Section 3

Facelift
Anatomically correct facial rejuvenation surgery is the basis for obtaining natural appearing and lasting results. The complexity of the anatomy of the face, and especially that of the midcheek, accounts for the formidable reputation of facial surgery. This is to the extent that many surgeons design their rejuvenation procedures around an avoidance of anatomical structures, and thereby limit the intent to camouflaging of the aging changes.

The purpose of this chapter is to establish a foundation for the advancement of facial rejuvenation surgery by defining clear general principles as the basis for a sound conceptualization of the facial structure.

A proper anatomical understanding is fundamental to mastery in facial rejuvenation for several reasons. The pathogenesis of facial aging is explained on an anatomical basis, and particularly the variations of the changes in individual patients. This is the basis of preoperative assessment from which follows a rational plan for the correction of the changes. The anatomy explains the differences between the many procedures available and the apparent similarities in their results. An accurate intraoperative map of the anatomy is essential for the surgeon for efficient and safe operating with minimal morbidity, and specifically addressing the overriding concern for the facial nerve.

**Functional evolution of the face**

The anatomy of the face is more readily understood when considered from the perspective of its evolution and the function of its components (Fig. 6.1). Located at the front of the head, the face provides the mouth and masticatory apparatus at the entrance to the embryonic foregut, as well as being the location for the receptor organs of the special senses: eyes, nose and ears. The skeleton of the face incorporates a bony cavity for each of these four structures. Those for the special senses have a well-defined bony rim, in contrast to the articulated broad opening of the jaws covered by the oral cavity. The soft tissues of the face, integral to facial beauty and attraction, are in reality, dedicated entirely to their functions.

The soft tissue overlying each cavity undergoes modifications to form the cheeks, including the lips, the eyelids, the nose, and the ears. For each there is a full thickness penetration through the soft tissue, around which superficial facial muscles are located for control of the aperture of the functioning shutter. This is most evident for the lids and lips in the human. While the primary function of the sphincteric shutters is to protect the contents of the cavities, they are further adapted to a higher level of functioning for the additional roles of expression and communication. The degree of precision required for this important secondary function requires the muscles to be more finely tuned and the soft tissue fixation modified, to allow mobility. The balance between these two opposing functions, movement and stability, is integral to the facial structure. Aging brings with it a change of the youthful balance, leading to altered expression on activity and at rest. It is a major surgical challenge to restore the youthful balance following rejuvenation surgery and to have normal dynamic appearance.

**Principle**

The combination of continued movement and delicate fixation of the tissues is the basis for the ligamentous laxity that predisposes to the characteristic sagging changes of the aging face.

**Regions of the face**

The traditional approach to the face in thirds (upper, middle and lower) while useful, limits conceptualization, as it is not based on the evolving structure. The significant muscles of facial expression are all located on the front of the face (anterior aspect) predominately around the eyes and mouth, where their effect is seen in communication. For these functional reasons the anterior aspect of the face contains the more
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delicate expressive areas, which are prone to developing aging changes (Fig. 6.2).

In contrast, the lateral face is relatively immobile as it passively overlies the structures to do with mastication, which are all deep to the investing deep fascia. These are the temporalis and masseter on either side of the zygomatic arch, along with the parotid and its duct. The only superficial muscle in the lateral face is the platysma in the lower third, which reaches no higher than the oral commissure. Internally, a distinct boundary separates the mobile anterior face from the lateral face. The vertically oriented line of retaining ligaments attached to the facial skeleton forms this boundary (Fig. 6.2).

The soft tissue of the anterior face is further subdivided according to where it overlies the skeleton and where it overlies the space of a bony cavity. Where there is no underlying deep fascia. The transitions defining the part of the cheek overlying bone, (the malar segment), and the mobile extensions (lower lid and the mobile cheek, nasolabial segment) over the spaces, are not visible in youth due to the shape of the youthful midcheek, which has a compacted rounded fullness. Subsequently, these transitions become visible due to aging laxity in the midcheek.

