

Human Anatomy

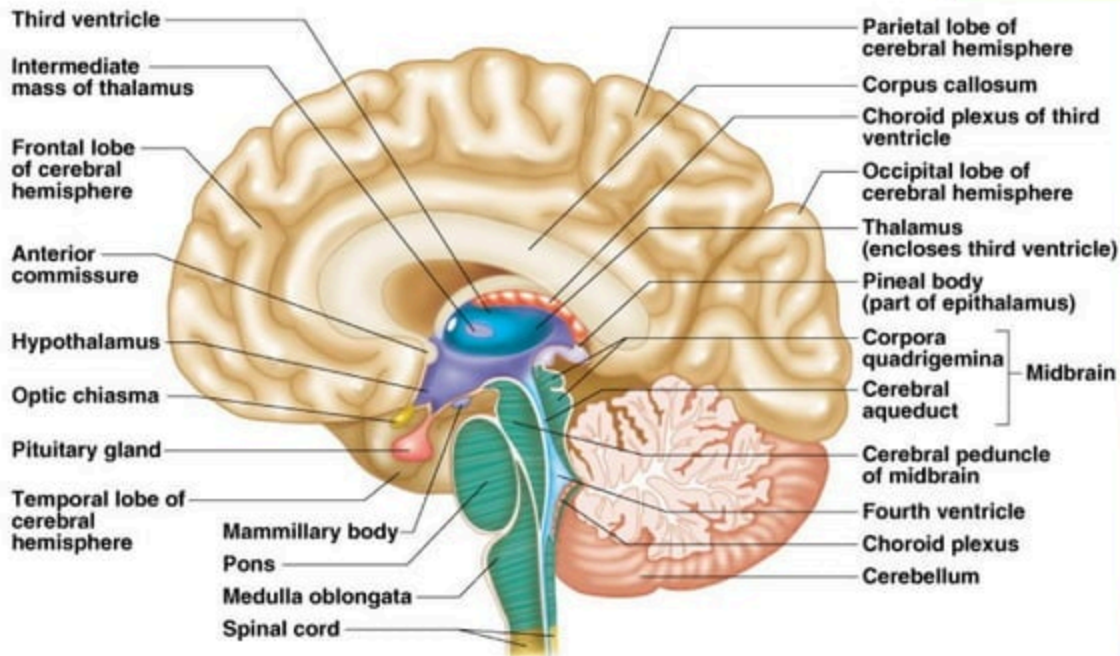
NERVOUS SYSTEM

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Cerebellum

- Two hemispheres with convoluted surfaces
- Provides involuntary coordination of body movements

Cerebellum

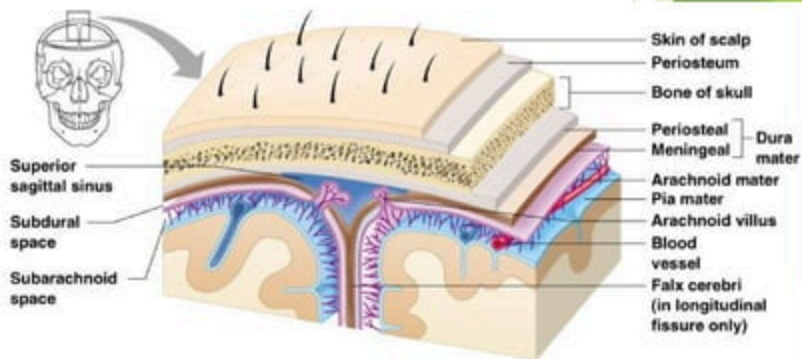


(a)

Figure 7.15a

Protection of the Central Nervous System

- Scalp and skin
- Skull and vertebral column



(a)

