Cosmetic

Surgical Anatomy of the Ligamentous Attachments in the Temple and Periorbital Regions

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This study documents the anatomy of the deep attachments of the superficial fasciae within the temporal and periorbital regions. A highly organized and consistent three-dimensional connective tissue framework supports the overlying skin and soft tissues in these areas.

The regional nerves and vessels display constant and predictable relationships with both the fascial planes and their ligamentous attachments. Knowledge of these relationships allows the surgeon to use the tissue planes and soft-tissue ligaments as intraoperative landmarks for the vital neurovascular structures. This results in improved efficiency and safety for aesthetic procedures in these regions. (Plast. Reconstr. Surg. 105: 1475, 2000.)

The patterns of arrangement of the layers of superficial fascia in the cheek, forehead, scalp, and temple have been well described. This superficial fascia in the temple, forehead, and periorbital regions meets the definition of a SMAS layer as described in the midface. The superficial fascia thus extends like a mask throughout the whole of the face. The descriptions of these layers have found wide application to aesthetic surgery.

The areolar tissue plane beneath the fibrous layer of the superficial fascia of the temple has been given numerous names. A superficial fascial plane is located deep to the galea in the upper face, the SMAS in the midface, and the platysma in the neck. The ease of dissection along this plane in the scalp and forehead results from the relative paucity of connective tissue attachments between the galea and the underlying deep fascia or pericranium.

The superficial fascial layer is retained by a complex system of deep attachments that arise from the underlying deep fascia/periosteum. The subSMAS plane that contains these attachments is therefore not always a simple cleavage plane. This explains why surgical dissection is considerably more complicated in the midfacial, temporal, and periorbital regions than in the scalp.

In the cheek, these deep attachments have been defined as the zygomatic, masseteric, and mandibular-cutaneous ligaments. These ligaments provide a lateral line of fixation for the mobile tissues of the medial cheek. Release of these retaining ligaments is fundamental to the extended SMAS technique of “deep-plane” surgery.

The ligaments act as markers to the position of the facial nerve branches in the cheek. The zygomatic and buccal branches emerge from the masseteric fascia and cross the subSMAS plane to the underside of the SMAS. This passage occurs just medial to the cheek ligaments. The ligaments therefore retain the overlying SMAS and protect the facial nerve branches as they cross this glide plane.

In facial rejuvenation surgery, the deep-plane method achieves a tightening of the medial cheek soft tissues. After the retaining ligaments are released, the superficial fascia can be drawn posteriorly. The facial nerve branches are simultaneously identified and preserved during surgical ligament release.

Previous authors have provided a great deal
of information on the deep attachments in the cheek.\textsuperscript{18,21} Recently, studies have begun to investigate deep attachments found in the temporal\textsuperscript{12,25} and periorbital regions.\textsuperscript{26,27} These areas are therefore the focus of this article.

The origin and pattern of migration of the embryonic facial muscles that occur in the mid-face also occur in the upper face.\textsuperscript{28,29} Accordingly, it could be expected that the upper face would display similar tissue and neurovascular arrangements.

The relationships of the facial nerve\textsuperscript{16,30–32} and sensory nerves\textsuperscript{33} to the fascial planes in the upper face have received much attention. Although helpful in identifying the layer of passage of the facial nerve branches, these studies do not define their exact course. Currently, surface anatomy landmarks are widely used in locating the facial nerve.\textsuperscript{34,35} However, surface anatomy is not sufficiently precise for intraoperative dissection when facial nerve branches are involved.

This investigation commenced with the hypothesis that, as in the cheek, the internal soft-tissue ligaments of the temporal and periorbital regions display a constant anatomy with predictable relationships to the temporal branches of the facial nerve. The aim of the study was therefore to define this not previously described anatomy. Although the data reported in this article pertain only to the temporal and periorbital regions, they are derived from a comprehensive study investigating the superficial tissues of the whole face and neck.