The facial nerve in relation to regions of the face

The level in which the facial nerve branches travel relates to the region of the face (Fig. 6.4). In the lateral face below the zygomatic arch the branches remain deep to the investing deep fascia. In the anterior face (and above the lower border of the zygoma) the branches are more superficial in relation to their muscles. The transition in levels occurs at the retaining ligament boundary, which is the last position of stability before the mobile anterior face. The nerves are protected here as they course outward to their final destination.

Layers of the face

The principles of facial structure can be summarized quite simply:
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1. The scalp is the basic prototype for understanding facial anatomy, as it is the least differentiated part of the face (Fig. 6.4).

2. The face is constructed of concentric soft tissue layers over the bony skeleton.

3. The five layers of the scalp are: (i) skin; (ii) subcutaneous; (iii) musculo-aponeurotic; (iv) areola tissue; (v) deep fascia.

4. The layers are not homogenous over the face proper, as they are modified in areas of function.

5. The key areas of function overlie the bony cavities, especially the eyelids and the cheeks and mouth.

6. A multilinked fibrous support system supports the dermis to the skeleton (Fig. 6.5). The components of the system pass through all layers.

7. At the transition between that over the skeleton to that overlying the cavities (eyelids and mouth) there is a modification of the anatomy.

8. The complexity of the facial structure results from the balance required between mobility and stability (ligamentous support).

It should be remembered that the complexity of the facial structure is entirely due to the bony cavities and their functional requirements. Transitional anatomy occurs at the boundary of the cavities, as in the scalp where the complexity of the glabella occurs where the forehead adjoins the orbital and nasal cavities. Here, the deeper facial muscles and related retaining ligaments attach to the skeleton.

Details of the layers

Layer one – skin

The structural collagen of the dermis is the outermost part of the fibrous support system and is intrinsically linked, both embryologically and structurally, with the collagenous tissue of the deeper layers. The thickness of the dermal collagen relates to its function, and tends to be in inverse proportion to its mobility. The dermis is thinnest on the eyelids and thickest on the forehead and nasal tip. The thinner, more mobile dermis is susceptible to an increased tendency for aging changes.
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Fig. 6.3  The internal structure of the midcheek is revealed by its surface anatomy when aging changes are present. The two functional parts of the midcheek relate to the underlying cavities and are separated by the oblique line of the midcheek groove (3) which overlies the skeleton. The midcheek has three segments. The lid–cheek segment (blue) and the malar segment (green) are within the periorbital part and are adjacent to the nasolabial segment (yellow) in the perioral part, which overlies the vestibule of the oral cavity. The three grooves defining the boundaries of the three segments interconnect like the italic letter Y. The palpebral-malar groove (1) overlies the inferolateral orbital rim and the nasojugal groove (2) overlies the inferomedial orbital rim, then continues into the midcheek groove (3). Mendelson Jacobson; Surgical Anatomy of the Midcheek: Facial Layers, Spaces, and the Midcheek Segments; Clinics in Plastic Surgery 2008 Elsevier.

Fig. 6.4  The layers of the face. The five layers of the scalp are a prototype of facial anatomy and the simpler basis for the more complex structure elsewhere on the face. Layer 4 is the most changed layer, consisting of alternating spaces and ligaments. The course of the facial nerve changes level at the ligamentous boundary transition from the lateral to the anterior face. Mendelson Jacobson; Surgical Anatomy of the Midcheek: Facial Layers, Spaces, and the Midcheek Segments; Clinics in Plastic Surgery 2008 Elsevier.
Layer two – subcutaneous

The subcutaneous layer has two components: (i) the subcutaneous fat, which provides volume and mobility, is supported by (ii) the fibrous retinacular cutis that connects the dermis with the underlying SMAS. Both components vary in amount, proportion and arrangement according to the specific region of the face.

