Unit 2. Suboccipital Triangle, Vertebral Column, Spinal Cord

Dissection Instructions:

Prior to dissection be sure to study the vertebral column as well as the individual vertebrae.

*Both sides are to be dissected.* An articulated **vertebral column** or one strung on cord is necessary for study (*Plates 12, 15, 16, 146; 4.1, 4.3*). The column consists of 7 **cervical**, 12 **thoracic**, 5 **fused sacral** and 3 or 4 **fused coccygeal vertebrae** (*Plates 15, 16, 147, 148, 150; 4.4, 4.9 - 4.13*). Look first at a vertebra from the mid-thoracic region. Identify on it the **body**, **vertebral arch**, **vertebral foramen**, **pedicles**, **laminae**, **spinous process**, **transverse processes** and **articular processes**. Note on the sides of the body and on the transverse processes the articular surfaces for ribs. The upper and lower surfaces of the pedicles have notches, the upper one being the smaller. Now fit two vertebrae together as they would be in life and observe that the notches form boundaries of **intervertebral foramina**. The **spinal cord** would be located in the vertebral foramen and the spinal nerves would pass through the intervertebral foramina. Compare the size and shape of the vertebral body to those in different regions of the column. The **vertebral bodies** become larger and stronger towards the inferior end of the column. The **atlas** does not have a body. It is replaced by an anterior arch. Developmentally, the body of the atlas fuses to the second cervical vertebra, the **axis**. Compare the transverse processes in the different regions. Note that the **transverse processes** in the cervical region have a transverse foramen in each of them. Transverse foramina are found only in the cervical region. Only in the thoracic region do the transverse processes have **facets for articulation with ribs**. Compare the **spinous processes** of each region for size, shape and direction. Note that the first cervical vertebra, the atlas, has a tubercle instead of a spinous process. Note that most of the cervical vertebrae have bifid spinous processes. The intervertebral foramina in the sacral region are the largest.

In life, the vertebrae are joined together by numerous ligaments (*Plates 17, 18, 15, 152; 4.23, 4.24*). The bodies are separated by **intervertebral disks** which account for about one-fifth of the length of the column. The disks have outer and inner parts (*Plates 148; 4.23B*). The outer part is called the **annulus fibrosis** and consists of laminae of collagen fibers, each oriented in different directions. The inner part is the **nucleus pulposus**, a gelatinous material. The bodies and disks are joined together and further strengthened by **anterior and posterior longitudinal ligaments** (*Plates 151, 152; 4.24*). The anterior longitudinal ligament is stronger than the posterior. The ligaments have their strongest attachments to the disks and the upper and lower parts of the bodies.

The **laminae** are joined together by elastic ligaments called **ligamentum flavum** (*Plate 151; 4.244*). While the longitudinal ligaments are continuous the length of the column, the ligamentum flavum extends longitudinally only from one lamina to the next. These are very strong ligaments and they extend transversely from the mid-line to the articular processes. Adjacent spinous and transverse processes are each joined by **interspinous and intertransverse ligaments**, respectively. The **articular processes** below are joined to the articular processes.
above through synovial joints which are surrounded by capsular ligaments.

Remove the **semispinalis capitis muscle** from both sides to expose the **suboccipital triangle** (Plates 171; 4.35-4.36, Table 4.5 and figures-p.318) keeping the **greater occipital nerve** intact. Carefully clean the surface of the **rectus capitis posterior major and minor muscles** and the **superior and inferior oblique muscles**, which form the boundaries of the **suboccipital triangle**. All four muscles are innervated by C1 (suboccipital nerve) located within the triangle. The **rectus capitis posterior minor** arises from the posterior tubercle of CV1 and the **rectus capitis posterior major** arises from the spinous process of CV2. The **in inferior oblique muscle** arises from the spinous process of CV2 and inserts on the transverse process of CV1, where the **superior oblique muscle** arises. The two rectus muscles and the superior oblique muscle all insert on the occipital bone inferior and deep to the semispinalis capitis insertion. The suboccipital muscles are involved with **turning the head** or in **looking upward**.

Probe in the triangle and locate the lamina of CV1, then clean the connective tissue from the triangle to expose it. Carefully clean the region immediately above the lamina for the **vertebral artery**, which lies in a groove on the upper surface of the lamina. The vertebral artery is carrying blood from the **subclavian artery** to the brain. It enters the **transverse foramen** of CV6 and ascends through the transverse foramina of all the cervical vertebrae above, including the first. After passing through the transverse foramen of the atlas, the artery turns posterior and medial, passes behind the superior articular process, enters the cranial cavity through the **foramen magnum**, then passes anterior to the brain stem where the **left and right vertebral arteries** fuse to form the **basilar artery**.

*The reason for learning about the suboccipital triangle is to remind those who attempt to draw cerebrospinal fluid from the cisterna magna that the vertebral artery is near and should not be punctured.* The **cisterna magna** is a space containing accumulations of cerebrospinal fluid below the cerebellum.

Remove the deep muscles of the back from CV5 to the lower sacrum to expose the laminae of those vertebrae. Using chisel and mallet, cut through the laminae adjacent to the articular process and remove all the exposed laminae and spinous processes so that the **vertebral canal** is opened from the cervical to sacral regions (Figure 2-1). Take care to preserve the spinal nerves as they leave the spinal cord and exit through the intervertebral foramina. **Clean the extradural fat and internal vertebral venous plexus** from the dura mater. *(Plates 166; 4.26)*
Follow one or two thoracic spinal nerves laterally until they divide into anterior and posterior primary rami (Plates 162, 163; 4.40, 4.44, 4.46). Locate gray and white communicating rami branching from the anterior primary ramus.

Open the dura mater by a longitudinal incision along its entire exposed length (Plates 153, 162; 4.40, 4.41, 4.45A). In a living person, the arachnoid mater is immediately adjacent to the dura, but in the cadaver, the subdural space is usually exaggerated. Study the arachnoid and then open it as you did the dura. Identify dorsal and ventral roots and note that they do not join to form a spinal nerve until after they enter the lateral extension of the dura. The dura fuses to the nerves before reaching the dorsal root ganglion.

Locate the lower end of the spinal cord the conus medullaris which continues inferiorly as the filum terminale (pia) (Plates 153, 154; 4.40-4.43, 4.48). The collection of dorsal and ventral roots below the spinal cord is called the cauda equina. The dural sac ends below at the level of SV2, where the coccygeal ligament begins. The coccygeal ligament is the fused filum terminale and dura. It ends by attaching to the coccyx.
Be sure to identify all of the following in this unit

rectus capitis posterior major muscle
rectus capitis posterior minor muscle
superior oblique muscle
inferior oblique muscle
vertebral artery
greater occipital nerve
cervical vertebrae
thoracic vertebrae
lumbar vertebrae
sacral vertebrae
coccygeal vertebrae
vertebral arch
body
vertebral foramen
pedicle
laminae
spinous process
transverse process
articular process
intervertebral foramen
atlas
axis
facets for articulation of ribs
intervertebral disc
anterior longitudinal ligament
posterior longitudinal ligament
ligamentum flavum
thoracic spinal nerves
ventral(anterior) primary ramus
dorsal(posterior) primary ramus
dura mater
arachnoid mater
ventral(anterior) root
dorsal(posterior) root
dorsal root ganglion
spinal nerve
pia mater
denticulate ligament conus
medullaris
filum terminale
cauda equina