\section*{Materials and Methods}

This study involved dissection of 22 facial halves. All were performed on fresh cadavers of normal body mass index with ages ranging from 60 to 78 years. Preserved (formalinized) cadavers were excluded because they distorted the delicate connective tissue and facial nerve anatomy. Of the 22 dissections, 10 were performed following intraarterial vascular injection with a lead oxide mixture\textsuperscript{36,37} and 12 were performed in fresh specimens without arterial injection. These data were combined with the anatomic recordings from several hundred intraoperative dissections including open coronal brow and temporal lifts and endoscopic temple lifts.

Dissection was performed under 3× loupe magnification according to a standardized technique that commenced with a coronal incision, entered the subgalea plane, and then proceeded in a caudal direction over the forehead and the temporal, periorbital, and facial regions. Loose areolar tissue was gently dissected away, preserving the dense connective tissue attachments between the deep and superficial tissues. The precise locations of these attachments were recorded on a standardized worksheet with reference to specific fixed bony landmarks. The relationships of the major neurovascular structures to both the connective tissue attachments and the fixed skeletal landmarks were documented carefully with appropriate measurements.

The cadavers that underwent initial vascular injection were dissected with an identical technique and provided additional information on the relationships between the arterial supply and both the connective tissue layers and their attachments. The uninjected specimens provided detailed information on the cutaneous sensory nerves and fine motor branches of the facial nerve.

\section*{Results}

\subsection*{Arrangement of the Tissue Layers}

The tissues are arranged into two basic layers that may be summarized under the headings of the superficial and the deep fasciae. A continuous layer of superficial fascia comprises the galea occipitofrontalis, the superficial temporal fascia, the SMAS of the zygomatic and cheek regions, and the platysma. This SMAS system receives the insertion of those facial muscles arising directly from bone such as the zygomaticus major and minor; it also envelops the flat muscles such as orbicularis oculi that have important attachments around their perimeter to the SMAS layers.

An easily developed surgical plane exists between these deep and superficial tissue planes. This subsuperficial fascial plane is a potential space that mainly contains loose areolar or fibro-fatty tissue. In predictable locations, dissection through this plane is limited by the fibrous and muscular attachments that retain the superficial tissues.

\subsection*{Classification of Ligament Morphology}

The fibrous attachments retaining the SMAS layer and skin to the deep tissues may be collectively referred to as the ligamentous attachments of the superficial tissues. The individual ligaments have predictable and constant loca-
tions; however, they vary in the density of their fibrous tissue.

Clear description of the ligamentous anatomy in the superficial tissues of the head and neck has required the introduction of a number of new terms. The ligaments have been classified according to three morphological forms: true ligaments, septa, and adhesions (Fig. 1).

True ligament. A true ligament is similar to a skeletal ligament in that it is a discrete cylindrical arrangement of fibrous tissue that is surrounded by fatty tissue. True ligaments were found in the medial midface and lower face and provided the greatest latitude of movement of all the attachments (Fig. 1). True ligaments arise from either the deep fascia or the periosteum. They then cross the subSMAS plane to the undersurface of the SMAS, where they divide into numerous branches in a tree-like fashion. These branches then distribute the attachment of the ligament to the dermis through a

Fig. 1. Classification of ligamentous morphology. The major tissue planes from deep to superficial include the deep fascia/pericranium, the subSMAS plane, the SMAS/galea, subcutaneous tissue, and the skin. The diagram shows the three morphologic forms of ligaments that pass through the subSMAS plane to the superficial tissues. These are classified into true ligaments, septa, and adhesions.
subcutaneous fascial system, the retinacula cutis. Examples include the zygomatic and masseteric ligaments (Fig. 1).

**Septum.** A septum is a fibrous wall passing between the deep fascia and the undersurface of the SMAS (Fig. 1). This arrangement permits mobility only in a plane perpendicular to the deep line of attachment of the septum. Most of the septa defined within the head and neck are located in the temporal and periorbital regions. Examples include the inferior temporal septum, the superior temporal septum, and the periorbital septum (Fig. 1).

**Adhesion.** The third form is a low-density area of fibrous or fibro-fatty adhesion between the deep fascia/pericranium and the superficial fascia (Fig. 1). Basically a two-dimensional structure, an adhesion restricts mobility in all directions and to the greatest degree of the three forms. It is important to note that septa and adhesions retain the SMAS plane only, and considerable mobility may still occur at more superficial layers. Aside from the preauricular and parotid regions, adhesions were found only in the forehead and temporal regions. Examples include the temporal (Fig. 1) and the supraorbital ligamentous adhesions.

