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ORIGINAL ARTICLE

External landmarks for identifying the drainage site of the vein of Labbé: application to neurosurgical procedures

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Abstract

Introduction. **The vein of Labbé is an important structure of the lateral cortical surface. However, to date, studies aimed at providing external landmarks for aiding in its identification have been scant. Therefore, the present study focussed on establishing reliable bony landmarks for localizing this deeper lying venous structure.** ***Materials and methods.*** **Fifteen adult cadavers (30 sides) underwent dissection of the lateral cortical brain surface with special attention given to the drainage site of the vein of Labbé into the transverse sinus. Measurements of the distance from this site to surrounding external bony landmarks were then made.** ***Results.*** **We found that this drainage site into the transverse sinus was 0.8–1.5 cm (mean 1.1 cm, SD 0.567) superior to the superior border of the zygomatic arch and 2 – 5 cm (mean 2.9 cm, SD 0.713) posterior to the opening of the external auditory meatus. Statistically, there was no significance between left and right sides or between sexes.** ***Conclusions.*** **We found that the junction between the vein of Labbé and transverse sinus may be variable. Nonetheless, additional landmarks found in this study for identifying the junction may aid in its earlier identification during surgery, potentially decreasing operative morbidity.**

Keywords: anatomy; neurosurgery; landmarks; cranial; venous system.

Introduction

The vein of Labbé (Charles Labbé 1851–1889), also known as the inferior anastomotic vein, plays an important role in the superficial cerebral venous system. This 2–3-mm diameter vessel unites the superficial middle cerebral vein with the transverse sinus and is one of the most important draining veins of the temporal and parietal regions.[1–3] Injury and damage to the vein of Labbé may lead to postoperative lobar venous infarction and associated morbidity.[1–4] Therefore, identifying and preserving this vessel during, for example, subtemporal approaches or tentorial division is important in avoiding iatrogenic injury such as avulsion or thrombosis with prolonged retraction.[1,5]

Positionally, Oka et al.[5] found the vein of Labbé at the level of the middle temporal vein in 12 specimens, the posterior temporal vein in 6, and the anterior temporal vein in 2. Gaillard[6] described the position of this vein as midtemporal in 60%, posterior temporal in 30% and anterior temporal in 10%. Bigelow et al.[7] acknowledged the variability of this vein as it may cross the temporal lobe as far back as the posterior limit of the lobe or as far forward as the anterior one-third of its lateral surface. In addition, some studies have identified more than one vein of Labbé per side.[2,8] Although Sood and colleagues[9] observed similar findings to Koperna et al.,[1] they observed size differences. By analyzing 47 epilepsy patients who underwent temporal lobe resection, Sindou et al.[3] found that 76.6% of patients had a dominant vein of Labbé. Of those who had a small vein of Labbé, the mean number of superficial lateral temporal veins was significantly greater, with 60% having three or more veins, compared to the mean number of superficial lateral temporal veins among the patients with a prominent vein of Labbé.[3] Finally, as noted in the study of Oka et al.[5] the veins of Labbé and Trolard show an inverse relationship to one another; if one predominates, the other vein is small or absent. The vein of Labbé has been found to be dominant on the left side in 42% and on the right side in 21% of patients, whereas the vein of Trolard has been found

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to be dominant on the left side in 24% and right side in 52% of patients.[6]

The aim of the present study was to identify reliable superficial landmarks for localizing the drainage site of the vein of Labbé with the hopes of decreasing surgical morbidity that may follow surgical procedures in this region.

Materials and methods

Fifteen (30 sides) adult (aged 49–88 years at death, mean 74 years) latex-injected fresh cadavers underwent dissection of the lateral cortical surface of the brain. These comprised 9 male and 6 female specimens. After removal of the calvaria with an oscillating bone saw, the dura mater was carefully removed over the cerebral hemispheres. Two distances were measured and all measurements were made with rulers and calipers (Fig. 1). The first measurement was the vertical distance from the upper edge of the zygomatic arch to the drainage site of the vein of Labbé. The second measurement was of the horizontal distance posterior to the opening of the external auditory meatus to the drainage site of the vein of Labbé. Statistical analysis between sides and genders was performed using Statistica for Window and significance was set at $P < 0.05$.

