The Relationship of the Superficial and Deep Facial Fascias: Relevance to Rhytidectomy and Aging

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Controversy persists regarding the relationship of the superficial facial fascia (SMAS) to the mimetic muscles, deep facial fascia, and underlying facial nerve branches. Using fresh cadaver dissection, and supplemented by several hundred intraoperative dissections, we studied facial soft-tissue anatomy.

The facial soft-tissue architecture can be described as being arranged in a series of concentric layers: skin, subcutaneous fat, superficial fascia, mimetic muscle, deep facial fascia (parotidomasseteric fascia), and the plane containing the facial nerve, parotid duct, and buccal fat pad. The anatomic relationships existing within the facial soft-tissue layers are (1) the superficial facial fascia invests the superficially situated mimetic muscles (platysma, orbicularis oculi, and zygomaticus major and minor); (2) the deep facial fascia represents a continuation of the deep cervical fascia cephalad into the face, the importance of which lies in the fact that the facial nerve branches within the cheek lie deep to this deep fascial layer; and (3) two types of relationships exist between the superficial and deep facial fascias: In some regions of the face, these fascial planes are separated by an areolar plane, and in other regions of the face, the superficial and deep fascia are intimately adherent to one another through a series of dense fibrous attachments.

The layers of the facial soft tissue are supported in normal anatomic position by a series of retaining ligaments that run from deep, fixed facial structures to the overlying dermis. Two types of retaining ligaments are noted as defined by their origin, either from bone or from other fixed structures within the face. The significance of the retaining ligaments lies in the fact that as people age, the support from this ligamentous system becomes attenuated, leading to many of the stigmata of the aging face, such as the development of jowling and prominent nasolabial folds.

The anatomic changes that occur in the aging face are delineated. With an adequate understanding of the anatomic changes that occur with aging, rhytidectomy can be approached as a reconstructive procedure, restoring facial soft tissue to its original anatomic state and location.

Since the description of the superficial musculoaponeurotic system (SMAS) by Mitz and Peyronie in 1976,[1] great interest has focused on rhytidectomy in terms of the SMAS technique. Despite numerous publications on this subject, there remain significant variations in the anatomic descriptions of facial fascial anatomy, and descriptions of the relationship between the superficial and deep facial fascia remain imprecise.[2-6] As greater experience is obtained in SMAS techniques in rhytidectomy, the relevance of an accurate understanding of the relationship between the superficial and deep facial fascia becomes paramount in the prevention of facial nerve injury. Armed with an accurate understanding of facial soft-tissue anatomy and the anatomic changes that occur with aging, extensive mobilization and contouring of the facial fascia can be performed in a safe and precise fashion.

MATERIALS AND METHODS

Our findings are based on seven fresh cadaver dissections (14 sides) and are supplemented by several hundred intraoperative dissections during rhytidectomy.

ANATOMIC FINDINGS

The facial soft tissue is arranged in concentric layers: skin, subcutaneous fat, superficial fascia (SMAS), mimetic muscle, deep facial fascia (parotidomasseteric fascia), and the plane containing the facial nerve, parotid duct, and buccal fat pad. While individual variation is considerable in

terms of the thickness of these layers from ca-
daver to cadaver, structures present within each
layer were found to be anatomically constant in all
dissections.

SMAS

The superficial facial fascia (or SMAS) repre-
sents a discrete fascial layer that separates the
overlying subcutaneous fat from the underlying
parotidomasseteric fascia and facial nerve. The
SMAS is an extension of the superficial cervical
fascia cephalad into the face. This superficial
fascia forms a continuous sheath throughout the
head and neck, extending into the temporal
region, forehead, scalp, malar areas, nose, and
upper lip.[1,7,8]

The thickness of the superficial fascia varies
greatly from one region of the face to another.
This fascia is very dense and thick overlying the
parotid and is also quite substantive within the
temporal region (temporoparietal fascia) and
scalp (galea). The SMAS overlying the masseter
and buccal fat pad tends to be thinner and less

substantive, while the SMAS within the malar
region is quite thin, essentially comprising the
epimysium of the elevators of the upper lip.