The deep attachments of the superficial fascia in the temporal and periorbital regions comprised only septa and adhesions. No true ligaments were seen in these regions.

**The Temporal Ligamentous Adhesion**

The temporal ligamentous adhesion (temporal ligament) supports the region immediately superior to the eyebrow at the junction of its middle and lateral thirds (Figs. 2 and 3). Located at the intersection of the temporal, frontal, and periorbital regions, it is a well-
FIG. 3. Periorbital and temporal ligamentous attachments with major neurovascular relationships: anterior view. Temporal ligamentous adhesion (TLA), supraorbital ligamentous adhesion (SLA), superior temporal septum (STS), inferior temporal septum (ITS), periorbital septum (PS), lateral brow thickening of periorbital septum (LBT), lateral orbital thickening of periorbital septum (LOT), sentinel vessel (SV), temporal branches of facial nerve (TFN), zygomaticotemporal nerve (ZTN), zygomaticofacial nerve (ZFN).
defined keystone structure in that three ligaments radiate from each of its angles. These are the superior temporal septum, the inferior temporal septum, and the supraorbital adhesion (Figs. 4 through 6). The temporal ligament arises from the frontal bone periosteum as an expansion at the anterior end of the superior temporal septum (STS), which separates the frontal periosteum (FP) medially from the deep temporal fascia (DTP) laterally. The superior extension of the temporal ligamentous adhesion is the superior temporal septum (STS). The location of the deep and superficial attachments of the inferior temporal septum (ITS) are defined by the line of the fine blue suture.

The superior temporal septum. This septum arises from the periosteum along the superior temporal line of the skull and inserts into the line of junction between the superficial temporal fascia and the galea (Fig. 1). Anteriorly, this line of junction occurs between the superficial temporal fascia and the galea lining the deep surface of the lateral border of the frontalis muscle. Whereas it more closely resembles a septum posteriorly, it becomes a broad adhe-

Fig. 4. Right temple. Subject’s nose is to the right. Hairline incision across the forehead with retraction of the flap. The retractor is in the superficial temporal fascia (STF). The scissors are releasing the temporal ligamentous adhesion (TLA) at the anterior end of the superior temporal septum (STS), which separates the frontal periosteum (FP) medially from the deep temporal fascia (DTP) laterally. The superior extension of the temporal ligamentous adhesion is the superior temporal septum (STS). The location of the deep and superficial attachments of the inferior temporal septum (ITS) are defined by the line of the fine blue suture.

Fig. 5. Further elevation of the superficial fascia, deep to the superficial temporal fascia (STF), by releasing the inferior temporal septum. The temple is divided into two parts by the line of attachment of the inferior temporal septum. Above, no vital anatomy is present. In the lower compartment lies the detailed neurovascular anatomy. This contains lobulated fat on the floor. Unnamed minor ligamentous attachments (marked with blue ink) are seen centrally and related to the emerging branches of the zygomaticotemporal nerve (ZTN, yellow beads). The sentinel vessel (SV) crosses the lower temporal compartment inferior to the inferior temporal septum (ITS) just posterior to the frontal process of the zygoma. The green background and green beads display the temporal branches of the facial nerve (TFN) within the fatty layer deep to the superficial temporal fascia, which forms the roof of the triangular compartment. The dotted blue line demarcates the upper border of the supraorbital ligamentous adhesion (SLA).
sion at its anterior termination 30 mm from the supraorbital rim. This expanded end is the temporal ligamentous adhesion (Figs. 2 and 4).

The inferior temporal septum. This septum takes an oblique course along a line extending from the lateral corner of the temporal ligament toward the external acoustic meatus (Fig. 1). It comprises criss-crossed fibers that reflect from the deep temporal fascia to their insertion into the deepest layers of the superficial temporal fascia (Figs. 7 and 8).

The septum is found an average of 27 mm above the zygoma at the level of the temporal border of the frontal process of the zygoma and 21 mm above the superior border of the zygoma at its midportion. The average heights for the level of the division of the deep temporal fascia into its deep and superficial leaves are 37 mm and 27 mm above the zygoma, respectively. The division of the deep temporal fascia into superficial and deep leaves is therefore above the level of the inferior temporal septum.