Results

The vein of Labbé drained into the transverse sinus on all sides. One right side had three tributaries of this vein and the most anterior of these was used for measurements. The drainage site of the vein of Labbé was found to lie 0.8–1.5 cm (mean 1.1 cm, SD 0.567) superior to the zygomatic arch, and 2–5 cm (mean 2.9 cm, SD 0.713) posterior to the opening of the external auditory meatus. Statistically, no difference was found between left or right sides or between sexes ($P = 0.563$ and $P = 0.679$, respectively). No intracranial pathology or anomaly was noted in any specimen.

Discussion

Koperna et al.[1] found that the vein of Labbé may frequently drain into a tentorial sinus; however, this was not observed in the current study where all veins drained into the transverse sinus. Some of this discrepancy may be explained by the definition of a tentorial sinus as used by these prior authors. Han et al.[8] found that the average diameter of the vein of Labbé was 2.8 mm and that 74% drained into the transverse sinus directly. However, 8% travelled through the tentorial sinuses before entering the transverse sinus, and 9 and 8%

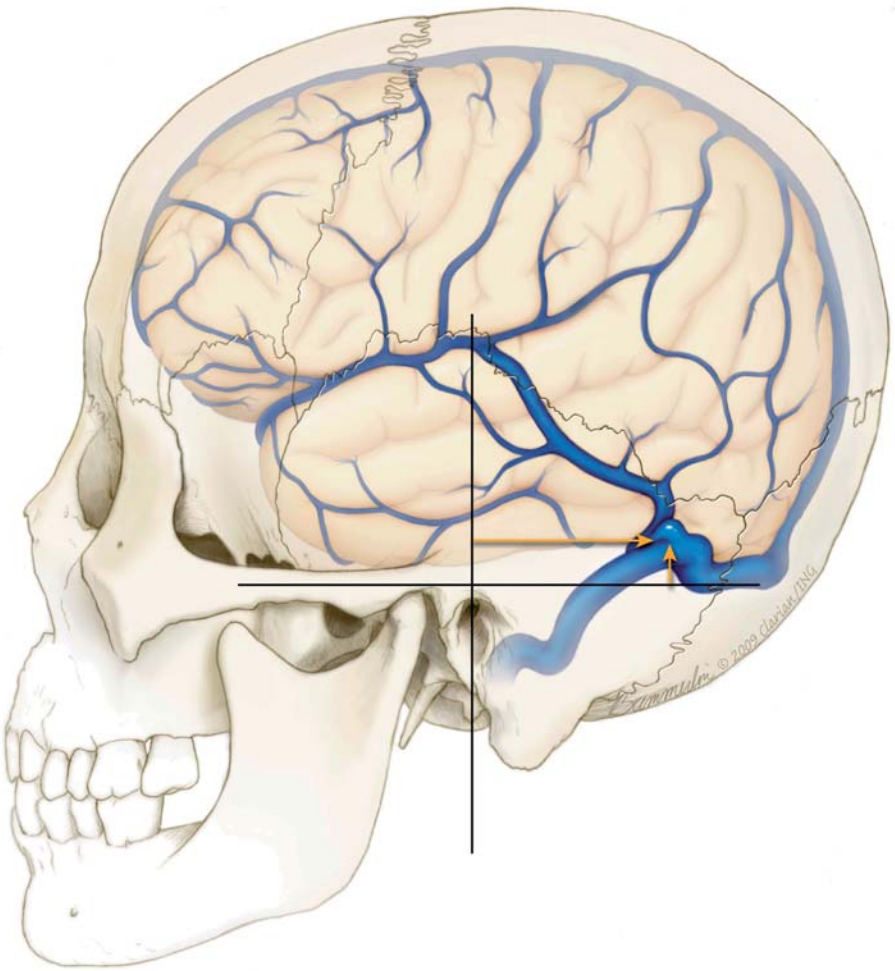

Fig. 1. Schematic drawing of the measurements made in the current study between the external auditory meatus and zygomatic arch, 152 × 169 mm (300 × 300 DPI).

drained into the meningeal vein of the occipital dura and petrosal sinus, respectively. Again, such drainage sites were not observed in our specimens.

