

Traumatic Brain Injury and Cranial Bleeds

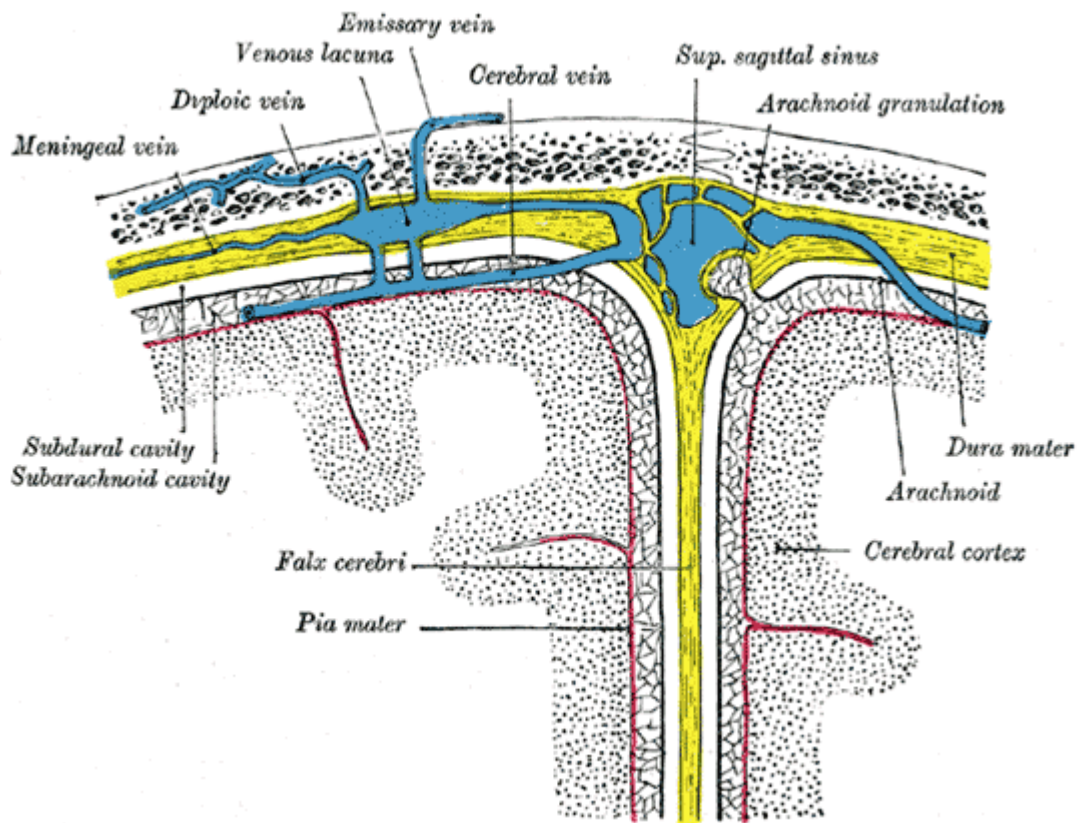
There are different types of hemorrhages that can occur in the central nervous system. We will discuss the four major types: epidural, subdural, subarachnoid and intracerebral hemorrhages.

Epidural Hemorrhages

Epidural hemorrhages occur between the dura mater and the skull and are usually very rapid because the hemorrhage comes from damage to the arteries along the inside of the skull. Recall looking at the skulls in lab and seeing the grooves where the arteries of the skull once ran. These arteries are under high-pressure vessels bleed rapidly when damaged. This bleeding results in a hematoma, which strips the dura membrane off the skull as it expands, causing intense headaches. More seriously is the compression of the nervous system as the hematoma expands against the skull. The most common cause of epidural bleeds is a skull fracture which lacerates these arteries. Epidural hemorrhages can be fatal if left untreated. Treatment is done by surgically draining or removing the hematoma to relieve pressure on the brain.

Subdural Hemorrhages

Subdural hemorrhages occur between the dura mater and the brain. These result from tears in the veins that cross the subdural space in response to a head injury, especially rotational or linear forces. Subdural hemorrhages are classic injuries found in shaken baby syndrome and severe whiplash. They are also more common in people taking aspirin since aspirin inhibits blood clotting. They can be subdivided into acute, subacute and chronic subdural hematomas depending on the severity of the hemorrhage. Acute hematomas develop rapidly and are the most severe with a mortality rate of 60 to 80%. Subacute hematomas fall into the same category although slightly less severe. Chronic subdural hematomas develop over a period of days to weeks and often result from minor head trauma (like a concussion). Symptoms of subdural hemorrhage typically have a slower onset than epidural bleeds because the bleeding comes from veins instead of arteries.



Layers and Veins Structure of the Cerebral Cortex. *Grays Anatomy: Public Domain*

To understand subdural hemorrhages better, it helps to examine the anatomy. Notice that veins from the brain cross the subarachnoid space and pierce both the arachnoid and dura mater to finally dump venous blood in the superior sagittal sinus. When whiplash, shaking or any type of rapid, intense linear motion occurs, the brain moves inside the skull. This type of movement will put tension on the veins where they pierce the arachnoid and dura mater membranes. The arachnoid membrane moves relatively easy compared to the dura mater. A shearing effect can occur where the vein is broken off just superior to the arachnoid membrane. Blood slowly starts to fill the space between the arachnoid mater and the dura mater.

Subarachnoid Hemorrhages

Subarachnoid hemorrhages occur in the area between the arachnoid membrane and the pia mater that surrounds the brain (remember this is where the cerebral spinal fluid is found). There are many arteries in the subarachnoid space as it is this space that blood vessels like the internal carotid arteries enter. The bleeding may occur by spontaneous rupture or as a result of head injury. The most common symptom is called the thunderclap headache, or one that develops immediately within seconds and feels like a kick in the head.

Intracerebral Hemorrhages

Intracerebral hemorrhages occur within the brain tissue itself and usually involve very small blood vessels. This type of hemorrhage may be caused by trauma or spontaneous rupture. Symptoms are associated with the functional area of the brain that is experiencing the trauma. Intracerebral hemorrhages are the second most common cause of stroke and the risk of experiencing this type of hemorrhage is increased by high blood pressure and diabetes.



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