Mimetic Muscles

The mimetic musculature is comprised of in-
dividual muscles that receive their innervation
from the facial nerve and are responsible for
facial movement. These muscles commonly over-
lap one another and have been described as being
arranged within four anatomic layers.[9] The or-
bicularis oculi, platysma, zygomaticus major and
minor, and risorius are examples of superficially
situated mimetic muscles. The buccinator and
mentalis muscles are examples of deeply situated
mimetic muscles. Since most of the mimetic
muscles lie superficial to the plane of the facial
nerve, they receive their innervation from their
deep surfaces. Only the buccinator, the levator
anguli oris, and the mentalis muscle, which are
deeply situated within the face, lie posterior to the
plane of the facial nerve and therefore receive
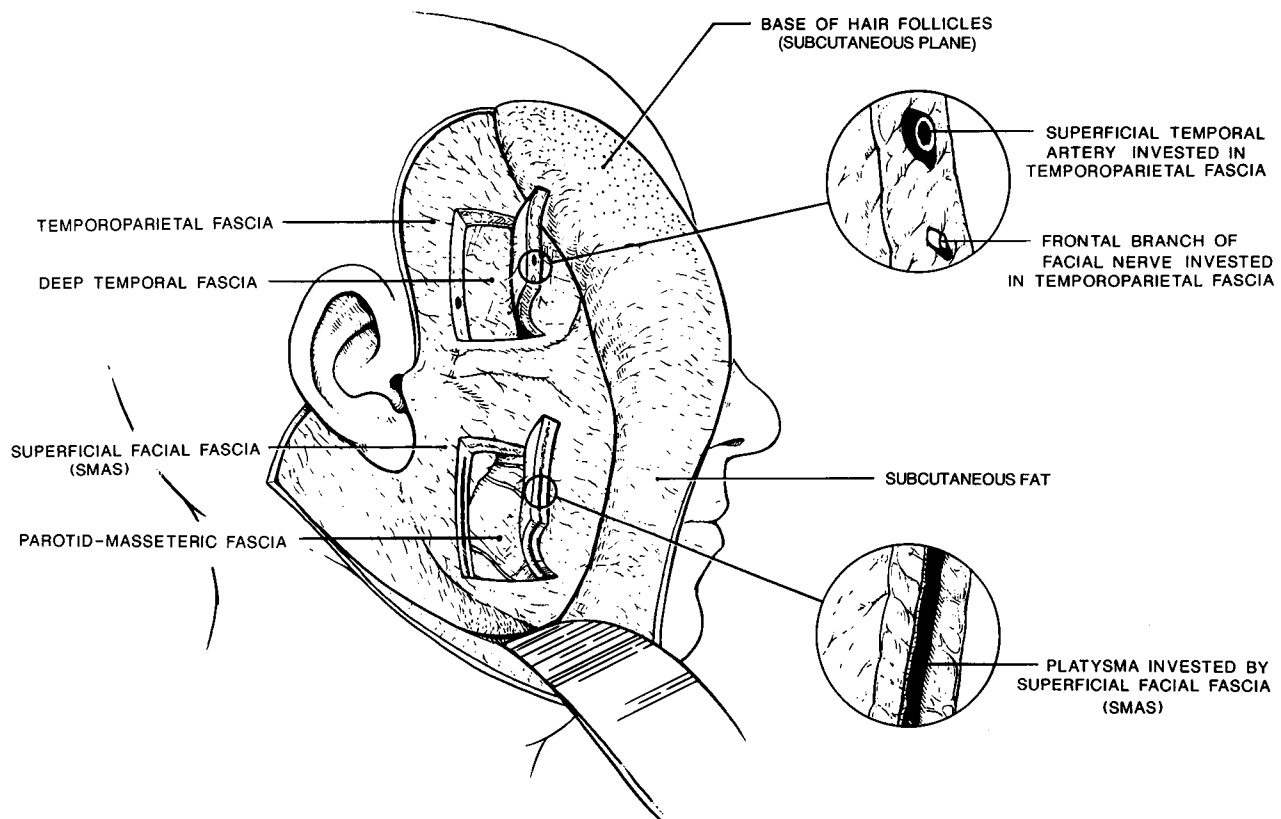their innervation from their superficial surface.[9]

FIG. 1. Following dissection within the subcutaneous plane, the underlying SMAS with its continuation as temporoparietal
fascia is evident. The superficial facial fascia (SMAS) forms an investing fascial layer. In the temporal region, the thickness of
the temporoparietal fascia invests the superficial temporal artery and frontal branch of the facial nerve. In a similar fashion, within
the cheek, the thickness of the superficial facial fascia invests the platysma. Dissection of a flap of temporoparietal fascia is
anatomically similar to dissection of the SMAS-platysma complex, except for the absence of mimetic muscle within the temporal
region.

Relationship of the Superficial Fascia to the Mimetic Muscles

The mimetic muscles and SMAS function as a single anatomic unit in producing movement of facial skin. The superficial facial fascia is intimately associated with the mimetic muscles, and muscle contracture is translated into movement of overlying facial skin through the vertical fibrous septa extending from the SMAS into the dermis.[1]

Anatomically, the superficial facial fascia is seen to invest the superficially lying mimetic muscles (platysma, orbicularis oculi, zygomaticus major and minor, and risorius).[10] By *investing*, we mean that the superficial fascia not only is identified along the superficial surface of these muscles, but also lines their deep surfaces. The investiture of mimetic muscles by the SMAS forms essentially a single anatomic layer, with fascia and muscle working in continuity to produce movement of facial skin.