The inferior temporal septum forms the superior border of a triangular fibro-fatty compartment between the superficial temporal fascia and the underlying deep temporal fascia (Fig. 6). Cephalad to this septum is an easily developed dissection plane beneath the superficial temporal fascia. Within the lower temporal (triangular) compartment, the planes are more adherent because of numerous fine, fibrous adhesions contained within a variable amount of adipose tissue. These fibrous strands have related vessels and cutaneous nerve branches (Figs. 5 and 9 through 12). Inferiorly these fibrous attachments become increasingly condensed. At the level of the lower zygoma they comprise the named zygomatic (true) ligaments.

The supraorbital (ligamentous) adhesion. The density of this fibrous adhesion varies widely. The more dense adhesions maintain a greater restraining effect on the superficial fascia of the brow, thus reducing brow mobility.

The supraorbital ligamentous adhesion arises from the frontal bone above the orbital rim, extending between the temporal ligament and the origin of the corrugator muscle (Fig. 3). The well-defined inferior border is located 6 mm above the deep attachment of the periorbital septum. The upper border of this origin is less distinct and extended a variable 20 to 40 mm above the orbital rim. The ligament is condensed around the branches of the supraorbital nerve and the corrugator muscle origin.

The supraorbital adhesion supports the deep galea which encloses a fat pad and the lower frontalis muscle. The adhesion allowed minimal mobility, and therefore retained the deep tissues of the lower brow. The corrugator and procerus muscles assist in providing an important dynamic support to the medial brow. Significant mobility of the medial eyebrow can still occur within the tissues superficial to the superficial fascial layer.

The periorbital septum. This well-defined fibrous septum gains origin from three-quarters of the circumference of the orbital rim, extending from the corrugator origin around to the inferomedial bony origin of the orbicularis oculi (Fig. 3). It is continuous with two more broad adhesions, which are named the lateral brow and the lateral orbital ligamentous thickenings.
FIG. 7. Right temple, shown from above, looking down toward the zygomatic arch. The subject’s orbit is to the left, ear to the right. Skin hooks are elevating the superficial temporal fascia from the deep temporal fascia to demonstrate the upper temporal compartment. The attachments of the inferior temporal septum (ITS) are marked by the upper blue line on the underside of the superficial temporal fascia (STF) and the lower blue line on the deep temporal fascia (DTF). The tip of the scissors is in the lower triangular compartment. The inferior temporal septum terminates anteriorly by merging with the temporal ligamentous adhesion (TLA).

FIG. 8. Same orientation as in Figure 7 after completion of the release of the inferior temporal septum (ITS) and release of the temporal ligamentous adhesion (TLA, triangular adhesion outlined with ink). To the left is the supraorbital ligamentous adhesion (SLA) attached above the supraorbital rim. The released deep attachment of the temporal ligamentous adhesion is continuous with the supraorbital ligamentous adhesion. The scissors are beneath the orbital (internal) surface of the periorbital septum (PS). A nonadherent area devoid of ligamentous attachments exists between the periorbital septum and the temporal/supraorbital ligamentous adhesions. STF, superficial temporal fascia.

FIG. 9. Dissection continued inferior to the inferior temporal septum (ITS) within the lower triangular compartment of the temple. Note the fatty tissue within this lower compartment compared with the areolar tissue within the upper compartment. The sentinel vessel (SV) is on the left. The scissors are between the medial and lateral branches of the zygomaticotemporal nerve (ZTN), which are protected by fibrous tissue.
FIG. 10. Dissection of the underside of the roof of the lower temporal compartment. Multiple temporal facial nerve branches (TFN) are contained within a layer of fibrofatty tissue adherent to the deep surface of the superficial temporal fascia (STF). These branches pass perpendicular to the branches of the zygomaticotemporal nerve (ZTN) as they perforate the superficial temporal fascia. SV, sentinel vein; ITS, inferior temporal septum.