Figure 7.16a

Protection of the Central Nervous System

- *Meninges:*
 - Dura mater
 - Arachnoid
 - Pia Mater

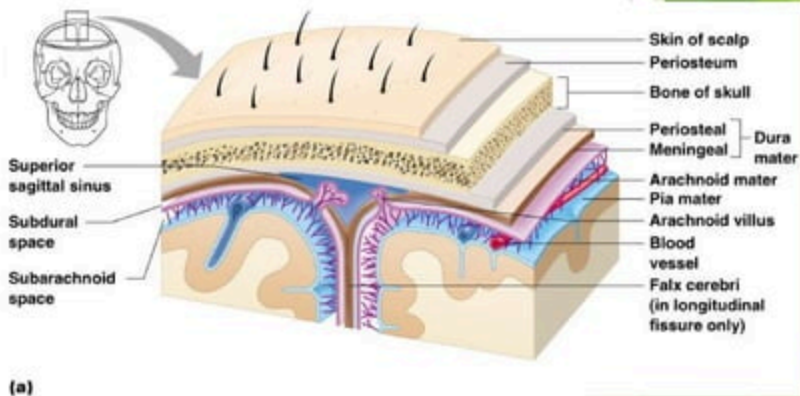
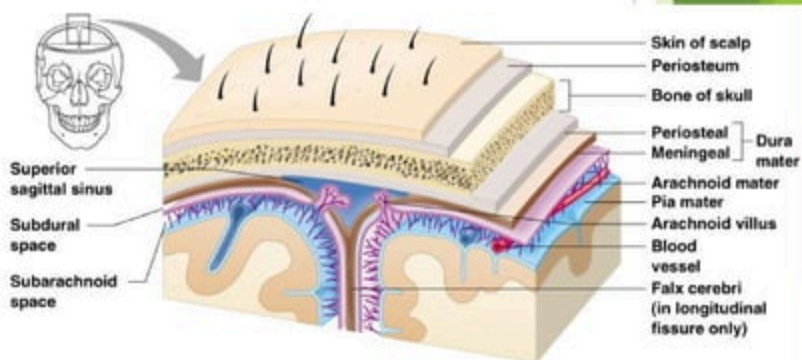


Figure 7.16a

Protection of the Central Nervous System

- Cerebrospinal fluid: *subarachnoid space*
- Blood brain barrier



(a)

Figure 7.16a

Meninges

- Dura mater
 - Double-layered external covering
 - Periosteum – attached to surface of the skull
 - Meningeal layer – outer covering of the brain
 - Folds inward to support hemispheres

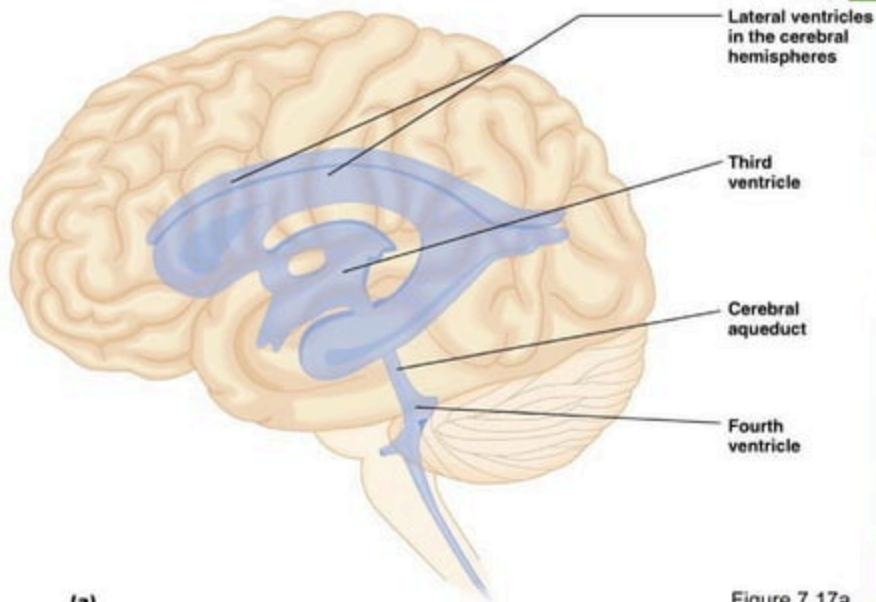
Meninges

- Arachnoid layer
 - Middle layer
 - Web-like
- Pia mater
 - Internal layer
 - Clings to the surface of the brain

Cerebrospinal Fluid

- Similar to blood plasma
- Formed by the *choroid plexus*
- Forms a watery cushion to protect the brain
- Circulated in subarachnoid space, ventricles, and central canal of the spinal cord