To understand the concept of investiture of mimetic muscles by the SMAS, it is helpful to compare dissection of the SMAS-platysma complex with dissection of a flap of temporoparietal fascia. As the thickness of the temporoparietal fascia within the temporal region invests the superficial temporal vessels and the frontal branch of the facial nerve, in a similar fashion the thickness of the SMAS within the cheek and neck invests the platysma. Both flaps are mobilized by separating subcutaneous fat from the superficial surface of the SMAS, followed by dissecting the deep surface of the flap from the underlying deep facial fascia (or deep temporal fascia). The only difference anatomically between dissection of temporoparietal fascia as compared with dissection of SMAS-platysma is the absence of mimetic muscle within the temporal region (Fig. 1).

Clinically, it is possible to dissect the superficial fascia overlying the platysma, but raising fascia without platysma produces a less substantial flap than when the platysma is raised in continuity with the SMAS. Dissection along the undersurface of the platysma elevates both platysma and the fascia investing this muscle in continuity, producing a substantial myofascial flap.

Parotidomasseteric Fascia

Since the SMAS represents a continuation of the superficial cervical fascia into the face, the corresponding deep layer of cervical fascia con-
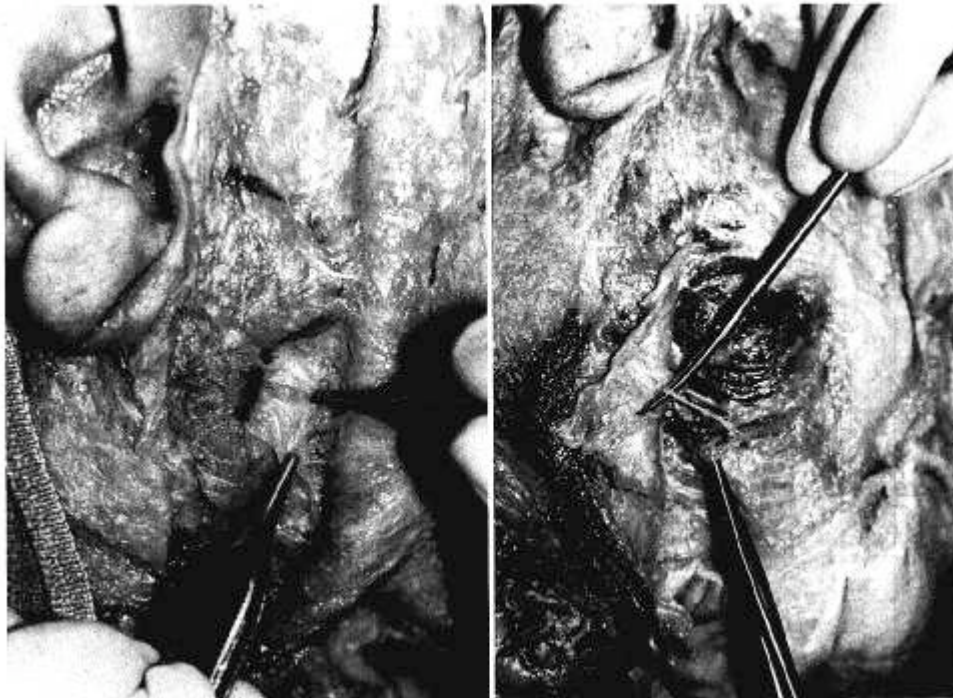