In the scalp, the subcutaneous layer has a uniform thickness and consistency of fixation to the overlying dermis, whereas over the face proper, the subcutaneous layer has considerable variation in thickness and attachment. In the high function mobile areas bordering an aperture such as the pretarsal part of the eyelid and the lips, this layer is compacted and subcutaneous fat is not present, so that the layer appears to be non-existent.

Each of the three midcheek segments has a distinctly different thickness of subcutaneous fat. The subcutaneous layer is thinnest in the lid–cheek segment adjacent to the lid proper. In the malar segment the layer is moderately thick and uniform, whereas it is markedly thicker in the nasolabial segment, which has the thickest layer of subcutaneous fat of the face. Where the subcutaneous fat is thicker, the retinacular fibers are lengthened and more prone to weakness and distension. The thick subcutaneous fat in the nasolabial segment is named the malar fat pad, which is confusing terminology given that its position is predominately medial to the prominence of the zygoma in the perioral part of the midcheek.\(^1,4\) (Fig. 6.2).

Within the subcutaneous layer the attachment to the overlying dermis is stronger than on its deep surface, due to the tree-like arrangement of the retinacular cutis fibers (Fig. 6.5). In superficial, i.e. subdermal, dissection of the subcutaneous layer, many fine retinacula cutis fibers are encountered. At the interface with the underlying layer 3, there are fewer, though larger fibers and less subcutaneous fat, which appears not to descend fully to the interface where it overlies the superficial muscles, orbicularis oculi and platysma.

This explains why surgically the subcutaneous layer can be more easily dissected off the outer surface of the underlying muscle layer (orbicularis oculi and platysma) than over other parts of layer 3.

The retinacular fibers are not uniform across the face, but vary in their orientation and arrangement according to the region. This variation mirrors the anatomy of the underlying 4th layer. As will be more apparent when the 4th layer is discussed, the line of retaining ligaments continue vertically through the subcutaneous layer to form septae, that form boundaries which compartmentalize between more mobile areas.\(^5\) Accordingly, where the subcutaneous layer overlies spaces (in the 4th layer) there are no vertically oriented subcutaneous ligaments extending through. In contrast, the retinacular fibers overlying the spaces have a predominantly...
horizontal orientation, being in strata-like layers that are less restrictive to underlying movement.

**Clinical correlation** The variation in the arrangement of the retinacular cutis fibers accounts for the variability in ease of subcutaneous dissection between different parts of the face. Where the subcutaneous dissection overlies a space and the retinacular cutis fibers are more horizontal, the subcutaneous layer tends to separate relatively easily, often with simple blunt dissection. Where the subcutaneous dissection directly overlies a facial ligament, the vertical septae are responsible for a firmer adhesion between the SMAS and the dermis. Sharp dissection is usually required for release here.

**Layer three – musculo-aponeurotic**

To fulfill its functional role, the face contains skeletal muscle within its soft tissue structure. These ‘intrinsic’ muscles of facial expression are fundamentally different to skeletal muscles beneath the deep fascia, which move bones, because they move the soft tissues of which they are a part. All the muscles of the face are within this layer, enclosed to a varying degree within a fascial covering and lining. The muscles are all derived from the embryonic second branchial arch. The muscle precursors migrated into the facial soft tissues in a series of laminae, each lamina being innervated by its own branch of the facial nerve. While the definitive muscles have subsequently lost continuity with their origin, the facial nerve branches remain, like the vapor trail of an aeroplane, as an indicator of the migratory path.

In the anterior face, the migrated muscle masses are mainly located over and around the orbital and oral cavities. The double innervation of corrugator supercilii demonstrates the dual origins of the muscle from the supraorbital as well as the infraorbital migrating muscle mass.

