

VENTRICLES AND CEREBROSPINAL FLUID

Production of CSF

Blood is supplied to the brain via the carotid arteries and the vertebral arteries. The carotid arteries pass through the skull at the carotid canal, and the vertebral arteries enter through the foramen magnum, the largest opening at the bottom of the skull. The arteries branch many times until they are so tiny they are microscopic and only one cell layer thick. They are now called capillaries. The **choroid plexuses** are capillaries located on the roof of each ventricle that filter the blood and allow the plasma to enter the ventricles, accumulating as cerebrospinal fluid. The red and white blood cells are too large and remain in the blood.

Cerebrospinal fluid is a clear liquid that gives buoyancy to brain so it doesn't crush under its own weight; it also provides protection and cushion for the brain.

Circulation of CSF

Two **lateral ventricles** (cavities within the brain) are separated by the **septum pellucidum**, a thin sheet of connective tissue. CSF enters the **third ventricle** via the **interventricular foramina**. CSF moves passes through the **cerebral aqueduct** on its way to the **fourth ventricle**. At this point, some leaves the brain and enters the **central canal** of the spinal cord; and some exits the fourth ventricle via **apertures** to circulate up and around the brain within the **subarachnoid space**.

Ependymal cells are ciliated cells that line the ventricles and circulate the fluid.

Return of CSF to the Blood Vessels

CSF in the subarachnoid space is able to reenter the venous circulation via the **superior sagittal sinus** (sinuses are cavities within the skull). Once the CSF is collected in the sinuses, it enters blood vessels that return blood to the heart. Specifically, it eventually drains into the jugular veins. These exit through the skull at the jugular foramen.

If CSF is blocked at any point, pressure can build up on the brain, causing swelling and eventual brain damage. Blockages most commonly occur due to the growth of tumors, or after trauma (such as a car accident). Hydrocephalus "water head" is the term for this condition. Infants' skull bones are not yet fully fused, so their entire head will expand if they have a blockage (in babies' cases, this is usually a result of a developmental abnormality, not a tumor). Surgical repair and a shunt (tube to drain the CSF) treat this problem.

Lumbar Puncture (spinal tap): A sampling of CSF taken for analysis, usually to check for brain infection (meningitis or encephalitis). CSF circulates down the central canal and then pools at the base of the spinal cord. This is a safe place to take the sample because the needle won't accidentally puncture the spinal cord. The spinal cord ends in the lumbar region of the spine, and the needle is usually inserted between the fourth and fifth lumbar vertebrae to withdraw the CSF. If the fluid is visibly cloudy (rather than clear), then an infection is clearly present.