FIG. 2. (*Left*) Cadaver dissection following SMAS-platysma elevation within the cheek exposing the underlying parotid gland, anterior border of parotid (*marked in ink*), and parotidomasseteric fascia (*held in forceps*). The surgical significance of the parotidomasseteric fascia is that the facial nerve branches within the cheek are always deep to this anatomic layer. (*Right*) Cadaver dissection following elevation of the parotidomasseteric fascia exposing the underlying masseter muscle and the marginal mandibular nerve as it crosses the facial artery and vein.
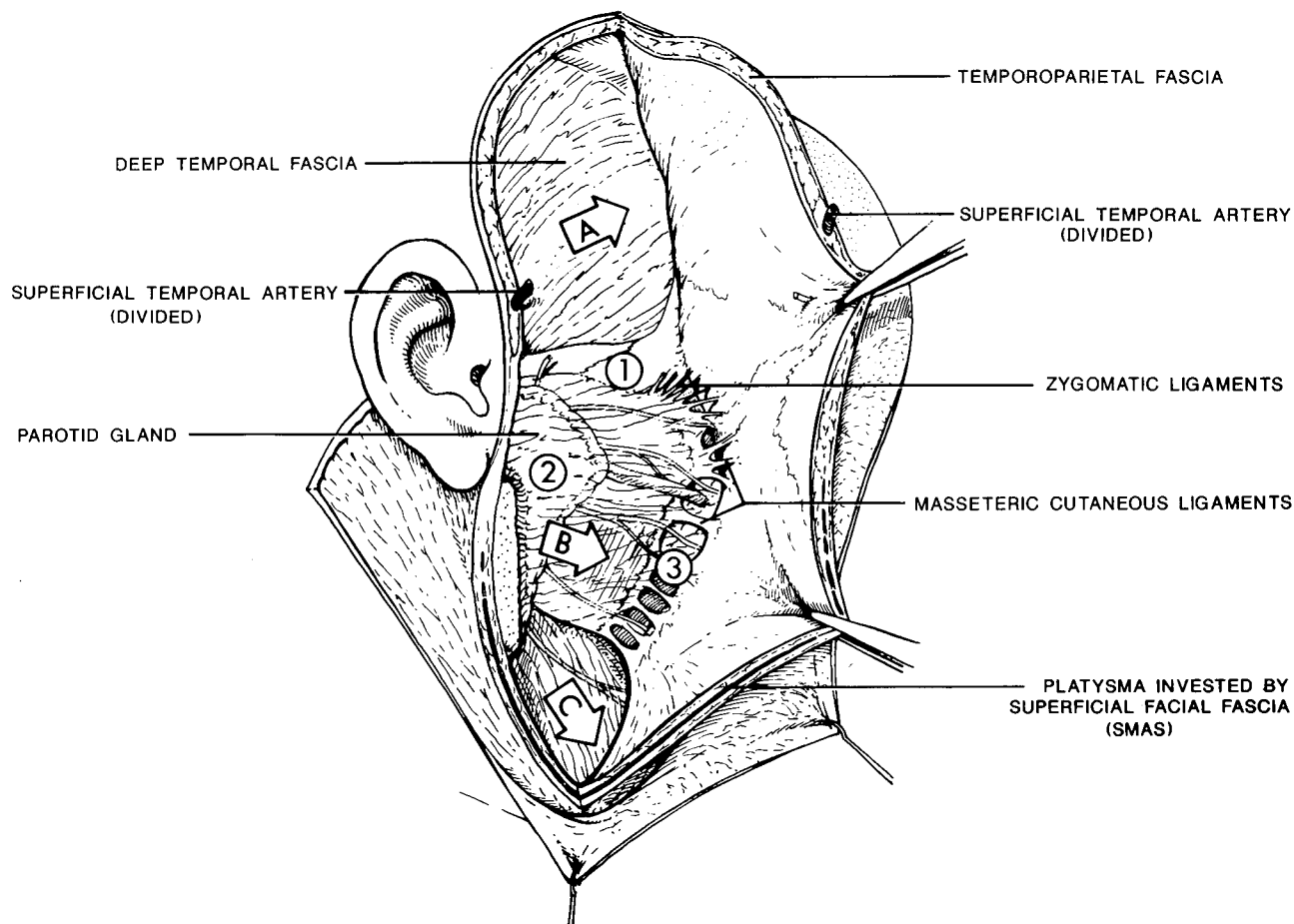
DEEP TEMPORAL FASCIA ⎯⎯⎯⎯⎯⎯

SUPERFICIAL TEMPORAL ARTERY ⎯⎯
(DIVIDED)

PAROTID GLAND ⎯⎯⎯⎯⎯⎯

TEMPOROPARIETAL FASCIA

SUPERFICIAL TEMPORAL ARTERY
(DIVIDED)

ZYGOMATIC LIGAMENTS

MASSETERIC CUTANEOUS LIGAMENTS

PLATYSMA INVESTED BY
SUPERFICIAL FACIAL FASCIA
(SMAS)

FIG. 3. Two types of relationships exist between the superficial and deep facial fascias. In some areas of the face, the superficial and deep fascia are separated by an areolar plane that exists within the temporal region between the temporoparietal and deep temporal fascias, directly overlying the masseter muscle, and deep to the platysma within the neck. In other locations within the face, the superficial and deep facial fascias are densely adherent to one another. Examples of this fibrous adherence exist along the zygomatic arch, overlying the parotid gland, and along the anterior border of the masseter muscle.

tinues into the face and has been termed the *pa-rotidomasseteric fascia.*[3,11,12] The significance of this anatomic layer lies in the fact that the *facial nerve branches within the cheek, as well as the parotid duct, lie deep to this deep fascial layer* (Fig. 2).