![Fig. 6.6](image-url) Evolution of the facial muscles. The migratory path of the evolving muscles, including their connections and the multiple levels of the muscles, explain the definitive location of the facial nerve branches. The mandibular lamina splits into two trunks around the oral cavity. The upper trunk, the infraorbital lamina separates early for the developing midcheek while the mandibular lamina continues into the lower third. The two laminae later reconnect at the modiolus, which explains the two buccal trunks of the facial nerve. The infraorbital lamina in turn splits around the orbital cavity as well as branching to different depth levels.
In the prototype scalp, the third layer demonstrates key principles about the facial muscles. The superficial muscle, occipito-frontalis, moves the overlying soft tissues including the skin of the scalp and forehead. While the muscles have a minimal area of bony origin, which is remote (on the superior nuchal line), they have an extensive area of insertion into the overlying soft tissues.

The fibrous sheath enclosing the frontalis and occipitales is continuous across the entire scalp, whereas the enclosed muscles are discontinuous. Where the fascia is present without intervening muscle, the superficial and deep layers of the sheath are apposed and fused to form the galea aponeurotica. This is the basis for the aponeurotic part of the 3rd layer. The superficial fascial layer is thin where it overlies the muscle, and in areas such as over the forehead, muscle fibers extend into the subcutaneous layer. In contrast, the deep layer of the fascia is thicker, more supporting and provides a gliding surface at the interface with the underlying 4th layer. The original description of the SMAS (superficial muscloaponeurotic system) in 1976 was essentially a description of this 3rd layer, as is applied to the mid and lower thirds of the face. The flat superficial muscle component predominates in some areas of layer 3, while in areas without muscle the aponeurotic element predominates.

When a scalp flap is elevated, the flap naturally separates from the peristeum following release of minimal attachments in layer 4. A scalp flap, being a natural fusion of the outer three layers, is a composite unit, both anatomically and functionally. The fibrous component of the outer 3 layer is the superficial fascia of the face. The SMAS is the deepest of the three layers of the composite unit. In the mid and lower face the composite structure is also present, although less obviously apparent.

Layer 3 is a continuous generic layer of the face, which for descriptive purposes has different names to locate the particular part of the superficial fascia. Galea is the name of the scalp part and temporoparietal fascia where this layer extends over the temple, whereas over the orbital rim and upper cheek it is the orbicularis muscle and its fascia.

The definitive muscles in level 3 have a layered arrangement. The broad flat muscles form the superficial layer that covers the anterior aspect of the face: frontalis overlies the upper third and orbicularis oculi the middle third. The platysma, over the lower third extends onto the lateral face, presumably related to jaw movement, which functionally dominates the lower third. The superficial muscles are more closely related to the overlying subcutaneous layer than they are to the deeper structures. The superficial flat muscles have a minimal direct attachment to the bone. They are indirectly stabilized to the skeleton by ligament, located at the lateral border of the muscles. The frontalis is fixed by the superior temporal ligament along the superior temporal line, the orbicularis oculi is stabilized by the main zygomatic ligament at its inferolateral border and the platysma is stabilized at its upper border by the upper key masseteric ligament (Fig. 6.15).

The composite three-layer structure of the outer face suggests it would be no less logical to use the SMAS as a 'surgical carrier' for the overlying soft tissue layers, than it is with a scalp flap.

The deeper muscles within layer 3 are concentrated only in areas of greater function, which is to do with the bony cavities. For the upper third they are corrugator supercili and procerus. Around the oral cavity, the deeper muscles are the elevators (zygomaticus major and minor, levator labii superioris, levator anguli oris) and depressors (depressor anguli oris, depressor labii inferioris) of the oral sphincter. Compared to the superficial muscles, the deep muscles arise from a relatively larger origin on the skeleton close to the target soft tissue and have a short course through layer 4 to a more focused area of insertion. Interestingly, the deeper intrinsic muscles of the eyelids, the levator and capsulopalpebral fascia arise not from these facial muscles, but from within the orbit.