Ventricles and Location of the Cerebrospinal Fluid



(a)

Figure 7.17a

Ventricles and Location of the Cerebrospinal Fluid

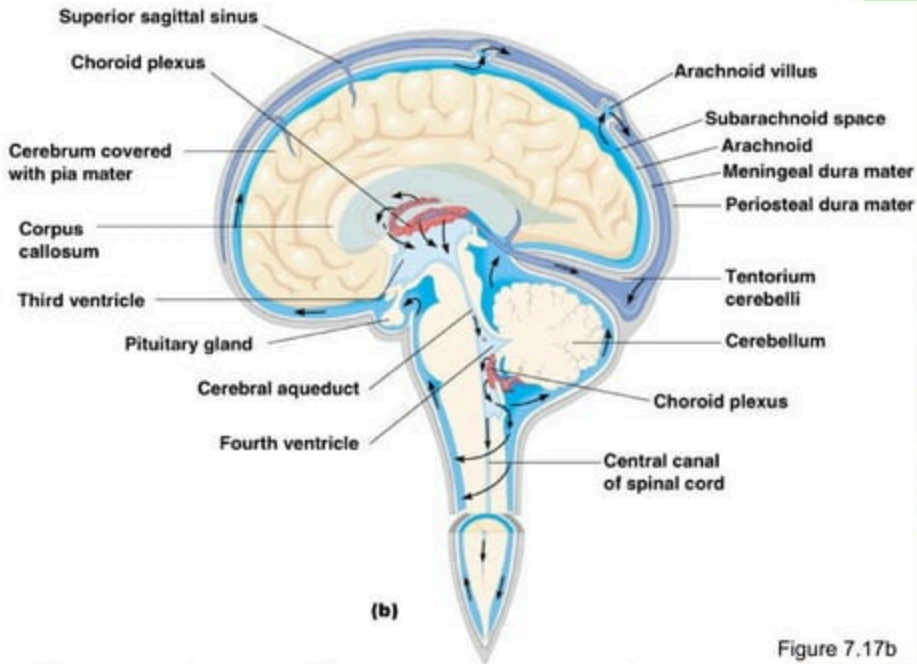


Figure 7.17b

Blood Brain Barrier

- The least permeable capillaries of the body + astrocyte processes
- Excludes many potentially harmful substances
- Useless against some substances
 - Fat soluble substances
 - Anesthetics

Blood Brain Barrier

- “Good news”: keeps out most harmful substances
 - Alcohol, viruses, some drugs
- “Bad news”: keeps out most helpful substances
 - Antibiotics, chemotherapy drugs

Traumatic Brain Injuries

- *Concussion*
 - Slight brain injury
 - Usually no permanent damage
- *Contusion*
 - Nervous tissue destruction occurs
 - Nervous tissue does not regenerate
- *Cerebral edema*
 - May compress and kill brain tissue

Cerebrovascular Accident (CVA)

- Commonly called a *stroke*
- The result of a ruptured blood vessel
- Brain tissue supplied with oxygen from that blood source dies
- Loss of some functions or death may result

Alzheimer's Disease

- Progressive degenerative brain disease
- Mostly seen in the elderly, but may begin in middle age
- Structural changes in the brain due to abnormal proteins
- Symptoms: memory loss, irritability, confusion, ultimately hallucinations and death

Spinal Cord

- Extends from the medulla oblongata to L-1
 - Below is the *cauda equina*
- Enlargements in the *cervical* and *lumbar* regions

