The frontal branch of the facial nerve has been extensively studied in the past.1-6 Historically, there has been quite a bit of interest with regard to aesthetic procedures, especially the relationship with the zygomatic arch.7-9 It is at this juncture that the nerve passes from the deep tissue plane to the more superficial. There is dense tissue directly over the arch, and care has been taken to map out the typical route of the nerve. There is, however, another concern, not limited to aesthetic procedures, regarding the three-dimensional position of the nerve and its relationship with the typical elevation plane. Many cranial approaches use a bicoronal incision and thus place the nerve at risk. The relationship with the typical elevation plane has often been described in 2 dimensions, except for the area over the zygomatic arch.8,10,11 Anatomic dissections and the clinical experience with the frontal branch of the facial nerve are well outlined over the zygomatic arch.

Over the past decade, there has been increasing interest in various modifications of aesthetic procedures and also craniofacial approaches. Most notably, the use of endoscopic approaches has become well entrenched in the surgical armamentarium. The surgical experience with bicoronal incisions has led to the observation that there is a second area of interest regarding the risk of injury to the frontal branch of the facial nerve. The transition plane between the area over the temporalis muscle and the pericranial region exhibits an area of interest for potential injury. With this in mind, an anatomic study with fresh frozen cadavers was undertaken to further define this area.

**MATERIALS AND METHODS**

A prospective study of 10 fresh frozen cadaver halves was performed. The dissections were carried out by use of a standard surgical bicoronal approach with surgical instrumentation, and under loupe magnification × 2.5. The standard bicoronal incision was made in each instance. Care was taken to dissect deep to the loose areolar tissue overlying the deep temporal fascia. The nerve was cephalad to the sentinel vein in each instance, and the tissue was freely dissected medial and lateral to the fusion point of the galea and the temporal fascia. The fusion plane was dense and in a direct line in the vertical direction with the loose areolar plane on either side.

**CONCLUSION:** The dense tissue within the galeal temporal region needs to be approached with caution, avoiding electrocautery and using sharp dissection. The cadaver study demonstrates the close proximity of the nerve in the deeper portion of the elevated superficial flap. (Aesthetic Surg J 2008;28:143–146.)

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**BACKGROUND:** Risks to the frontal branch of the facial nerve, especially at the juncture of the zygomatic arch, have been well studied in connection with aesthetic procedures. The use of bicoronal incisions led to the observation that there is a second area in which injury to the frontal branch of the facial nerve is at risk: the transition plane between the area over the temporalis muscle and the pericranial region.

**OBJECTIVE:** A study was conducted to map out the frontal branch of the facial nerve as it passes through the dense galeal temporal fascia, because this is a zone of potential injury.

**METHODS:** Ten fresh frozen cadaver halves were dissected by use of a standard surgical bicoronal approach with surgical instrumentation and loupe magnification × 2.5.

**RESULTS:** In the area of interest, which included the region overlying the zygomatic arch, as well as the galeal frontalis fusion point, the nerve was found to be deep and within the fusion point. The nerve was cephalad to the sentinel vein in each instance, and the tissue was freely dissected medial and lateral to the fusion point of the galea and the temporal fascia. The fusion plane was dense and in a direct line in the vertical direction with the loose areolar plane on either side.

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There is, however, another concern, not limited to aesthetic procedures, regarding the three-dimensional position of the nerve and its relationship with the typical elevation plane. Many cranial approaches use a bicoronal incision and thus place the nerve at risk. The relationship with the typical elevation plane has often been described in 2 dimensions, except for the area over the zygomatic arch.8,10,11 Anatomic dissections and the clinical experience with the frontal branch of the facial nerve are well outlined over the zygomatic arch.

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nerve was identified on the deep surface between the area of the zygomatic arch and the galeal temporal interface. The nerve was tracked along the entire path, mapped by use of pins, and the elevated flap was placed into the native position to identify the two-dimensional trajectory and also the third dimension with regard to the depth. The relationship to the “sentinel” vein was also identified.12

RESULTS

The frontal branch of the facial nerve was found to course within the elevated flap, but very close to the deep surface. It could be readily seen. The elevation in the loose areolar plane left the nerve intact without any apparent penetration into the tissue. The area of interest, however, included the region overlying the zygomatic arch, but also over the galeal frontalis fusion point. It was at this point that the nerve was found to be deep and within the fusion point. The transition at this zone was evident in each dissection. The nerve was followed into this fusion plane and was uniform in each dissection. The nerve was also found to be cephalad to the sentinel vein in each instance (Figure 2). The tissue was freely dissected medial and lateral to the fusion point of the galea and the temporal fascia. This fusion point was dissected with a knife (Figure 3), and the nerve was followed across this transition zone and was found to be within 2 mm of the deep surface in each cadaver half. The fusion plane was dense and in a direct line in the vertical direction with the loose areolar plane on either side (Figure 4).