Layer four
In the scalp, layer 4 is a gliding plane, without structure, other than the loose areolar tissue that allows movement of the overlying composite superficial fascia secondary to contraction of occipito-frontalis. There are no structures traversing the layer and impeding movement. However, where the scalp is attached at its boundary with the temple along the superior temporal line and across the superior orbital rim there is a form of ligamentous attachment. This anatomical arrangement illustrates the basic pattern of layer 4.

In the scalp the anatomy of the fourth layer is so inherently simple and safe for surgery that a subgaleal scalp flap is the easiest and most natural layer in which to dissect. In contrast, layer 4 over the face proper, is the most complex and most dangerous level to dissect. This complexity results from the compaction of the midcheek components during vertebrate evolution, such that the cavities and the structures to do with their dynamic activity are in such close approximation that they overlap. In addition, layer 4 is the battleground in which the fight between mobility and stability is played out.

The following structures are contained within layer 4, but each is distributed in different areas:
1. Retaining ligaments of the face.
2. The deep layer of the intrinsic muscles.
4. Non-mobile areas of important anatomy.
5. Facial nerve branches.

The complexity of the anatomy within layer 4 becomes simplified when it is understood how these structures are arranged. The following principles assist with this understanding:

- Overlying the skeleton, layer 4 is essentially composed of a series of ‘spaces’ and non-mobile areas of important anatomy.
The spaces are mobile functional areas. Each space has a definite boundary and minimal fixation.

- The boundaries tend to be the least mobile part of the soft tissue.
- The retaining ligaments are located within and reinforce the boundaries that separate the different functional areas.
- The intrinsic muscles of the deeper layer attach to the bone within the boundaries.
- Superficially, the muscles insert into the mobile soft tissues in layer 3, in the area of maximum mobility.
- All the deep muscles of clinical significance attach to the bony border of the oral cavity.
- The retaining ligaments and muscle origins share a bony origin at the boundary.
- A line of ligamentous attachment continues around the perimeter of the bony cavities.

**Principle**

The five-layered soft tissue anatomy should be considered in its two variants:

1. that overlying the skeleton, and
2. that overlying the bony cavities.

To allow physical movement of the soft tissue over the rigid skeleton subsequent to contraction of the superficial muscles, the soft tissue of the face incorporates a unique anatomical arrangement in the form of a series of spaces. Movement is possible only because of the presence of spaces beneath the muscles. The spaces are located between places of fixation. The facial spaces are in two forms:

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**Fig. 6.7** Relationship between muscles and underlying spaces. Movement occurs where there is muscle in layer 3 and a related space in layer 4. The spaces are, from above: the preseptal space of the lower lid, the prezygomatic space, the masticator space for the buccal fat pad and the premasseter space.
1. Spaces provided by the bony cavities; the preseptal and conjunctival spaces of the eyelids within the orbit and the vestibule of the oral cavity beneath the lips and the nasolabial segment of the cheeks.

2. Soft tissue spaces overlying the facial skeleton between the bony cavities. The series of tissue spaces between level 3 and level 5 are voids in the attachment of the mobile soft tissues to the underlying skeleton.

The significance of the spaces is only now becoming appreciated. The spaces are not only essential for function; their presence explains much about the changes that occur with facial aging. The appearance with aging of malar mounds, jowls and labiomandibular folds is due entirely to changes of previously unrecognized facial soft tissue spaces.7

Retaining ligaments of the face The retaining ligaments of the face are located in specific locations.8,9 These are in between areas of movement (spaces). The trunks of the ligaments pass out through layer 4 as part of the multilinked fibrous support system.2,10 These structures were not originally thought of as being ligaments as they are not part of the musculoskeletal system and do not have the typical appearance of ligaments, such as the cruciate ligament. However, a ligament is, by definition, a fibrous structure that binds or ties adjacent structures. The soft tissue ligaments take varied forms consistent with the functions of the face.

Principle
Where there is a muscle in the face there is always a related space.

