Bridging vein

Veins, which drain the underlying neural tissue and puncture the dura mater, empty into these dural sinuses.

Importance

Acute subdural hematoma (ASDs) are caused by blood from hemorrhagic contusions and traumatic subarachnoid hemorrhage that extends to the subdural space due to tears of the arachnoid membrane. In other cases, ASDs are caused by rupture of bridging veins, which run between the surface of the brain and the skull and are especially numerous along the superior sagittal sinus.

Excessive movement of the brain causes rupture of these vessels, which are attached to the skull. Individuals with brain atrophy, in whom the bridging veins are stretched and there is more room for the brain to move, are especially prone to developing subdural hematoma. Such ASDs may occur with mild or trivial head trauma. The same thing may happen in patients with hydrocephalus, if the ventricles collapse rapidly after shunting. Less commonly, subdural hematomas result from rupture of arteries that accompany bridging veins.

A rupture of a bridging vein can cause a venous infarction.

Types

see Frontopolar vein

see Superior cerebral veins

see Inferior cerebral veins

see Superficial middle cerebral vein

see Vein of Labbé

see Vein of Trolard

The “Starling resistor,” which has been conserved across species, acts at the junction between cortical bridging veins that drain into the superior sagittal sinus, prevents siphoning of venous blood, and maintains ICP as we stand up.

Bridging vein in interhemispheric approach

Midline afferent veins enter into the superior sagittal sinus SSS. They are met during interhemispheric approaches. Seventy percent of sagittal venous drainage is evident within the sector four centimeters posterior to the coronal suture; it corresponds to the central group. Sacrifice of the midline central
group is risky. The sacrifice of the other midline veins, unless they are of large calibre, does not appear so hazardous.

If venous drainage is symmetrical, the non-dominant hemisphere is the optimal choice for a \textit{interhemispheric approach}; however, preservation of venous drainage overrides other considerations for placement of the \textit{craniotomy}.

\textbf{Bridging veins} arising from the frontal base (frontobasal bridging veins, FBBVs) can pose obstacles when performing clipping of \textit{anterior communicating artery aneurysms} via the \textit{pterional approach}. Although FBBVs can in general be sacrificed without critical complications to achieve an adequate retraction of the frontal lobe, neurosurgeons sometimes encounter postoperative venous infarction or contusion of the retracted \textit{frontal lobe}, which may be accounted for by the damage to the venous drainage system. Thus, preservation of \textit{intracranial veins} is desirable to prevent postoperative venous complications, especially when they are prominent \textsuperscript{1}.

\section*{Magnetic resonance venography}

\textbf{Magnetic resonance venography} can usually provide adequate visualization of the venous drainage for preoperative planning. Exposure of the interhemispheric region requires extending the craniotomy to the midline over the \textit{superior sagittal sinus}. To access the \textit{interhemispheric fissure}, removal of a bone flap up to the edge of the superior sagittal sinus can be followed by careful separation of the sinus from the inner table of the skull and then removal of the bone over the sinus.

Anatomy of the parasagittal bridging veins: regarding the numbers and diameters of the veins, we can separate cases with many bridging veins of small diameter from a group with few veins of a large diameter \textsuperscript{2}.

\section*{Indocyanine green videoangiogram}

In two patients, parasagittal meningiomas were found to be associated with paramedian veins that impeded complete removal of the tumors. The suitability of veins removal was assessed by applying a temporary aneurysm clip and performing an indocyanine green videoangiogram.

In one patient, stasis was observed in the vein. In the second patient, a collateral flow allowed the venous blood to drain. The former test was considered a counterindication for venous sacrifice, whereas the latter supported its feasibility. The vein was preserved in the former case and coagulated in the latter. In both cases, the patients did well.

Although this limited study cannot prove that venous congestion or infarction can be avoided with this technique, it does provide direct evidence of the presence or absence of collaterals that can help guide intraoperative surgical decision-making \textsuperscript{3}.

\cite{Ferroli2017} performed venous ICG videoangiography during 153 consecutive neurosurgical procedures. On those occasions in which a venous sacrifice occurred during surgery, whether that sacrifice was preplanned (intended) or unintended, venous ICG videoangiography was repeated so as to allow the study of the effect of venous sacrifice. A specific test to predict the presence of venous collateral circulation was also applied in 8 of these cases.

Venous ICG videoangiography allowed for an intraoperative real-time flow assessment of the exposed
veins with excellent image quality and resolution in all cases. The veins observed in this study were found to be extremely different with respect to flow dynamics and could be divided in 3 groups: 1) arterialized veins; 2) fast-draining veins with uniform filling and clear flow direction; and 3) slow-draining veins with nonuniform filling. Temporary clipping was found to be a simple and reversible way to test for the presence of potential anastomotic circulation.

Venous ICG videoangiography is able to reveal substantial variability in the venous flow dynamics. “Slow veins,” when they are tributaries of bridging veins, might hide a potential for anastomotic circulation that deserve further investigation.