Within the neck, the deep cervical fascia is identified along the superficial surface of the strap muscles. Superior to the hyoid, this fascial layer is observed overlying the mylohyoid and can be traced superiorly over the mandibular body.[13,14]

Ascending into the face, this fascial layer is given several names. Overlying the parotid, the deep fascia has been termed the *parotid capsule* or *investing parotid fascia.*[1,3,6,14] More anteriorly, this fascial layer directly overlies the masseter and has been termed the *masseteric fascia.*[3,11,12] Medial to the masseter, the deep fascia lines the superficial surface of the buccal fat pad and also overlies the parotid duct.[15] The deep fascia

extends into the malar region, lying deep to the elevators of the upper lip. An extension of deep facial fascia superior to the zygomatic arch, within the temporal region, has been termed the *deep temporal fascia.*[16]

Relationship Between the Superficial and Deep Facial Fascias

In general, two types of relationships exist between the superficial and deep facial fascias. The most typical relationship is the separation of these fascias by an areolar plane, which is similar to the separation of facial planes elsewhere within the body. Areolar planes exist in the head and neck in specific locations, including (A) between the temporoparietal and deep temporal fascias within the temporal region, (B) in the cheek, between the SMAS and the parotidomasseteric fascia directly overlying the masseter muscle, and

(C) between the platysma and underlying strap muscles within the neck (Fig. 3).

In other regions of the face, rather than being separated by an areolar plane, the superficial and deep fascias are intimately adherent to one another through dense fibrous attachments. Dense attachments between the superficial and deep fascias exist (1) along the zygomatic arch, (2) overlying the parotid gland, and (3) along the anterior border of the masseter muscle (see Fig. 3).

Facial Nerve

The facial nerve is encompassed by the parotid gland in the lateral aspect of the face. Medially, it leaves the parotid to traverse along the superficial surface of the masseter muscle and in this location always lies deep to the parotidomasseteric fascia. Medial to the masseter, the facial nerve overlies the buccal fat pad. The buccal fat pad, parotid duct, facial artery and vein, and facial nerve lie in the same anatomic plane within the cheek[15] (Fig. 4). As the nerve branches proceed peripherally, they penetrate the parotidomasseteric fascia to innervate the overlying mimetic muscles.[9]

The frontal branch of the facial nerve is an anomaly. Unlike other nerve branches that lie deep to the deep facial fascia, once the frontal branch crosses the zygomatic arch, it traverses the temporal region alongside the undersurface and then peripherally within the investiture of the temporoparietal fascia (SMAS).[16-20] The temporal region, therefore, represents one area of facial anatomy where a complete violation of the SMAS layer can produce direct injury to a motor branch.

Retaining Ligaments

Facial skin is supported in normal anatomic position by retaining ligaments that run from deep, fixed facial structures to the overlying dermis.[21] In performing cadavar dissection, it appears that two types of retaining ligaments exist. First, there are true osteocutaneous ligaments, which are a series of fibrous bands that run from periosteum to dermis. The zygomatic and mandibular ligaments are examples of these structures. A second system of supporting ligaments is formed by a coalescence that occurs between the superficial and deep facial fascias in certain regions of the face (parotidocutaneous
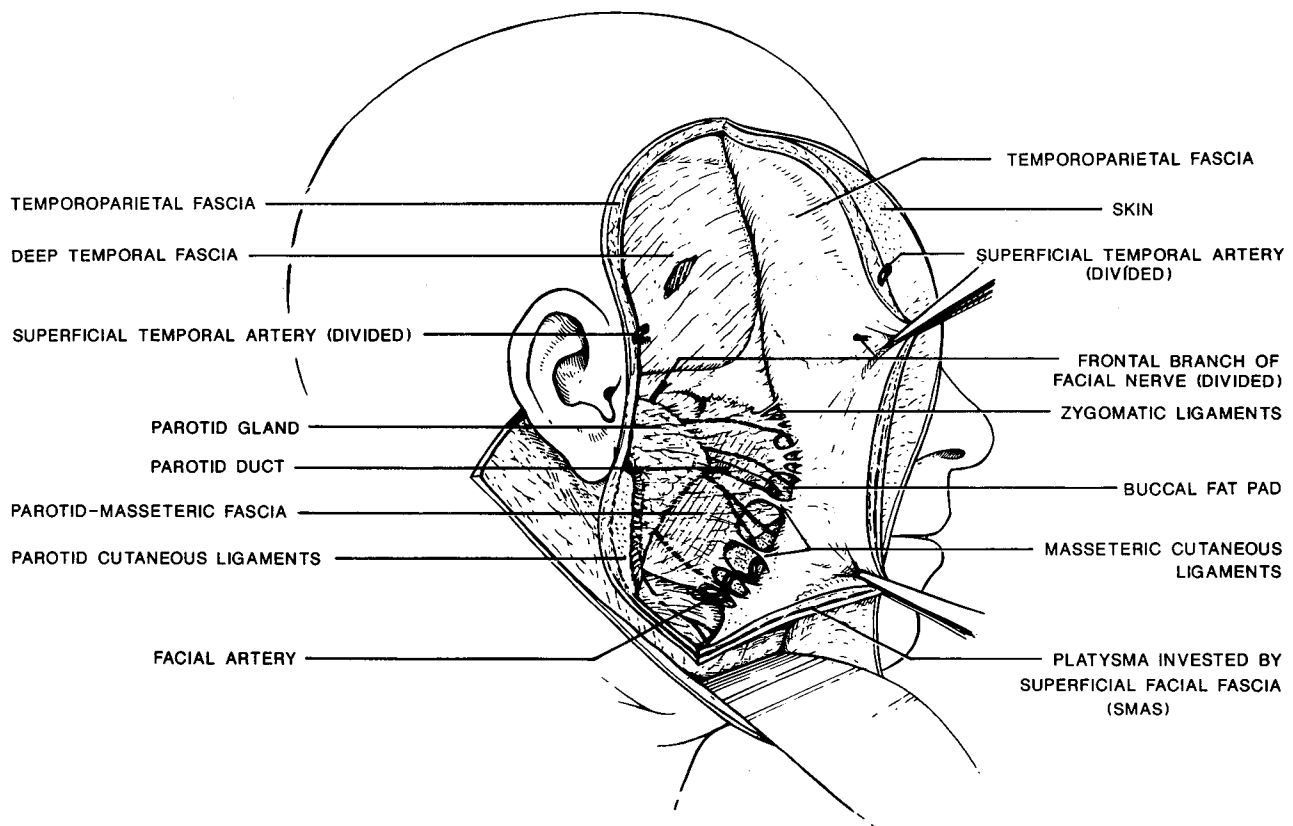

