Microsurgical Anatomy of the Interfascial Vein. Its Significance in the Interfascial Dissection of the Pterional Approach

BACKGROUND: The pterional approach (PA), together with its variants, is still one of the most common methods used by surgeons to reach the anterior and middle cranial base. A highly important technical detail during a PA is the preservation of the frontotemporal branch of the facial nerve, which can be achieved through an interfascial dissection.

OBJECTIVE: To describe the anatomy of the interfascial vein (IFV), highlighting its recognition as a significant anatomic reference to perform an interfascial dissection (IFD).

METHODS: Eight adult cadaveric heads, fixed with formaldehyde and injected with colored silicone, were studied. In 6 heads, an IFD was performed, simulating a PA. In the 2 remaining heads, the IFV was dissected. In addition, an IFD was performed in 10 patients, studying the IFV anatomy.

RESULTS: In the 6 cadaveric heads in which the PA with an IFD was performed, and in the 10 patients who underwent a PA with an IFD, the IFV was found. If the interfascial space is divided into thirds, in all cases, the IFV was located within the middle third of the interfascial fat pad. On the 2 cadaveric heads in which the IFV was anatomically dissected, the IFV was also located within the middle third of the interfascial space.

CONCLUSION: Recognizing the IFV in the interfascial space is of great help as an anatomic landmark to confirm that one is actually between both layers of the superficial temporal fascia.

KEY WORDS: Pterional approach, Interfascial dissection, Facial nerve, Interfascial vein

ABBREVIATIONS: FTB, frontotemporal branch; IFD, interfascial dissection; IFV, interfascial vein; PA, pterional approach

The pterional approach (PA), described by Yasargil more than 30 yr ago, together with its variants, is still one of the most common methods used by surgeons to reach the circle of Willis, the supra- and parasellar regions, the anterior and middle cranial fossae, the mesial temporal lobe, and the insular lobe. A highly important technical detail during a PA is the preservation of the frontotemporal branch (FTB) of the facial nerve, which can be achieved through an interfascial dissection (IFD). There are 3 fat pads in the anterior temporal region: (1) the subgaleal fat pad (between the galea and the external layer of the superficial temporal fascia; the FTB courses within this plane); (2) the interfascial fat pad (between the external and internal layers of the superficial temporal fascia); and (3) the subfascial fat pad (between the internal layer of the superficial temporal fascia and the temporalis muscle itself). It is important to highlight that the interfascial fat pad is not present on all the external surface of the temporalis muscle, but only on its anterior fourth, from approximately 4 cm behind the orbital rim. It is at that level that the IFD should be started.

Even though IFD was described many years ago, it still involves a certain degree of difficulty to perform, and it continues to be discussed in publications. A potential problem during IFD is the confusion of the subgaleal fat pad with the interfascial fat pad, thus bringing the dissection to the plane where the facial nerve branches are located. The interfascial vein (IFV) is always located in the interfascial space; thus, its recognition is a good anatomic landmark to perform a correct IFD.
The aim of the present study is to describe the anatomy of the IFV, highlighting its recognition as a highly significant anatomic reference to perform an IFD.

METHODS

Eight adult cadaveric heads, fixed with formaldehyde and injected with colored silicone, were studied (a total of 16 sides). In 6 heads (12 approaches), an IFD was performed, simulating a PA. In the 2 remaining heads (4 sides), the IFV was dissected until its junction with the superficial temporal vein. In addition, in 10 patients who had undergone a PA, an IFD was performed to study the IFV anatomy. Five patients were operated for anterior circulation aneurysms, 2 for tuberculum sellae meningiomas, 1 for macroadenoma, 1 for craniopharyngioma, and 1 for cavernoma of the mesial temporal region.

In all dissections, we divided the interfascial space (from the superior temporal line until the zygomatic arch) into thirds, studying in which sector the IFV was located (Figures 1C and 2A).

RESULTS

In the 6 cadaveric heads (12 sides) in which the PA with an IFD was performed, and in the 10 patients who underwent a PA with an IFD, the IFV was found within the interfascial fat pad (between the external and internal layers of the superficial temporal fascia; Figures 2-4). The interfascial space is located in the anterior fourth of the outer surface of the temporal muscle and distributed from the superior temporal line to the zygomatic arch. Regarding its location, if the interfascial space is divided into thirds (from the superior temporal line superiorly to the zygomatic arch inferiorly), in all cases the IFV was found in the middle third (Figures 1C and 2A). Also, it was observed that the IFV is oblique in its course within the interfascial space, going dorsally and caudally. Of the 10 patients operated on with a PA, no palsy of the FTB was observed in the postoperative follow-up.