In regard to the drainage site of the vein, Koperna et al.[1] observed a distance of at least 7 mm between the junctions of the vein of Labbé and superior petrosal sinus into the transverse sinus. In a study of 40 temporal lobe specimens, Guppy et al.[10] discovered three basic venous configurations of the vein of Labbé: (1) multiple veins forming a single draining vein; (2) multiple veins that drain independently; and (3) a venous lake that drains from the tentorium cerebelli. As mentioned above, other studies have shown that the vein of Labbé may on occasion join the tentorial sinus.[2]

Localizing important cerebral venous structures via superficial landmarks is important to the neurosurgeon. In a previous cadaveric study regarding the superficial temporal artery, we found that the distance between the parietal branch of this vessel at the level of the tentorium and the entrance of the vein of Labbé into the transverse sinus ranged from 4 to 5.5 cm (mean 4.8 cm).[11] Because the vein of Labbé and its drainage site are of special significance in the subtemporal approach, a great deal of care, through optimal surgical routes and modifications, is needed to avoid exposing this vein to injury. In the current study, this venous drainage site was compared to easily identifiable superficial bony landmarks. The site was roughly 1 cm superior to the zygomatic arch and 3–4 cm posterior to the opening of the external auditory meatus. Bony exposure and dural opening in this region should preserve the drainage site the vein of Labbé into the transverse sinus. Burr holes should be placed in this region with caution, and the dura should be stripped away from the inner aspect of the skull before completing the craniotomy. The dural opening should commence away from this region, and dural incision should be tailored to leave a piece of dura over the junction to avoid inadvertent venous injury. This piece of dura, left over the junction, may protect the junction during subtemporal approaches when the entry of the vein of Labbé into the transverse sinus may be placed under tension due to overly vigorous retraction of the temporal lobe.[7] Gaillard[6] suggested that preservation of this vein may require leaving some cortical tissue behind during temporal lobectomy. Based on our findings, blind dural opening over the area 3–4 cm posterior to the external auditory canal should be avoided.

In regard to the site of drainage of the vein of Labbé, Day et al.[12] found that a line drawn from the zygoma root to the inion reliably located the rostrocaudal level of the transverse sinus in all specimens. Although the asterion did not consistently fall on this line, the transverse-sigmoid junction could reliably be placed at the anteroposterior level of the asterion.

Noteworthy, even though there is much literature supporting the preservation of the vein of Labbé, Sood et al.[9] found no statistical significance between patients undergoing epilepsy surgery who had their vein of Labbé sacrificed and those who had their vein preserved. This may be explained by the fact that since a large portion of the temporal lobe was excised during surgery, venous infarction of this area was, therefore, inconsequential. In addition, there was no significant difference in surgical outcomes between the two groups.[9] Regardless, an improved knowledge of the drainage site of this vessel may assist the surgeon in avoiding iatrogenic injury to this venous structure.

Conclusions

Additional external landmarks for identifying important structures such as the vein of Labbé and its entrance into the transverse sinus may aid the neurosurgeon during operative interventions. Our hopes are that the simple superficial landmarks used in the present study will be useful in localizing the drainage site for this vein early in the operation and minimize its risk of injury. Although in an era where neuronavigation or CT venograms or angiograms can easily pinpoint such anatomic locations, institutions where such technology is not readily available may benefit from the landmarks outlined herein.

Declaration of interest: The authors report no conflicts of interest and the authors alone are responsible for the content and writing of the article.

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