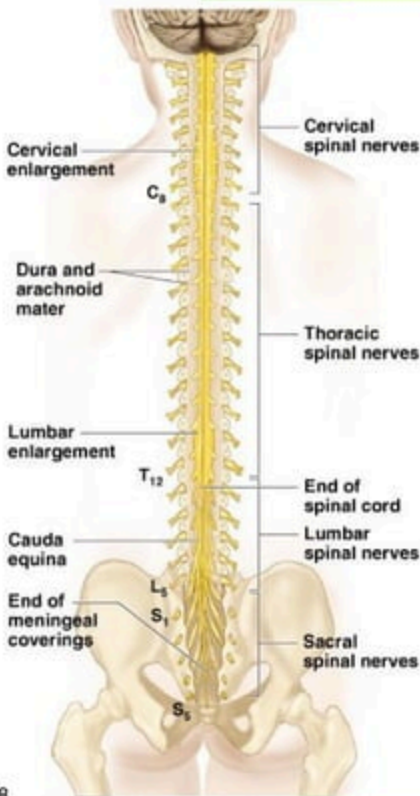


Figure 7.18

Spinal Cord Anatomy

- White matter – conduction tracts
 - Superficially located

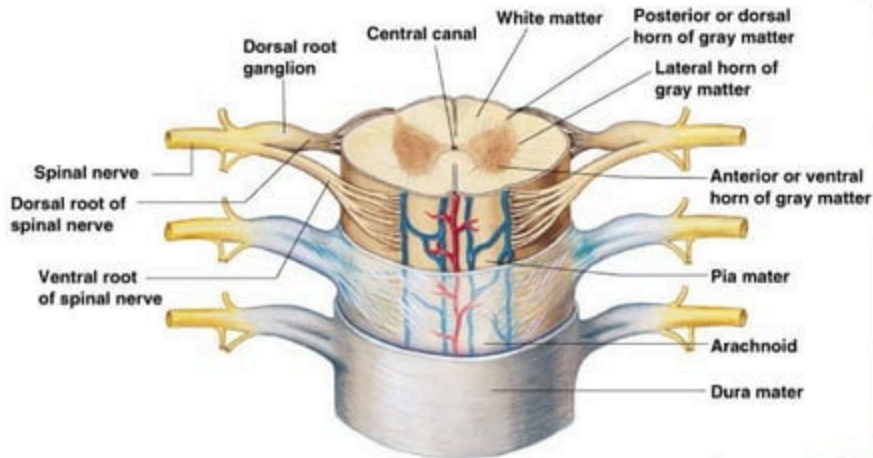


Figure 7.19

Spinal Cord Anatomy

- Gray matter - mostly cell bodies, deep
 - Dorsal (posterior) gray horns
 - Ventral (anterior) gray horns

