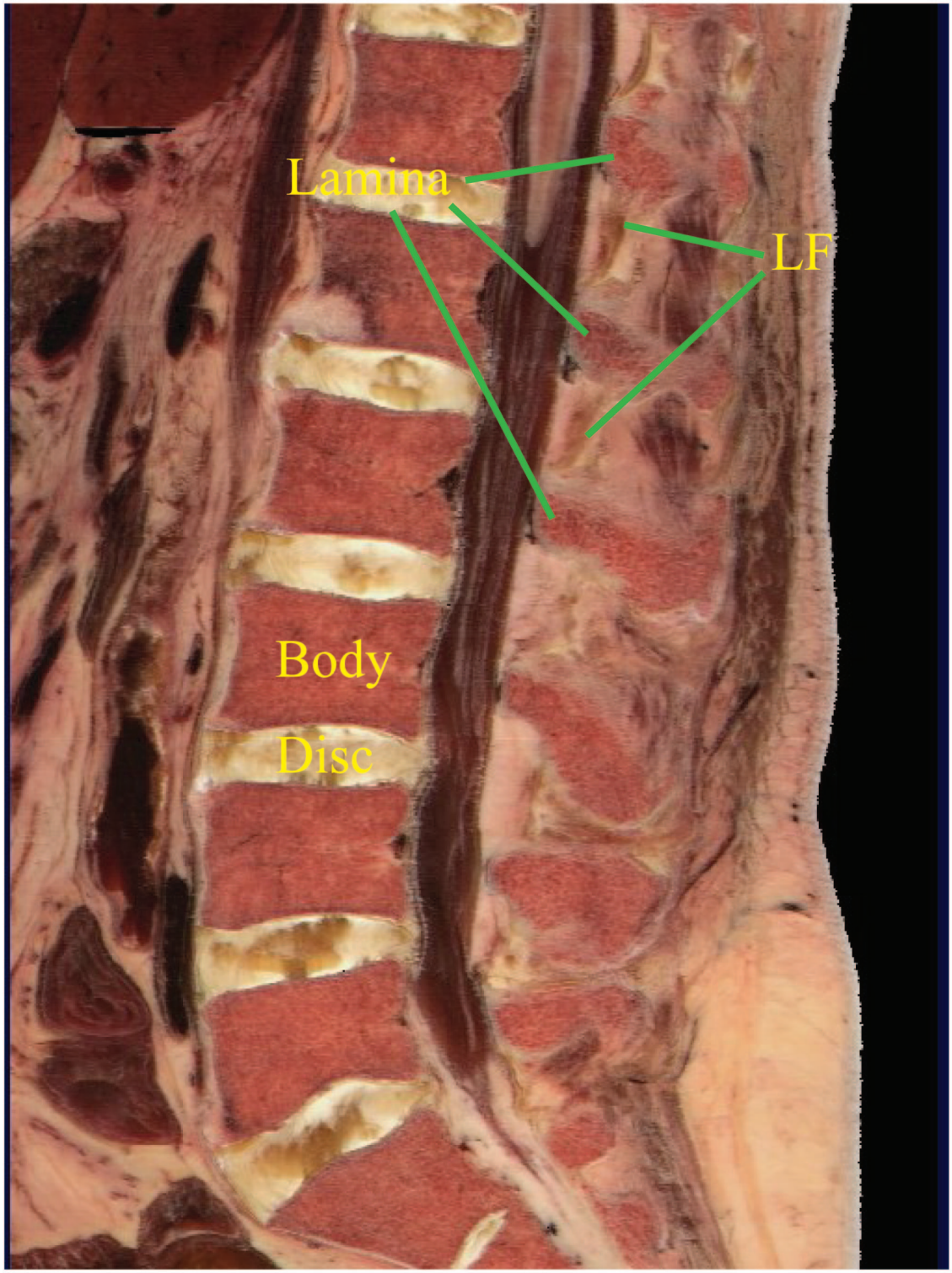


Now we'll look at the anatomy using images from the visible human project, staring with this mid-sagittal image. The plane of section is shown by the dotted red line. We'll add some ligaments as well: the anterior longitudinal ligament (ALL), the posterior longitudinal ligament (PLL) and the interspinous ligament (IL).