Fig. 6.8 The three morphologic forms of facial ligaments. Moss CJ, Mendelson BC, and Taylor GI. Surgical anatomy of the ligamentous attachments in the temple and periorbital regions. Plast Reconstr Surg 2000;105:1475.
The lateral face immediately in front of the ear is not a mobile area. This zone of no movement extends forward of the ear cartilage for 25 to 30 millimeters due to an important, but little appreciated, area of ligamentous attachment the platysma auricular fascia (PAF). The PAF is unique because it is two layers formed into one structure. It consists of a diffuse area of layer 4 ligament that binds the SMAS with the underlying parotid massesteric fascia and parotid capsule. It includes the part of the SMAS (layer 3) between the ear cartilage and posterior border of the platysma. It is both part of the SMAS (layer 3) as well as ligament (layer 4). The retinacular cutis overlying the PAF is ‘dense’ because it does not overlie a space. Forward of the anterior border of the PAF where the platysma is present, the soft tissue layers are mobile.

Clinical correlation The unique qualities of the PAF are important for facelift. When a traditional SMAS facelift is performed it is not easy to elevate the preauricular SMAS (as involves splitting the fused components of the PAF). This is a difficult dissection because it is not a natural plane of separation as it is, for example, when elevating the SMAS where it overlies a space. The fused PAF gives strength to the tissues, which is an advantage for holding the sutures used to fix the advanced mobile SMAS and posterior platysma.

If tightening laxity of the anterior face is to be achieved, when operating through the lateral face, the surgeon must bypass the vertical line of retaining ligaments if they remain sufficiently strong to be providing resistance to any traction effect (Fig. 6.10).

In the anterior face the ligaments are arranged around the entrance of each bony cavity. As there are not any retaining ligaments from within the bony cavities to provide support for the mobile shutters of the lids and lips, there is a compensatory gathering of the ligaments at the last place available for skeletal support.

Sub-SMAS facial spaces The sub-SMAS layer 4 is largely composed of ‘spaces’. These intervals have defined boundaries and in the boundaries are located the retaining ligaments. The spaces are by definition safe spaces, because there are no structures within and no structures cross through the spaces. This is important for the surgeon, as all facial nerve branches are outside the spaces. Because spaces allow movement, laxity develops more of the space than occurs in the ligamentous boundaries. This differential laxity accounts for much of the characteristic changes of aging.

Principle The soft tissue spaces offer the surgeon ‘predissected’ areas, which avoids the need for dissection. This means reduced of bleeding, bruising and risk of facial nerve trauma.

When operating in the upper temporal space, in the interval between the superficial temporal (temporoparietal) fascia and the surface of the underlying deep temporal (temporalis muscle) fascia, simple blunt dissection only is sufficient to separate the loose areolar tissue and convert a potential space into a real space. A different surgical approach is required when the ligamentous boundaries are released as the temporal branches of the facial nerve branches are in proximity.
The ligamentous boundary that separates the forehead space from the upper temporal space is the superior temporal septum, which originates along the superior temporal line (the zone of fusion). Within the temple a second fibromembranous ligamentous structure, the inferior temporal septum, crosses the outer surface of the deep temporal fascia and separates the upper temporal space from a lower triangular-shaped zone containing detailed temporal anatomy. The superior temporal septum and the inferior temporal septum meet at the respective corners of the triangular-shaped temporal ligament, (also called orbital ligament), an area of ligamentous adhesion to the underlying periosteum and adjacent deep temporal fascia (Fig. 6.11).

As seen in the prototype forehead and temple, the fourth layer is composed of a series of spaces that are separated by boundaries containing the facial ligaments, the deeper facial muscles and facial nerve branches. Because of the greater movement of the middle and lower thirds of the face, soft tissue spaces are more required.