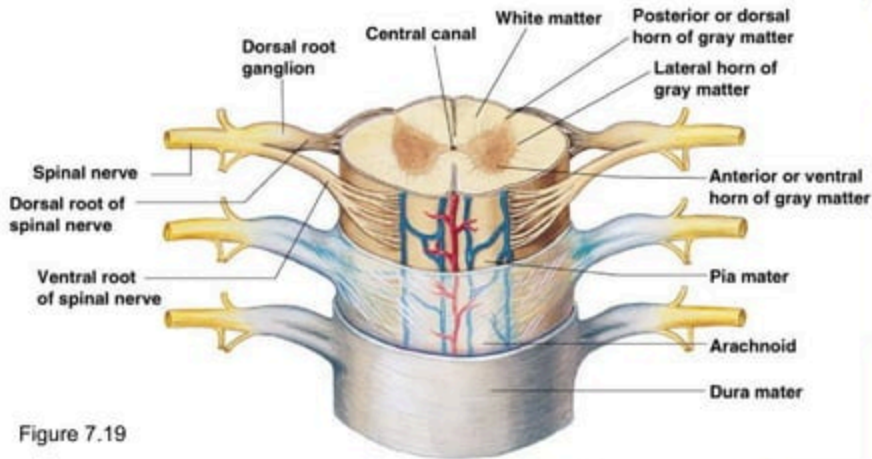


Figure 7.19

Spinal Cord Anatomy

- Central canal: holds cerebrospinal fluid

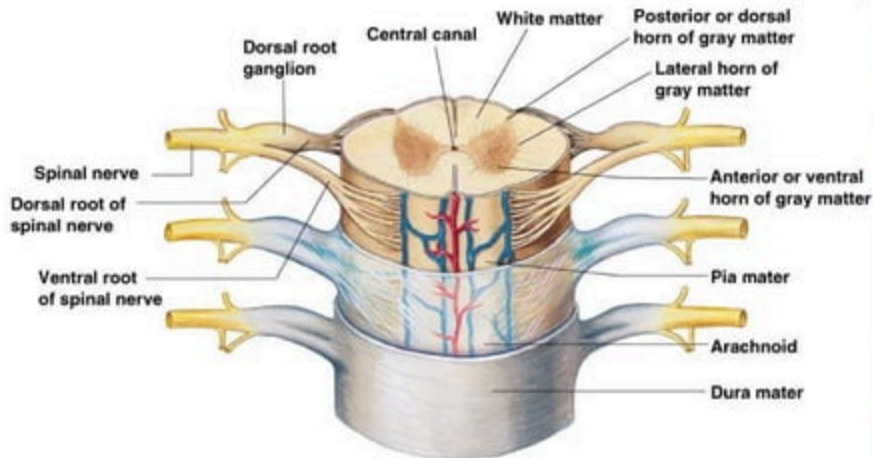


Figure 7.19

Spinal Cord Anatomy

- Meninges: same as brain
- Spinal Nerves attached to each spinal segment
 - Dorsal root: sensory
 - Associated with the *dorsal root ganglia*
 - Ventral root: motor

Peripheral Nervous System

- All structures outside CNS
- *Nerve* = bundle of neuron fibers (usually axons)
- Neuron fibers: bundled by connective tissue (like muscles)

Structure of a Nerve

- *Endoneurium* surrounds each fiber
- Groups of fibers are fascicles
 - Coverd by *perineurium*
- Fascicles bound by *epineurium*

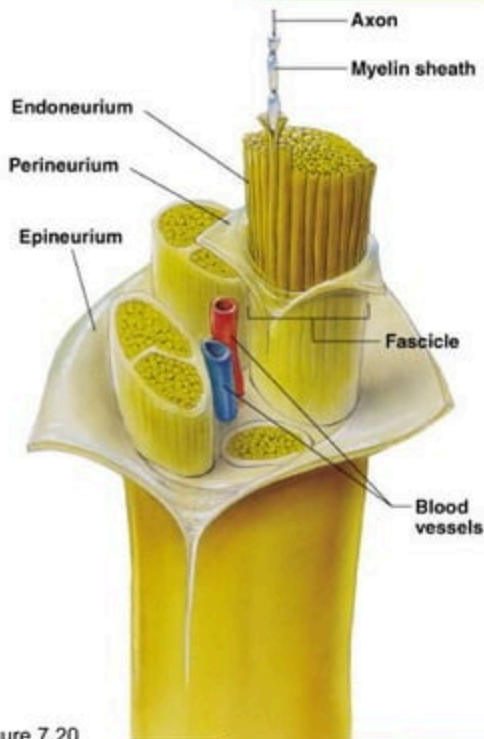


Figure 7.20

Nerves (PNS) vs. Tracts (CNS)

- *Tract*: a bundle of neuron fibers inside the CNS
 - Usually axons
 - Wrapped by CT
 - Continuation of “nerve” from PNS
 - Long tracts in spinal cord
 - Short tracts in brain

Classification of Peripheral Nerves

- *Mixed nerves* – both sensory and motor fibers
- *Afferent (sensory) nerves* – carry impulses toward the CNS
- *Efferent (motor) nerves* – carry impulses away from the CNS

Cranial Nerves

- Arise from brain
- 12 pairs of nerves
- Numbered in order, anterior to posterior
- Most are mixed nerves, but three are sensory only

Cranial Nerves

- **I** Olfactory nerve – sensory for smell
- **II** Optic nerve – sensory for vision
- **III** Oculomotor nerve – motor fibers to eye muscles
- **IV** Trochlear – motor fiber to eye muscles

Cranial Nerves

- **V** Trigeminal nerve – sensory for the face; motor fibers to chewing muscles
- **VI** Abducens nerve – motor fibers to eye muscles
- **VII** Facial nerve – sensory for taste; motor fibers to the face
- **VIII** Vestibulocochlear nerve – sensory for balance and hearing

Cranial Nerves

- **IX** Glossopharyngeal nerve – sensory for taste; motor fibers to the pharynx
- **X** Vagus nerves – sensory and motor fibers for pharynx, larynx, and viscera
- **XI** Accessory nerve – motor fibers to neck and upper back
- **XII** Hypoglossal nerve – motor fibers to tongue