FIG. 4. Anatomic illustration following dissection of the SMAS-platysma complex in continuity with the temporoparietal fascia. Following elevation of the superficial facial fascia, the underlying deep facial fascia is exposed. Deep to the deep facial fascia lie the parotid gland, facial nerve branches, parotid duct, and buccal fat pad.

ligaments, masseteric cutaneous ligaments). These fascial connections, which fix both superficial and deep fascias to underlying fixed structures of the face, similarly lend support against gravitational forces through fibrous septa that extend into dermis (Fig. 5).

The zygomatic ligaments originate from the periosteum of the malar region. These ligaments exist as a series of fibrous septa that begin laterally in the region where the zygomatic arch joins the body of the zygoma. Similar fibers are observed overlying the malar eminence. A particularly stout ligament is noted to originate along the most medial portion of the zygoma, near the zygomaticomaxillary suture. The fibers comprising the zygomatic ligament extend through the malar pad (McGregor's patch) and insert into the overlying malar skin. The zygomatic ligaments fix the malar pad to the underlying zygomatic eminence.[21,22]

The mandibular ligaments are identified in the parasymphysial region of the mandible and extend from bone into the overlying skin. These ligaments securely fix the parasymphysial dermis to the underlying mandible.

Support of the soft tissues of the medial cheek is provided by a series of fibrous bands that extend along the entire anterior border of the masseter. These fibers are easily demonstrated in sub-SMAS dissection. Once the SMAS is elevated anterior to the parotid, an areolar plane exists between the superficial and deep facial fascias extending from the anterior border of the parotid to the anterior border of the masseter.[2,3,23,24] On reaching the anterior border of the masseter, a series of fibrous bands is identified along the entire length of the masseter beginning in the malar region and extending inferiorly to the mandibular border.[3,21] These fibers represent a coalescence between the superficial and deep fascias, extending from the masseter muscle vertically to insert into the overlying dermis. The fibers of the so-called masseteric cutaneous ligaments support the soft tissue of the medial cheek superiorly over the mandibular body (see Fig. 5).