FIG. 11. Complete elevation of the superficial flap to the boundaries of the lower temporal compartment. The continuous blue line defines the upper border of the zygomatic arch (ZA). The temporal branches of the facial nerve (TFN) are already located in the roof of the compartment at the inferior border of the compartment. They do not cross to the roof within the boundaries of the compartment. Zygomaticotemporal nerve branches (ZTN) do cross the lower compartment and are clearly defined; their fibrous protection has been dissected free. The fine fibrous attachments (X) at the upper border of the zygomatic arch become progressively more concentrated until the lower border of the arch, where a true ligament can be identified. ITS, inferior temporal septum.

FIG. 12. Dissection inferior to the lower temporal space extending over the zygomatic arch (ZA). The ear is seen on the right side. The course of the temporal branches of the facial nerve (TFN, highlighted by green background and indicated by arrows) is defined. These emerge from beneath the lower border of the zygomatic arch (ZA) and pass to the underside of the superficial temporal fascia. In this passage through soft, yellow fat they are protected by definite ligamentous condensations, which attach the superficial temporal fascia to the zygomatic arch.
Superiorly, the orbicularis oculi and frontalis muscles merge in an aponeurosis, each with a layer of galeal fascia on their deep surface. The orbicularis oculi fibers passed superficial to those of the frontalis. The periorbital septum inserts at a T-junction into the deep galea lining the deep surface of the flat facial muscles. The superior arc of the periorbital septum therefore provides an indirect bony origin for both the frontalis and the orbicularis oculi muscles and plays a significant role in restraining the brow and upper eyelid soft tissues.

At the inferolateral orbital rim, the septum inserts into the deep surface of the orbital component of the orbicularis oculi muscle. Dissected toward its origin at the arcus marginalis, the periorbital septum separates into two fascial layers. Internal to the orbital rim, the periorbital septum continues as the orbital septum; external to the orbital rim, it continues as the fibrous periosteum. The thin periorbital septum varies from 1 to 3 mm in thickness, with a height of 7 mm (Fig. 8). The lateral orbital thickening is $7 \times 10$ mm at its base and is located immediately superolateral to the lateral canthal tendon insertion. The smaller lateral brow thickening is $3 \times 11$ mm and arises from a bony crest on the lateral supraorbital rim. It does not arise from the zygomaticofrontal suture. Both of these ligaments insert into and retain the deep surface of the orbicularis oculi muscle fascia.

**Fascial Compartments**

The upper face and brow are separated into a number of fascial compartments by the arrangement of the temporal (ligamentous) adhesion, the three ligaments that radiate from it, and the periorbital septum (Fig. 2).

The inferior temporal septum divides the temple into the upper temporal compartment and the lower temporal compartment (Fig. 6). The upper temporal compartment is the potential space above the inferior temporal septum. Its upper border is the superior temporal septum. The lower temporal compartment is located below the inferior temporal septum; it is bounded inferiorly by the zygomatic arch and anteriorly by the frontal process of the zygoma. The upper compartment has no specific structures crossing and is safe for dissection. However, the triangular lower compartment contains the temporal branches of the facial nerve. (Fig. 10). There is no well-defined septum limiting inferior dissection over the anterior zygoma until the defined zygomatic ligaments are reached.

The forehead compartment is limited laterally by the superior temporal septum and inferiorly by the supraorbital ligamentous adhesion.

The periorbital septum divides the subsuperficial fascial space of the orbital region into two compartments: orbital and periorbital (Fig. 2). The subsuperficial fascial space of the orbital region, located internal to the orbital rim between the palpebral portion of the orbicularis oculi and the orbital septum, contains loose areolar tissue only. The superficial fascia itself contains fat within its deepest layers in the region of the orbital rim. The subsuperficial fascial compartment of the periorbital region lies external to the rim and contains the attachments between the orbital portion of the orbicularis oculi and the underlying pericranium.

**Relationships between Ligaments and Nerves**

**Facial nerve.** The 2 to 4 temporal branches of the facial nerve leave the superior pole of the parotid gland by perforating its capsule at the level of the lower border of the zygomatic arch. The nerves then cross the subSMAS plane inferior to the zygomatic arch (Fig. 12) to reach the deep surface of the SMAS (Fig. 10). In crossing this mobile plane, the nerve branches are protected by fibrous condensations passing from the zygomatico-frontal suture. Both of these ligaments insert into and retain the deep surface of the orbicularis oculi muscle fascia.

