Significance of preserving the vein of Labbé in epilepsy surgery involving temporal lobe resection

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Object. Preservation of the vein of Labbé is recommended to prevent temporal lobe infarction after skull base surgery. However, the importance of preserving the vein in epilepsy surgery involving resection of the temporal lobe is unclear.

Methods. Retrospective analysis was performed in 47 cases, in which patients underwent temporal lobe resection, out of 148 cases in which patients underwent surgery for intractable seizures over a 5-year period. Standard temporal lobe resection anterior to the vein of Labbé was performed in 11 patients. In 24 patients, the temporal lobe resection extended posterior to the vein of Labbé; the vein was preserved in eight patients, who underwent surgery prior to 2002, and resected in the other 16 patients, who underwent surgery after 2002. Twelve patients underwent a temporoparietooccipital resection.

There was no significant difference in the pattern of venous anatomy (based on analysis of the relative size of veins [chi-square test, \(p = 0.1\]) and the number of superficial veins draining the temporal lobe [\(p = 1\]) in patients in whom the vein was resected compared with those in whom it was preserved. No patient experienced postoperative infarction.

Conclusions. The authors conclude that the vein of Labbé may be safely resected in epilepsy surgery involving temporal lobe resection. The decision whether to resect the vein need not be based on the surface venous drainage pattern or number of veins draining the temporal lobe.

Key Words • vein of Labbé • epilepsy surgery • temporal lobectomy • pediatric neurosurgery

Serious consequences of injury to the vein of Labbé during skull base surgery have established the importance of preserving the vein. However, the relevance of preserving the vein during epilepsy surgery involving temporal lobe resection has not been previously addressed. In children with epilepsy, it is not unusual to find that the epileptogenic cortex extends behind the vein of Labbé. In these cases, a bridge of cortex around the vein is generally preserved. The purpose of this article is to present data from our own experience with regard to the importance of preserving the vein of Labbé.

Clinical Material and Methods

Patient Population

Over a 5-year period between 2000 and 2004, 148 patients underwent epilepsy surgery for intractable seizures at Children’s Hospital of Michigan. In 47 of these patients, the surgery involved temporal lobe resection. This group comprised 36 boys and 11 girls, with a mean age of 8.4 ± 5 years (± standard deviation, range 4 months–20 years).

The standard preoperative examinations included MR imaging, positron emission tomography, and video-encephalographic monitoring. Thirty-seven patients underwent a two-stage surgical procedure, with subdural grid placement for intracranial encephalographic monitoring and functional brain mapping prior to resection, and in 10 patients single-stage intraoperative electrocorticography and resection were performed. The operative procedure generally involved a large craniotomy extending to the midline and allowing good visualization of the frontal, parietal, and temporoparietooccipital regions.

Since 2002, all of the epilepsy surgeries that we performed via temporal lobe approaches were transsylvian resections, and in each case, the vein of Labbé was included in the resection extending behind the vein. The sylvian vein and its anterior drainage were preserved. Of the 47 patients involved, 11 underwent standard temporal lobectomy, 24 underwent extended temporal lobectomy, and 12 underwent temporoparietooccipital resection. In patients who had surgery prior to 2002, our approach was conservative, and the vein of Labbé was skeletonized for resections extending behind it.

Twenty-eight patients had nonlesional epilepsy (nondiagnostic MR imaging); histopathological examination of biopsy specimens from these patients revealed gliosis in 22 cases, dysplasia in four, dysgenesis in one, and heterotopia in one case.
in one. Nineteen patients had lesional epilepsy, including 10 with tuberous sclerosis, seven with dysembryoplastic neuroepithelial tumor, one with ganglioglioma, and one with cavernous angioma.

Follow-up MR images of the head were obtained in all patients, with studies performed at a mean interval of 7.2 ± 7 months (mean ± standard deviation) after resection.

Classification of Venous Anatomy

We analyzed intraoperative photographs from all 47 cases and classified the superficial venous anatomy, based on the relative prominence of the vein of Labbé, as follows: Type A1, prominent veins of Labbé and Trolard and a prominent sylvian vein; Type A2, prominent vein of Labbé and prominent sylvian vein with a poorly developed vein of Trolard; Type A3, prominent veins of Labbé and Trolard and poorly developed sylvian vein; Type B, poorly developed vein of Labbé (Fig. 1). The drainage pattern of the temporal base veins was not included in this classification.

The number of superficial veins draining the lateral temporal lobe and traversing the cortical gyri was recorded as one, two, or three or more.