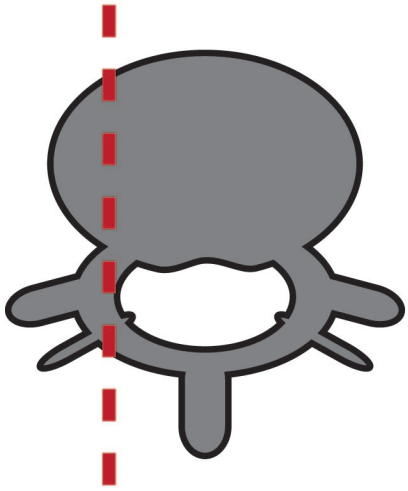


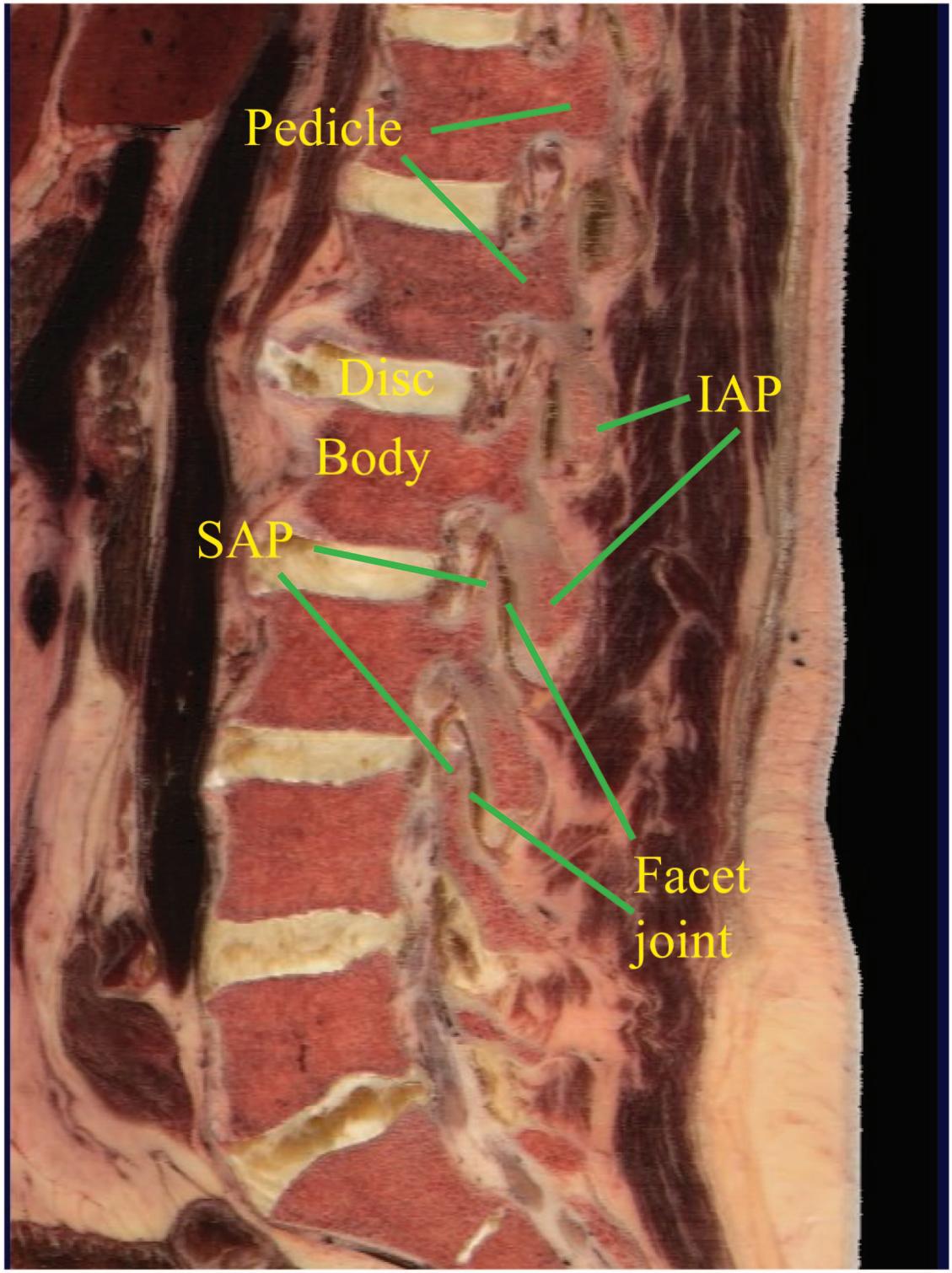


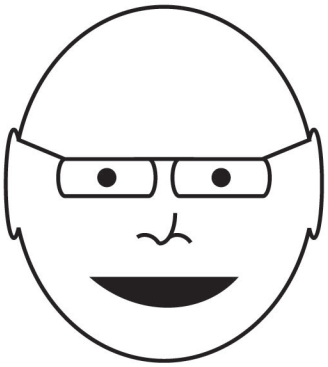
Next, we'll look at a parasagittal image, again, the dotted red line shows the plane of section. This time we are sectioning through the laminae and we see the ligament that runs between the laminae: the ligamentum flavum (LF).