The sentinel vein is located immediately inferior to the inferior temporal septum (Fig. 9). The temporal nerve branches display a variable relationship to the sometimes duplicated sentinel vein. Although the temporal nerve branches display a variable relationship to the sentinel vein, they are predominantly located cephalad to the sentinel vein (Fig. 2). Inconstant smaller nerve branches are found caudal to the sentinel vein.

The inferior temporal septum is therefore a
reliable and identifiable marker for the location of the temporal nerves as it inserts into the superficial temporal fascia along a line immediately cephalad to the most superior temporal nerve branches (Fig. 5). Dissecting in an inferior direction, the release of the inferior temporal septum (Fig. 7) exposes the temporal nerves. They are surrounded by loose adipose tissue and plastered to the deep surface of the superficial temporal fascia by a thin areolar fascia (Fig. 10).

Sensory nerves. Each of the major cutaneous nerves in the region cross the mobile subsuperficial fascia plane in association with a named ligamentous attachment.

The supraorbital nerve branches pass along the upper peri orbital septum to reach the deep galea. The supraorbital ligamentous adhesion is condensed along the course of the nerves. Branches of the infraorbital nerve to the lower eyelid region follow the inferior periorbital septum. Where the periorbital septum attaches to the superficial fascia the respective nerves divide into two groups of branches: those to the eyelid and those to the peri orbital tissues. The supratrochlear nerve is an exception, crossing the plane between the heads of the corrugator muscle.

The anterior branch of the zygomaticotemporal nerve is usually related to the lateral orbital ligament; the smaller posterior branches within the lower temporal compartment are associated with minor fibrous attachments and fine veins (Figs. 5 and 11). The zygomaticofacial nerve emerges through a single or duplicate foramen in the zygoma and is then associated with the inferolateral portion of the peri orbital septum.

The zygomaticotemporal and supraorbital cutaneous nerves perforate the superficial fascia along the line of the facial nerves branches (Fig. 10). They could therefore be used as additional markers for the location of the facial nerve branches (Fig. 11).

DISCUSSION

Definition of a Ligament

This study raises the important issue of what exactly is the definition of a “ligament.” The Oxford Dictionary defines a ligament as “a band of fibrous tissue binding bones together or any membrane keeping an organ in position.” Although the word ligament traditionally describes a connective tissue that restrains bones, this definition has subsequently been widened to include “cutaneous retaining ligaments.” These are fibrous attachments anchoring skin to the underlying deep fascia or periosteum and have been described in various locations including the digits, the face, and the breast.

Furnas introduced the term “retaining ligaments” in the face. He documented four cutaneous ligaments in the cheek, naming them the zygomatic, mandibular, platysma-auricular, and anterior platysma ligaments. The first two of these ligaments passed from bone directly into the dermis, whereas the second two passed from the superficial fascia (platysma) to the dermis. Traction on the deep end of the cut ligament dimpled the skin. The ligaments fanned out as they approached the dermis and were notably absent in about 10 percent of dissections.

Stuzin et al. further elaborated on the definition of these retaining ligaments, also dividing them into two groups: the previously described true osteocutaneous ligaments and a second group that consisted of a coalescence between the deep and superficial fasciae of the face. This therefore widened the definition of retaining ligaments to include defined adhesions retaining the superficial to the deep fascia. These adhesions retain the overlying skin indirectly through a separate system of fibrous septa that extend from the superficial fascia into dermis. They differ from the discrete osteocutaneous ligaments, which run directly from periosteum to a focal area of dermis.

Knize recently suggested that, to be considered a retaining ligament, a structure should insert directly into dermis. However, it is important to recognize the vital role of those other ligaments that attach to the superficial fascia yet retain the overlying skin indirectly through the retinacula cutis.