On the 2 cadaveric heads (4 sides), in which the IFV was anatomically dissected, the same oblique course was observed, coursing through the interfascial space until reaching the superficial temporal vein, just ventral and cranial to the tragus (Figure 1). Also in these cases, the IFV was located in the middle third of the interfascial space. Measurements showed that the angle of the IFV was located 4.3 mm from the superior temporal line and 2.5 mm from the zygomatic arch (Figure 3E).

DISCUSSION

The PA and its variants (transzygomatic and orbitozygomatic approaches) have been designed in order to reach a wide variety of vascular and tumor lesions located in the anterior and middle cranial fossae. Because these pathways reach the skull via its anterolateral sector, it is essential to dissect and liberate the temporalis muscle. From an anatomic point of view, the most superior and posterior branch of the facial nerve in this sector is the FTB, which courses toward the frontalis muscle in order to raise the
**Figure 1.** Step-by-step anatomic dissection of the IFV. A. Subgaleal dissection: it can be observed that the IFV is in a deeper plane to the external layer of the superficial temporal fascia. B. The external layer of the superficial temporal fascia has been removed; the interfascial fat pad and the IFV are observed. C. The superficial temporal fascia has been removed behind the interfascial space, and it is observed that the IFV is a branch of the superficial temporal vein. We can also observe that the IFV is located in the middle third of the interfascial space. IF, interfascial; IFV, interfascial vein; Sup., superficial; STF, superficial temporal fascia; Temp., temporal; V., vein.

**Figure 2.** The first steps of the PA. A. The interfascial space (from the superior temporal line to the zygomatic arch) has been divided into thirds, and the IFV is observed to be located in the middle third. B. The IFV has been cut simulating a surgery in order to expose the orbital rim. IF, interfascial; IFV, interfascial vein; STF, superficial temporal fascia.

**Figure 3.** Step-by-step PA. A. Incision. B. Subgaleal dissection. The superior temporal artery has been exposed. C. IFD. The IFV has been exposed. D. The IFV has been cut, exposing the orbital rim. E. Enlarged vision of the IFD. Distance A: between the IFV angle (star) and the superior temporal line. Distance B: between the IFV angle (star) and the zygomatic arch. A., artery; IF, interfascial; IFV, interfascial vein; Sup., superficial; STF, superficial temporal fascia; Temp., temporal.

eyebrow. This branch courses within the subgaleal space approximately 2 to 3 cm behind the orbital rim. Therefore, for its anatomic and functional preservation, it is necessary to perform the dissection deeply in relation to the subgaleal plane. A purely subgaleal dissection may produce palsy of the frontalis muscle in approximately 30% of cases. Thus, there are 3 ways to preserve the FTB: (1) myocutaneous flap, (2) subfascial dissection, and (3) IFD. The myocutaneous flap consists of mobilization of the soft parts of the approach (skin, subcutaneous tissue, and temporalis muscle with its fascias) in only 1 plane; this technique virtually eliminates risk of FTB nerve injury, but at the expense of exposure, as the bulge produced by the temporalis muscle usually blocks visualization through the sphenoid rim. The subfascial technique involves making the dissection deeply into both layers of the superficial temporal fascia, between the internal layer of the superficial temporal fascia and the temporalis muscle itself. This technique is also good to eliminate the risk of FTB injury, but...
subperiosteal exposure of the zygomatic arch and the orbital rim is more difficult than the IFD.

The IFD consists of incising the external layer of the superficial temporal fascia together with the interfascial fat pad, and of bringing both elements rostrally; thus, dissection is performed in a deeper plane, where the FTB is located, preventing its damage. In order to carry out this technique, it is necessary to recognize, coagulate, and cut the IFV. The IFV, first described by Yasargil in 1984, runs through the interfascial space, then descends through the subgaleal space, draining into the superficial temporal vein just superior and ventral to the tragus.

The authors consider that recognizing the IFV in the interfascial fat space may serve as a helpful anatomic landmark for the surgeon to confirm that the IFD is being correctly performed. In the case of the subfascial dissection, the IFV also should be coagulated and incised, but posterior to the interfascial fat pad, in the subfascial space.

**CONCLUSION**

Recognizing the IFV in the interfascial space is of great help to confirm that one is actually in the fat pad located between both layers of the superficial temporal fascia. It is necessary to coagulate and cut the IFV in order to rostrally mobilize the soft part of the approach toward the orbital rim.

**Disclosure**

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

**REFERENCES**

COMMENT

The authors elegantly describe and illustrate a basic but very important landmark for the safe execution of the interfascial dissection of the temporalis muscle. The most common mistake leading to injury of the frontal branch of the facial nerve is misidentification of the correct layer. If an excessively deep dissection is readily identified when the fibers of the temporalis muscle are exposed, an excessively superficial dissection can easily go unrecognized. The subgaleal fat pad is always present and can be quite prominent in certain individuals to the point of being confused with the interfascial fat pad. Identification of the interfascial vein remains the most reliable landmark to identify the correct layer and allow the interfascial dissection to proceed safely.

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