Further laterally, we get into the facet joints, where the superior (SAP) and inferior (IAP) articular processes articulate. Again, the dotted red line shows the plane of section.

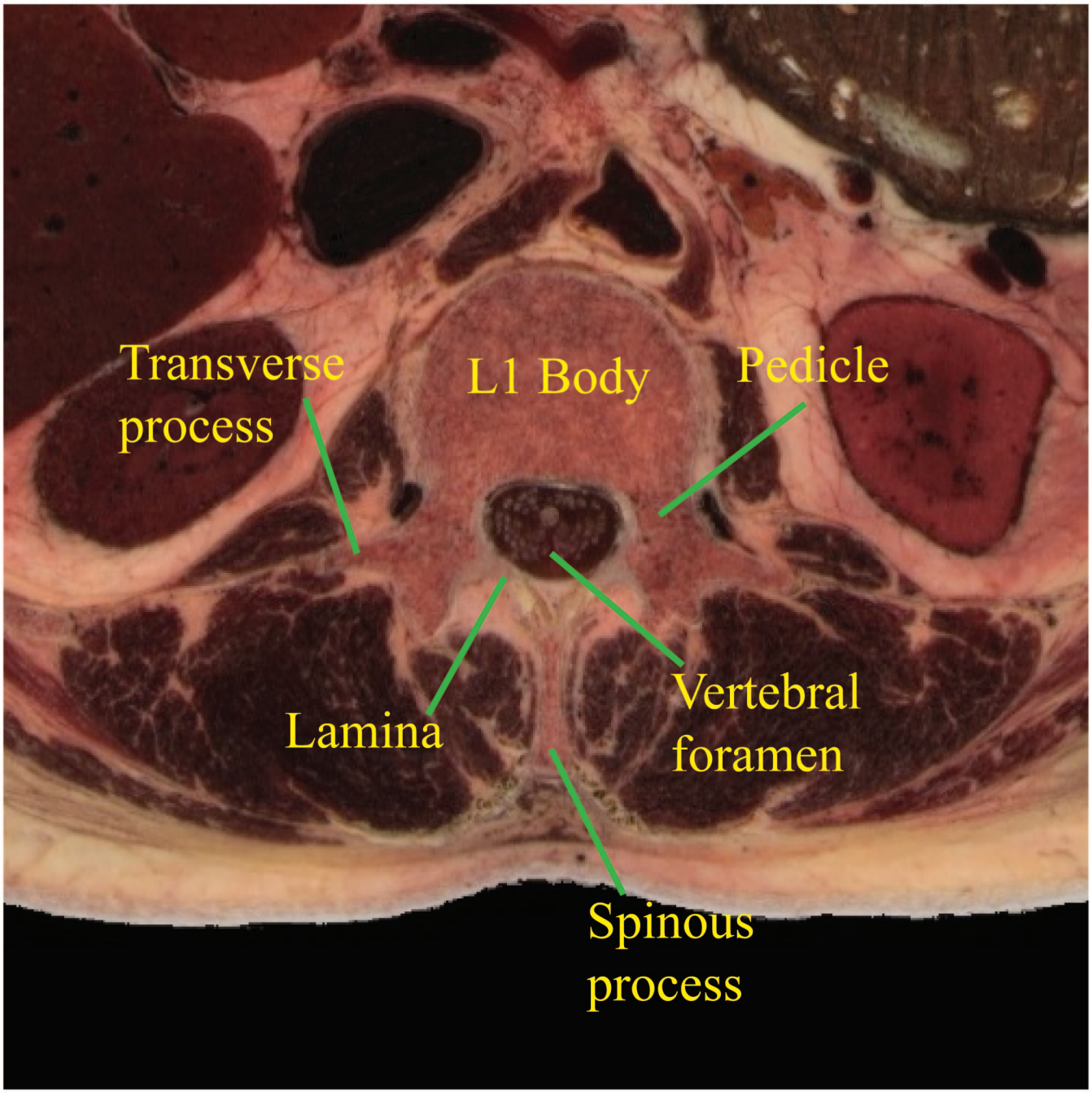


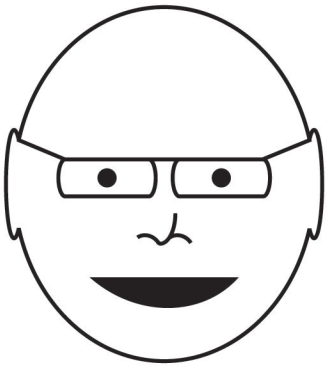




Now, we'll have a look in the axial plane, at the level of the the L1 vertebral body.