Statistical Analysis

The chi-square test was used to compare findings in patients in whom the vein of Labbé was resected with findings in those in whom the vein was preserved, with regard to venous anatomy, number of superficial temporal lobe veins, and type of surgery.

Results

Venous Anatomy

Our analysis showed that the vein of Labbé was prominent in 36 (76.6%) of 47 patients. In 13 (36.1%) of these 36 patients, the sylvian vein and the vein of Trolard were prominent as well, and these patients were therefore considered to have Type A1 venous anatomy. In 22 (61.1%) of these 36, the sylvian vein was prominent but the vein of Trolard was poorly developed, making this type of venous anatomy, Type A2, the most common in our cases (Fig. 1). Only one (2.7%) of these 36 patients had a small sylvian vein and was thus classified as having Type A3 venous anatomy.

Eleven (23.4%) of the 47 patients in our study population had a small vein of Labbé (Type B venous anatomy). The mean number of superficial lateral temporal veins in this group was significantly greater (p < 0.001, chi-square test) than the mean number of superficial lateral temporal veins in patients with a prominent vein of Labbé. Six of the 11 patients with a small vein of Labbé had at least three superficial lateral temporal veins.

The vein of Labbé was preserved in all 11 patients who underwent a standard temporal lobectomy. All of these patients had a prominent vein of Labbé, which marked the posterior limit of resection. Extended temporal lobectomy, in which the resection extends behind the vein of Labbé, was performed in 24 patients. Twenty of these had a prominent vein of Labbé. There were no significant between-group differences in the superficial venous drainage pattern (p = 1, chi-square test; Table 1).

The vein of Labbé was resected in 16 patients who underwent extended temporal resection after 2002. In half of these patients, the vein of Labbé was prominent. Findings in these patients were compared with those in eight patients who underwent surgery prior to 2002 and in whom the vein was preserved. There was no significant difference in the proportion of patients who had a prominent vein of Labbé in these two groups (p = 0.1, chi-square test; Table 2).

In nine of the 16 patients in whom the vein of Labbé was resected, there was only one vein on the lateral surface of the temporal lobe. In terms of the number of veins on the lateral surface of the temporal lobe, there was no significant difference between those patients in whom the vein of Labbé had been resected and those in whom the vein had been preserved (p = 1, chi-square test; Table 3).

Surgical Outcome

At a mean follow up of 2.2 years postoperatively, outcome was classified as Engel Class I or II— that is, complete seizure control or only rare seizures—in 66% of cas-

![Fig. 1. Intraoperative photographs illustrating classification of superficial venous anatomy. A: Prominent veins of Labbé and Trolard and sylvian veins (Type A1). B: Vein of Trolard poorly developed (Type A2). C: Poorly developed sylvian vein (Type A3). D: Small vein of Labbé (Type B). Abbreviations: L = vein of Labbé; S = sylvian vein; T = vein of Trolard.](image)

### TABLE 1

<table>
<thead>
<tr>
<th>Type A, Prominent VOL</th>
<th>Type B, Small VOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor (no. of patients)</td>
<td>A1, Prominent VOL &amp; SV</td>
</tr>
<tr>
<td>no. of patients lobectomy type (no. of ops)</td>
<td>12</td>
</tr>
<tr>
<td>standard temp (11)</td>
<td>5</td>
</tr>
<tr>
<td>extended temp (24)</td>
<td>7</td>
</tr>
</tbody>
</table>

* No statistically significant difference was observed (p = 1). Abbreviations: SV = sylvian vein; temp = temporal; VOL = vein of Labbé; VOT = vein of Trolard.
According to Bartels and found three types It is, in fact, the “smaller rudimentary vein” that Seventy percent of our patients had a single The rect communication as the smaller vein of Labbé, or cerebral vein as the vein of Labbé and the smaller indi-

size of these veins is noticeably increased in the absence of the vein of Trolard. His second major observation was that the vein of Trolard and the sylvian veins and draining into the lateral sinus. He also noted a less frequently found indirect connection between the superior sagittal sinus and the lateral sinus, or temporal lobe in 80% of the cadavers. The greater part of the medial, anteroinferior, and posteroinferior regional drainage was present in 90%, and in 90% of those it drained through the lateral complex. The medial complex was present in 40% of the cadavers, and in 90% of those it drained through the lateral complex. The lateral complex that incorporates the vein of Labbé not only provides regional drainage for the lateral temporal lobe, but also provides the final common drainage pathway for the greater part of the medial, anteroinferior, and posteroinferior temporal lobe in 80% of the cadavers.