The septa and adhesions in the temporal and periorbital regions pass to the superficial fascia and exert their effect on the skin, presumably thorough the retinacula cutis. The true (cutaneous) ligaments branch as they pass through the superficial fascia to the dermis. The three forms of fibrous attachment described in this article fulfill the criteria of “ligaments of the superficial tissues” and insert into either the superficial fascia or the dermis.
Surgical Applications

Connective tissue anatomy. The arrangement of the ligamentous fixation between the underside of the superficial fascia and the periosteum/deep temporal fascia provides landmark information for the surgeon operating in this area. The ligamentous attachments demarcate the anatomic spaces in the forehead, temple, and periorbital regions and localize the facial nerve and sensory branches.

This superior temporal septum has been referred to by Knize\textsuperscript{12} as the “zone of fixation.” At the anterior end of this structure is an expansion providing strong attachment to the frontal periosteum medial to the deep temporal fascia. This would seem to be what Knize calls the orbital ligament; however, our observations differ in that this temporal ligament does not extend to the orbital rim. The supraorbital ligamentous adhesion has been noted by Knize,\textsuperscript{12} who describes it as zone B of fixation in the lower 2 cm of the forehead. It would seem that the periorbital septum has not been described as such before; however, close examination of Knize’s\textsuperscript{12} histologic studies (Fig. 6 of Knize’s article, middle sagittal section) shows a fascial septum passing from the deep galea to the orbital rim.

Although there was a condensation of the connective tissue in the region of the zygomaticofacial suture, we did not find a definite ligament as described in Knize’s article. There was a thickening of the periorbital septum, the lateral brow thickening, which attaches to the orbital rim superior to the zygomaticofacial suture.

Relationship of the temporal nerves to the ligaments. Surgeons have long been cautious about operating in the temple because of the risk of damaging the temporal branch of the facial nerve. This concern has prompted numerous anatomic studies to define the trajectory or course of the branches.\textsuperscript{30–32} However, these studies have not fully satisfied the intra-

![Diagram](image-url)
operative requirement of the surgeon in relating the nerve to the planes of dissection as they have referred to external soft-tissue landmarks or to measurements along the zygomatic arch. The temporal ligament and the inferior temporal septum are reliable soft-tissue ligaments and provide accurate internal landmarks for predicting the neurovascular anatomy of the region.

The inferior temporal septum divides the subsuperficial fascial space in the temple into two separate compartments. The triangular lower temporal compartment contained all the “at risk” anatomic structures of the temple. This is significant for the surgeon in that dissection can be readily performed within the larger upper temporal compartment all the way to the septum when an abrupt change of approach is required. The inferior temporal septum is readily identified by its criss-crossed fibers that provide a barrier to the dissection. It is best defined by blunt dissection. This septum varies in thickness between individuals and can be quite fine in some.

After operating through this septum it is imperative that the level of dissection hug the floor of the space, that is, directly on the deep temporal fascia. This is because the temporal branches of the facial nerve course through the roof of the lower temporal compartment immediately abutting the inferior temporal septum. They run parallel to the line of attachment of the inferior septum to this roof. The branches run within a wafer-thin fat pad on the underside of the superficial temporal fascia. For the purposes of description, these nerves should be considered to be in the ceiling, rather than in the roof, of the space. Further, these nerves enter the lower temporal compartment already in the ceiling (this occurs just cephalad to the inferior border of the zygoma), and they remain in the ceiling at all times.

The sentinel vessels and both branches of the zygomaticotemporal nerve cross the lower temporal space, floor to ceiling, related to the inferomedial surface of the inferior temporal septum. They can also be safely spared at this juncture by judicious dissection. The majority of the facial nerve branches in the ceiling are in the narrow cephalad space between the sentinel vessels and the inferior temporal septum. Accordingly, dissection through the lower temporal compartment can be quite safe in regard to the facial nerve, provided the ceiling is lifted off the plane of dissection. Further, dissection can then continue readily inferiorly and anteriorly across the lower temporal space over the body of the zygoma, or to the periorbital attachments.

Relationship of the temporal nerves to the sentinel vessels. Previous studies have related the temporal nerve branches to perforating vessels, which enter the superficial temporal fascia 1 cm lateral to the superolateral angle of the orbit. De la Plaza has named these the “sentinel vessels of the lateral wall of the orbit,” and he makes the point that they must be electrocoagulated deep to avoid damage to the temporal nerves. The sentinel vessels provide a landmark for the temporal branches of the facial nerve during endoscopic forehead dissection.