ZYGOMATIC LIGAMENTS
ZYGOMATICUS MINOR M.
ZYGOMATICUS MAJOR M.
MASSETERIC CUTANEOUS LIGAMENTS
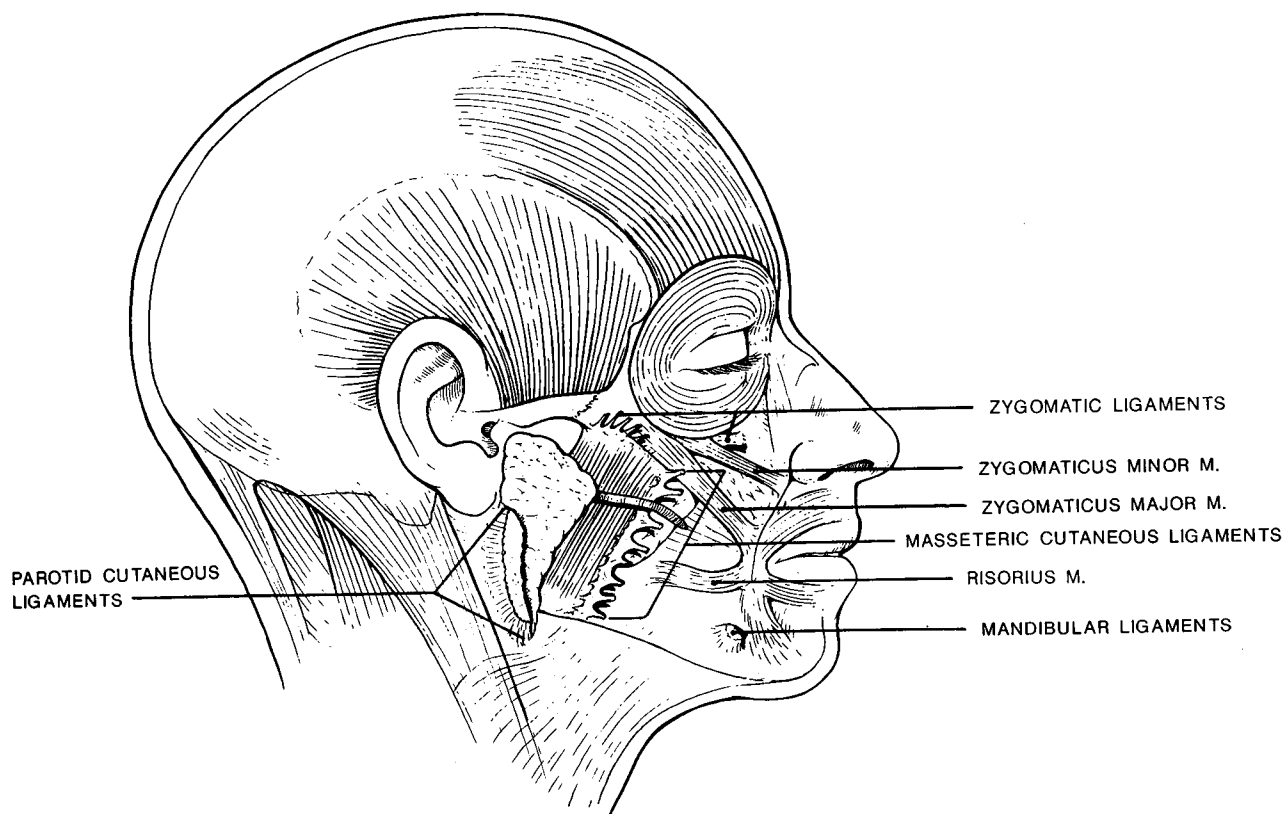RISORIUS M.
MANDIBULAR LIGAMENTS
PAROTID CUTANEOUS LIGAMENTS

FIG. 5. Facial soft tissue is supported in a normal anatomic location by a series of supporting ligaments. The zygomatic and mandibular ligaments are examples of osteocutaneous ligaments that originate from periosteum and insert directly into dermis. The masseteric cutaneous ligament and the parotid cutaneous ligaments are formed as a condensation between the superficial and deep facial fascias. Rather than originating from periosteum, these ligaments originate from relatively fixed facial structures such as the parotid gland and the anterior border of the masseter muscle. Attenuation of support from the retaining ligaments is responsible for many of the stigmata seen in the aging face.

DISCUSSION

While arranged within anatomic layers, the individual structures comprising facial soft tissue anatomically relate to one another to form a coherent, working structure that produces facial movement and resists gravitational change. An accurate understanding of these anatomic relationships is useful in gauging the clinical changes seen in the aging face and allows the surgeon to endeavor safely to reconstruct these deformities during rhytidectomy.

Furnas[21] is credited with describing the retaining ligaments of the face that support facial soft tissue in normal anatomic locations. In our dissections, two types of ligamentous support were seen. Discrete osteocutaneous ligaments (zygomatic and mandibular ligaments) originate from the periosteum and insert into the dermis. Other supporting ligaments are formed as a condensation between the superficial and deep fascias. Rather than originating from periosteum, they originate from relatively fixed facial structures, such as the parotid gland and the anterior border of the masseter muscle. As these ligaments become attenuated in association with the development of dermal elastosis, the stigmata of the aging face develop.

The importance of the zygomatic ligaments lies in their ability to suspend malar soft tissue over the zygomatic eminence. In aging, an attenuation of malar support is commonly seen, leading to an inferior migration of malar soft tissue. This soft-tissue ptosis occurs adjacent to the line of muscular fixation along the nasolabial fold. It is not that the fold deepens with aging, but rather malar soft tissue lateral to the nasolabial line accumulates, accounting for fold prominence in the aging face. Attempts at diminishing the prominent nasolabial fold therefore should be directed at a restoration of malar supports and repositioning of this malar soft tissue to its previous position[22,25,26] (Fig. 6).