The prezygomatic space overlies the prominence of the body of the zygoma and allows displacement of the orbicularis oculi, pars orbitale, in its roof (Fig. 6.12). The triangular-shaped space correlates with the shape of the bony platform and bounded above by the orbicularis retaining ligament and inferomedially by the line of zygomatic ligaments. Contraction of the overlying muscle results in visible zygomatic smile lines inferior to the horizontal crow's feet lines. With aging laxity of the roof these zygomatic lines become increasingly prominent and may eventually be present at rest. Further laxity may result in a bulge of the roof of the space at rest, so the called malar mounds, or malar bags (also called malar crescent). The presence of these changes indicates laxity of the orbicularis for which tightening is the treatment. When operating in the prezygomatic space it is logical and inherently safer to use blunt dissection with an appropriate surgical instrument, or finger.

The premasseter space in the lower third of the lateral face is analogous with the temporal space in overlying the deep fascia of a muscle of mastication. Opening of the jaw without restriction from the overlying soft tissue requires that movement of the soft tissues be provided by the premasseter space. Eventually, laxity develops in the platysma roof of the space and its attachment along the inferior and anterior boundaries leading to the bulging that forms the jowl and the labiomandibular fold (Fig. 6.15).

The masticator space (also called the buccal space on account of its content, the buccal fat pad) is different in character being on the anterior face (Figs 6.7, 6.13). It underlies the midcheek medial to the masseter. Similar to the oral cavity, the masticator space facilitates movement of the underlying nasolabial segment of the midcheek. Aging results in weakness of support of the boundaries and roof especially from attrition of the masseteric ligaments. As a result, the platysma becomes less closely bound to the masseter, allowing the masticator space to bulge inferiorly below the level of the oral commissure and into the lower face (Fig 6.15). With
major decent the buccal fat comes to overlie the anterior border of the lower masseter, such that the fullness of the displaced fat increases the prominence of the labiomandibular fold.

Surgical access to the masticator space is through the weakened borders with the adjacent spaces, either the premasseter space or oral cavity or the periosteum over the lower zygoma.

**Areas of important anatomy** Over the lateral face, on either side of the zygomatic arch, are two similar areas containing important anatomy (Fig. 6.9). These have not been specifically mentioned in the surgical literature, so for purposes of description they are described here as the lower temporal and upper massesteric areas of important anatomy, as they are neither spaces nor ligaments. By definition they aren’t spaces, as they have anatomical structures which are not lined by membrane. They both have soft fat protecting their contents, and can be gently opened, like a space, using gentle dissection.

The lower temporal area of important anatomy between the upper temporal space and the arch is the passageway from the lateral face into the upper third (Fig. 6.11). The temporal branches of the facial nerve are suspended from the roof, in a wafer-like strata of protective fat, immediately inferior to the inferior temporal septum. The contents, which cross the area from deep to superficial, include both zygomatico-temporal nerve branches and the sentinel vein. The upper massesteric area of important anatomy between the inferior border of the arch and the premasseter space is the route from the lateral face through to the midcheek and upper jaw. Here, structures course along, but do not cross from deep to superficial. These include the anterior extension of the parotid gland, its accessory lobe and the parotid duct. The zygomatic branch is above and the upper buccal trunk of the facial nerve is inferior to the duct.
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Fig. 6.12  A&B. The prezygomatic space overlies the body of the zygoma. The origins of the zygomatic muscles extends under the floor. The roof is formed by the orbicularis oculi lined by the SOOF (suborbicularis oculi fat). The upper ligamentous border formed by the orbicularis retaining ligament is not as strong as the zygomatic ligament reinforced lower border. Mendelson BC, Muzaffar AR and Adams WP, Jr. Surgical anatomy of the midcheek and malar mounds. Plast Reconstr Surg 2002;110:885.