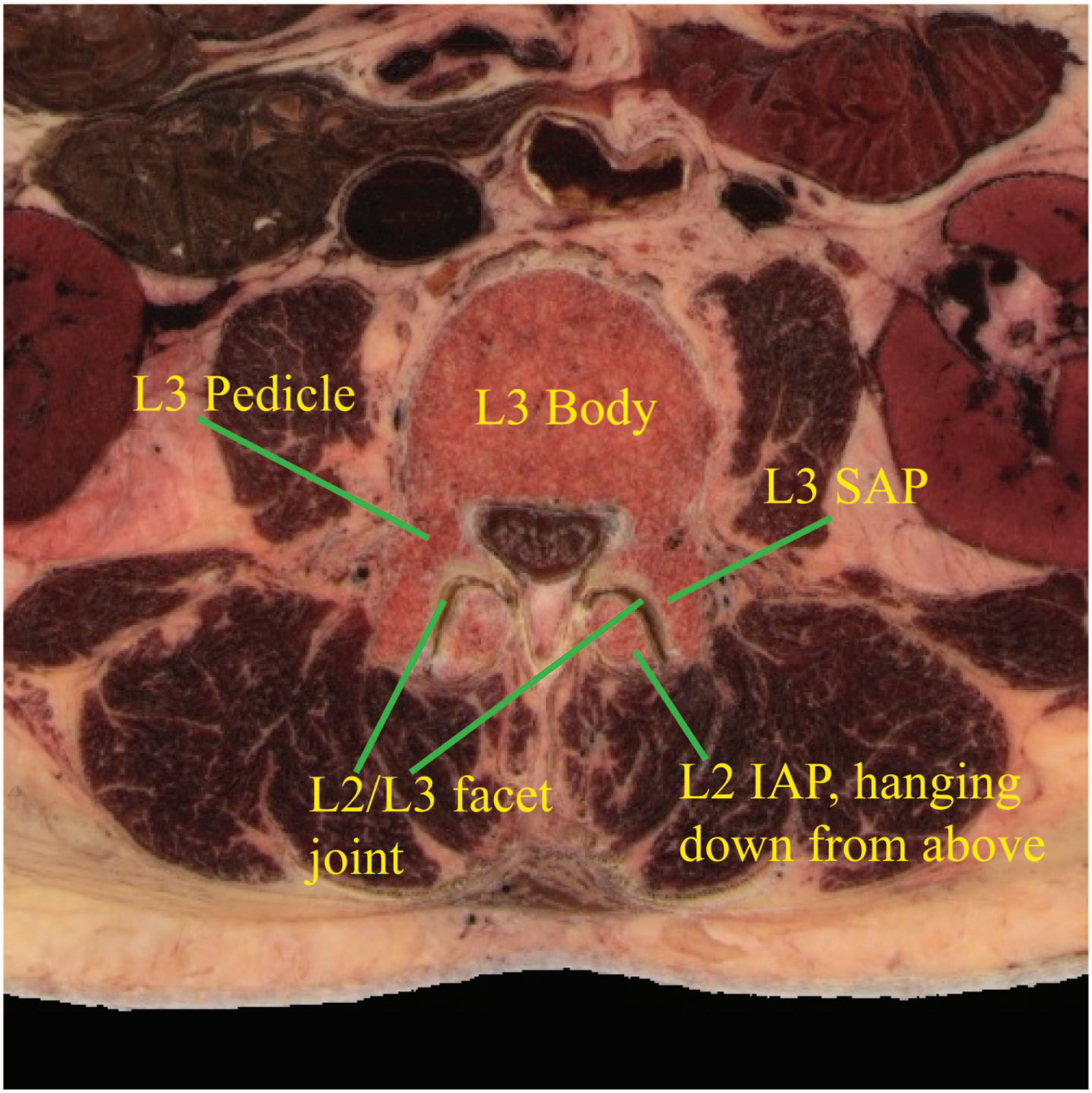
The very tip of the conus medularis and the cauda equina are clearly visible in the vertebral foramen.

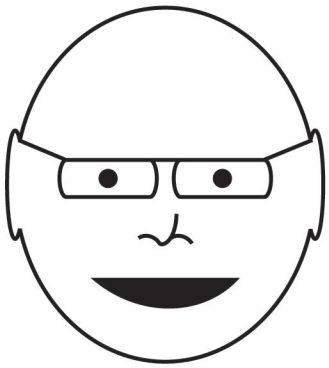




Let's look at what a facet joint looks like in the axial plan.

Remember that the facet joints are synovial joints.





That's all for now kids,
see you again soon for
another action packed
edition of Anatomy Comics!

Au revoir,
mes enfants!