Because the relationship between the sentinel veins and the temporal nerve branches is somewhat variable, the vessels should be used as a relative landmark for facial nerve anatomy. Sometimes the sentinel vessels are duplicated with tributaries at different vertical levels. Although temporal nerve branches are found just cephalad to the sentinel vessels, some also pass caudal to the vessels in an unpredictable fashion.

Surgical ligamentous release. Gravitational aging changes of the brow and also the upper cheek can be corrected by surgical repositioning after dissection beneath the superficial fascial plane.

As in deep-plane surgery of the cheek, en bloc mobilization of the ptotic superficial fascia allows it to be repositioned. An overcorrection of the position of the superficial fascia is required so that the laxity between it and the dermis is taken up. The skin position can then be corrected without direct skin traction.

The technique of ligamentous release differs between the temple and the cheek. In the temple, the facial nerve is not in immediate danger because it enters the region within the plane of the superficial fascia and therefore does not cross the plane of dissection. The only area of potential danger to the nerve is along the line of the inferior temporal septum. This is because the nerve branches that cross the temple immediately caudal to the septum are held by the septum close to the deep fascia.

Accordingly, a swift blunt dissection can be performed in the subgaleal plane of the upper temporal compartment and the forehead with
the knowledge that blunt dissection should cease at the inferior temporal septum. All vital anatomy is inferior to this septum in the lower temporal compartment. The inferior septum is then judiciously released by sharp dissection with small blunt scissors, at all times remaining directly applied to the surface of the deep fascia as the temporal branches lie immediately superficial. Once inside the inferior temporal compartment these branches are kept retracted out of the field.

The inferior temporal compartment is opened by blunt spreading dissection to protect the zygomaticotemporal nerves. Release of
the ligaments, other than the inferior temporal septum, requires sharp dissection. This can be performed with relative impunity once the temporal branches of the facial nerve are protected by the retractor.

The morphology of the ligaments determines the dissection technique. The cheek attachments are true ligaments, which have a discrete cylindrical nature. After specific release of these localized attachments, no further dissection is necessary. Unlike the true ligaments of the cheek, the ligaments of the temple and forehead are septa and adhesions, and therefore involve wide areas of attachment between the deep and superficial fasciae. Release of these regions therefore involves extensive dissection beneath the superficial fascia. Accordingly, elevation of the lateral brow requires more extensive ligamentous release than might be expected. Release of only the temporal ligamentous adhesion and the temporal septum is insufficient. The supraorbital ligamentous adhesion and the lateral brow thickening of the peri orbital septum must also be released (Figs. 13 and 14). The supraorbital ligamentous adhesion usually needs release all the way to the supraorbital nerve, being mindful that the lateral branch of the supraorbital nerve is at risk as it approaches the superior temporal septum. If the intended benefit is to include the lateral canthal and upper zygomatic regions, the peri orbital release must be extended to include the lateral orbital thickening at the lateral canthus. To benefit further around to the lateral lower lid, the peri orbital septal release is extended around to the zygo maticofacial nerve.

Ligamentous fixation. After the retaining ligaments are released, the superficial fascia is repositioned without being placed under tension. The fascia is maintained in its new location by suture fixation between the deep temporal fascia and the 2-cm-long temporal ligamentous adhesion (Fig. 3, inset). The remnants of the retaining ligament provide reinforced fibrous anchorage points for the sutures that replicate the temporal ligamentous adhesion. Knowledge of the relationship between the nerves and these ligaments allows this phase of the procedure to be performed safely.

Aging

The development of brow ptosis affects the lateral third of the brow and the temporal region earlier than it affects the medial brow. The pathogenesis of this complicated aging process is partly explained by the ligamentous anatomy of these regions. The superficial fascial layers of the medial face are strongly retained by connective tissue attachments including the temporal ligament, the supraorbital adhesions, and the periorbital septum.

In the temporal and lateral brow regions, the superficial tissues are restrained by only the two temporal septa, which provide less fixation than the many strong medial supports. This temporal ligament is located above the junction of the lateral and middle thirds of the eyebrow. Lateral to this the reduction in ligamentous attachment of the superficial fascia helps explain the earlier ptosis.

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