Furnas[21] described what he termed the *platysma cutaneous ligament*. In performing sub-SMAS–platysma dissection, it becomes apparent that the fibers of the platysma cutaneous ligament originate deep to the platysma along the anterior border of the masseter. Perhaps a better term for these fibers would be the *masseteric cutaneous ligament.* The importance of these fibers lies in

FIG. 6. (*Left*) Patient seen at age 26, following full-face chemical peel. (*Right*) Same patient at age 57. Attenuation of the zygomatic ligamentous support suspending the malar pad and medial cheek has led to an inferior migration of these soft tissues adjacent to the line of muscular fixation of the nasolabial fold. It is not that the fold deepens with aging, but rather that an accumulation of malar soft tissue lateral to the nasolabial line accounts for fold prominence in the aging face.

their supporting the soft tissue of the cheek superiorly above the mandibular border. In our opinion, an attenuation of the masseteric cutaneous ligament leads to an inferior migration of cheek soft tissue below the mandibular border and is largely responsible for the formation of jowls in the elderly patient. If one examines the patient with prominent jowling, it is apparent that the jowl complex has anatomically constant borders. Anteriorly, the jowl is bordered by the tethering mandibular ligaments, while posteriorly, the jowl complex is located along the anterior border of the masseter (Fig. 7). Attempts at diminishing the prominent jowl should therefore be directed at restoring cheek support and repositioning the soft tissue forming the jowl complex superiorly above the mandibular border.

Controversy in the literature has existed over

FIG. 7. Attenuation of support from the masseteric cutaneous ligament allows the soft tissues of the medial cheek to descend inferiorly in the aging face, leading to the formation of the facial jowl. Because of the anatomic relationships of the retaining ligaments, the jowl has anatomically constant borders. Anteriorly, the jowl is bordered by the tethering mandibular ligaments, while posteriorly, the jowl complex is positioned along the anterior border of the masseter.

the anatomic relationship of the SMAS, platysma, and parotidomasseteric fascia.[1-3,6] Much of the variation in findings can be resolved with the understanding of the investiture of the superficial mimetic muscles by the SMAS. Rather than descriptions of the SMAS lying either superficial or deep to the platysma, our findings show the superficial fascia to be present along both surfaces of this muscle. The investiture of platysma by the SMAS forms a single anatomic unit that can be dissected in continuity to form a substantial myofascial flap that is the keystone of the SMAS technique in rhytidectomy.

We agree with the observation of Jost and Levet[2] that certain deeper-lying mimetic muscles do not have fascial investiture along their deep surface. Perhaps these muscles, which are not invested by the superficial fascia, are more concerned with movement of facial structures, such as the upper and lower lip, than with the movement of facial skin.

The anatomic relationship that exists between the superficial and deep fascias allows for extensive SMAS mobilization with little jeopardy to the facial nerve. Laterally, the SMAS is densely adherent to the underlying investing parotid fascia and requires sharp dissection for elevation in this region. These attachments must be completely divided during SMAS elevation to obtain adequate flap mobility.

Once the SMAS is mobilized anterior to the gland, an areolar plane exists overlying masseter muscle.[2,3,23,24] The SMAS can be elevated rapidly using blunt technique from the anterior border of the parotid as far forward as the anterior border of the masseter, where the fibrous septa of the masseteric cutaneous ligament are encountered. As long as the underlying parotidomasseteric fascia is not violated during this dissection, facial nerve injury remains an impossibility.

Continuing the SMAS dissection into the malar region must involve a change of dissection plane to preserve the facial nerve. Since the zygomaticus major and minor are innervated segmentally along their deep surfaces, continuing the subplatysmal dissection plane into the malar region, which would carry the dissection deep to the elevators of the upper lip, might result in motor nerve injury. For this reason, on reaching the zygomaticus major muscle, the preferred dissection plane should be along the superficial surface of the elevators of the upper lip.[26] Elevation of the thin fascia investing the superficial surface of

these muscles, along with the overlying fibrous malar fat, produces a substantial flap that can be used in restoring contour to the malar region and improving the nasolabial fold.[22,25] As long as malar dissection remains superficial to the elevators of the upper lip, motor nerve injury will not occur.

The degree of required SMAS mobilization will vary from individual to individual. Traction on this layer as it is mobilized and observing the effect of contouring on various regions of the face form a useful guide for the amount of SMAS dissection required.[27]

CONCLUSION

In summary, the anatomic changes that develop as people age are predictable and have an anatomic basis. As we begin to understand the anatomic changes that occur in aging, the aesthetic goals in rhytidectomy should include the reconstruction and restoration of the facial soft tissues to their original anatomic state and location.

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