DISCUSSION

Over the past couple of decades there has been considerable interest in the path of the frontal branch of the facial nerve.1-5,12-17 As aesthetic and craniofacial surgery became more prevalent, refinements were added that have taken advantage of the anatomy of all the vital structures in the facial region.

The earliest work regarding the frontal branch emphasized the path of the nerve with respect to the zygomatic arch.1,7 There have been several studies that espouse the importance of the relationship of the nerve. The frontal branch itself is the superior branch of the frontozygomatic trunk of the facial nerve as it exits the stylomastoid foramen. The nerve is deep to the tissues in the preauricular region, passes through the superior edge of the parotid gland, and transitions into a more superficial layer. The original articles simplify the course of the nerve as “one of 5 branches of the facial nerve.” As it turns out, the facial nerve has multiple different branches and cross innervations, a fact that is important in minimizing the impact of injury to an isolated nerve branch. The frontal branch of the nerve, in particular, is variable in number of branches and locations in which it branches.

More recently, various minimally invasive procedures have increased the interest in identifying the “usual” locations of these nerves. The sentinel vein has been described as a landmark that could be used to identify a region of potential injury.18,19 In the study of cadavers presented here, the main branch of the frontal branch passes just cephalad to the sentinel vein in each instance.

The idea of performing this study arose from nearly 200 bicoronal incisions performed for various clinical needs, nearly all of which were for trauma-related conditions. During these dissections it was observed that there were 3 distinct zones of dissection for safe elevation that were all reproducible. It was these observations that provided the
impetus for the cadaver dissections, which were all carried out in the same format as the surgical approach.

The key point of division was the dense tissue at the junction between the galea and the temporal fascia. The temporal fascia has multiple layers, but these layers are easily identified during dissection. There is a loose areolar layer superficial to which the frontal branch runs. Whether there is one or several, the nerve always runs superficial to this layer. It is easily reflected away from the denser deep temporal fascia. There is also a difference in the direction of the fibers in the deep tissue. The fibers are in the same direction as the temporalis muscle itself. This deeper tissue is left behind in a nearly bloodless plane and tethered inferiorly by the tissue overlying the zygomatic arch and then further, medially, at the junction of the galea and the deep temporal fascia. The plane can easily be elevated on either side of this dense line of attachment. This approach was used in the clinical setting and then taken to the anatomy laboratory and used in the cadaver dissection (Figure 5). In each instance, the nerve was found to be in the superficial layer, which would correspond to the elevation scalp flap; then the nerve passed into the dense tissue, which was not easily elevated. The nerve passes within 2 mm of the layer to be left behind (deep). The dissection was carried out sharply to identify the passage of the nerve. There may be several branches of the nerve in the location, so the impact may not be as readily seen because of cross innervation. Transient defects can be explained away as traction but may be actual injury with cross innervation during the recovery period. The main trunk of the nerve, however, was noted to pass cephalad to the sentinel vein in each case. If the sentinel vein is used as a landmark, the nerve may already have been passed and possibly injured. The purpose of the study was to map out the nerve as it passes through the dense galeal temporal fascia. This region is clearly a zone of potential injury, and caution should be exercised in its release.

CONCLUSION

The frontal branch of the facial nerve has been well studied in the past. The concentration of previous studies was largely related to the branches of the nerve during its entire path. The other region of intense interest was in the transition zone from the deep to the superficial area, which would be over the zygomatic arch. Understanding of the nerve in this area has been a tremendous asset in avoiding injury to the proximal branch of the frontal branch of the facial nerve. The next area of potential injury may be less appreciated. The extent of injury is lessened by the arborization of the nerve as it passes distally, but it can still be susceptible to injury. The dense tissue with the galeal temporal region needs to be approached with caution. The method of dissection and elevation in the area has been carried out with sharp dissection with avoidance of electrocautery in the clinical setting. The cadaver study demonstrates the close proximity of the nerve in the
deeper portion of the elevated superficial flap and brings anatomic evidence to a valid clinical concern.

DISCLOSURES

The author has no disclosures with respect to the contents of this article.

REFERENCES