During surgery in which the temporal lobe is to be preserved, it is reasonable to maintain the integrity of the lateral complex veins to prevent edema, infarction, or hemorrhage. This observation has been reiterated numerous times in the literature pertaining to skull base surgery. It is generally presumed that the practice should also hold true for surgical procedures involving temporal lobe resection, including epilepsy surgery. In fact, most neurosurgical textbooks warn surgeons not to handle the vein of Labbé, even when performing a procedure that involves resection of the temporal lobe. There is no experimental literature to support this view, however, and our experience reviewed in this paper does not support it either.

**Discussion**

The vein of Labbé was first described by Charles Labbé, who, as a 3rd-year student at the Medical Faculty of Paris, became interested in the development of Pacchionian granulations and the venous sinuses. According to Bartels and van Overbeeke, Labbé made two important observations in his report published in 1879.

First, he described a vein behind the vein of Trolard, acting as a direct anastomotic channel between the superior and lateral sinuses. He called this vein the great anastomotic posterior cerebral vein, in contrast to the anterior anastomotic vein of Trolard that had been reported previously. He also noted a less frequently found indirect connection between the superior sagittal sinus and the lateral sinus, through a rudimentary vein arising from the junction of the vein of Trolard and the sylvian veins and draining into the lateral sinus. His second major observation was that the size of these veins is noticeably increased in the absence of the vein of Trolard.

In 1964, Gillot referred to the great anastomotic posterior or cerebral vein as the vein of Labbé and the smaller indirect communication as the smaller vein of Labbé, but in more recent literature, the term “vein of Labbé” has been used to refer to the largest channel that crosses the temporal lobe between the sylvian fissure and the transverse sinus. This is, in fact, the “smaller rudimentary vein” that was described by Labbé as an indirect, less frequently present structure arising from the junction of the vein of Trolard and the sylvian veins and draining into the lateral sinus. In this paper, and in our classification, we have therefore used the term “vein of Labbé” to refer to this superficial vein on the lateral surface of the temporal lobe and not to the basal venous complex draining the temporal lobe. Whether a superficial vein on the lateral surface of the temporal lobe can be resected should not, we believe, depend upon how it drains into the lateral sinus—that is, through multiple channels, as a single conglomerate of veins, or as a venous lake. Hence, we have not included the anatomy of the temporal basal veins in our classification or decision making.

The vein of Labbé is reported to be present in 25 to 97% of cases, but its location is highly variable. In approximately 60% of cases, the vein is in the middle temporal area; in 30%, posterior; and in 10%, more anterior. The termination of the vein, in the basal veins and lateral sinus, is just as variable. Guppy and colleagues found three types of variation: 1) multiple venous drainage complexes forming a single vein before termination, 2) multiple venous drainage complexes/veins entering independently, and 3) a venous lake. In a study of 21 cadavers, they identified four major routes of venous drainage in the temporal lobe. A lateral complex was present in 100% of the cadavers; an anteroinferior complex was present in 70%, and in 40% of those it drained through the lateral complex into the sinus. A medial complex was present in 40% of the cadavers, and in 90% of those it drained through the lateral complex. Posteriorinferior regional drainage was present in 90%, and in 60% of those it drained through the lateral complex. The lateral complex that incorporates the vein of Labbé not only provides regional drainage for the lateral temporal lobe, but also provides the final common drainage pathway for the greater part of the medial, anteroinferior, and posteroinferior or temporal lobe in 80% of the cadavers.

**Conclusions**

The drainage patterns of the vein of Labbé found in this study were similar to those previously reported in cadaveric studies. Seventy percent of our patients had a single large vein of Labbé, and 66% of these had a small vein of Trolard. Among the 25% who had a small vein of Labbé, a significantly greater number of patients had a greater number of superficial lateral temporal veins, with 60% having
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three or more veins. There was no significant difference in
the pattern of venous drainage or the number of superficial
veins draining the lateral temporal lobe between the patients
who underwent surgery that preserved the vein of Labbé
and those in whom the vein was resected. Because none of
the patients in the latter group were found to have any im-
mediate or long-term consequences of resection of the vein,
we conclude that it may be safe to resect the vein of Labbé
in patients undergoing extended temporal lobe resection for
epilepsy treatment. Although it could be argued that there is
no advantage to including the vein of Labbé in the resection,
it certainly makes the surgery easier and removes the psy-
chological barrier to proceeding behind the vein of Labbé
that may prevent adequate resection of epileptogenic foci.

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