Fig. 6.13  The rhomboidal-shaped premasseter space overlies the lower half of the masseter. The roof of the space is formed by platysma in the SMAS. The posterior border is defined by the anterior edge of the strong PAF and the anterior border is reinforced by the masseteric ligaments near the anterior edge of the masseter. The inferior boundary is mesenteric-like and does not contain any ligament. Weakness of attachment of the platysma roof at the inferior boundary leads to the formation of the jowl directly behind the strong mandibular ligament. The masticator space containing the buccal fat is anterior to the upper masseteric ligaments. All facial nerve branches course around and outside the space. The surgically important mandibular branch, after leaving the fixed PAF, courses under the inferior boundary of the space then rises onto the highly mobile outer surface of the mesenteric inferior border before reaching the mandibular ligament. With kind permission from Springer Science+Business Media. Aesthetic Plastic Surgery, Surgical Anatomy of the Lower Face: The Premasseter Space, the Jowl, and the Labiomandibular Fold, 32(2), 2008, 185–195, Mendelson, Freeman et al, figure 3.
Careful dissection in this area may be required to access the lateral zygomatic and upper massteric ligaments.

**Facial nerve branches** Confidence in the performance of facial surgery comes from understanding the course of the facial nerve branches, and this is based on the anatomy of the facial layers as previously described. The nerve branches remain deep to layer 5 in the lower two thirds of the lateral face. The final pathway of the nerves to the anterior face is on the underside of the muscles in layer 3.

**Clinical correlation** The facial nerve branches are ‘at greatest risk’ where they transverse layer 4 to access layer 3. The nerves cross this level in predictable locations, which is along the vertical ligamentous line defining the lateral face/ anterior face transition where they are under the protection of the retaining ligaments (Figs 6.4, 6.7).

The temporal and mandibular branches are the most important facial nerve branches in terms of surgical risk. The temporal branches gain the underside of layer 3 immediately on leaving the parotid, inferior to the zygomatic arch. These branches course within a wafer-like layer of fat contained in a fibrous envelope suspended from the underside of the temporal SMAS, as they course over the arch and the lower temporal triangle where they are immediately inferior to the inferior temporal septum (Fig. 6.11). The temporal branches can be safely avoided by maintaining the plane of dissection directly on the outer surface of the deep temporal fascia and avoiding compression neurapraxia from retractor pressure.

The mandibular branches are at risk where they are fixed by having a close relationship to ligament. Initially, this is within the PAF, and then well anteriorly by the mandibular ligament (Fig. 6.13). Over most of its course, where it is in relation to the premasseter space, the nerve is mobile. The absence of retaining ligaments along the mandible between the PAF and the mandibular ligament allows an inherent mobility of the tissue. For this reason, it is not necessary to dissect in the immediate vicinity of the mandibular branch in order to correct laxity of the platysma overlying the jaw and submandibular triangle.

**Layer six**

Over the lateral face the muscles of mastication largely conceal the skeleton and here the deep fascia equivalent is the deep temporal and masseteric fascia, which also provide attachment for retaining ligaments. The investing layer of deep cervical fascia is the corresponding layer in the neck. The deep fascia is traditionally taken to be the deep boundary of the territory for aesthetic surgery. However, in recent times this boundary is transgressed for subperiosteal ‘lifting’ and for bone contouring procedures. In the neck it is incised for access to the deeper located submandibular gland.

The periosteum is the carrier for all the overlying structures when a subperiosteal upper third or mid-facelift is performed. The effect of its displacement is transmitted through all levels of the multi-ligamentous support system.

Inherently the anatomy of the periosteum imposes limitations, which impose special surgical considerations:

1. An overcorrection is required to compensate for the ‘lift lag’ phenomenon. This is to compensate for the accumulated aging changes throughout the entire ligamentous support system to the dermis, in order to transmit sufficient effect to obtain the desired changes of shape and tone to the skin.
2. There is inherently more benefit from subperiosteal lifting where the overlying soft tissue layers are more tightly attached. This occurs overlying the skeleton, but less so over the bony cavities as there is no periosteum in the eyelid or the mobile part of the cheek, the nasolabial segment.
3. Because of the unyielding nature of periosteum, an extensive undermining is needed beyond the immediate area for intended correction. The alternative is to perform a ‘periosteal release’, that is to incise the periosteum at the boundary. This boundary release is commonly performed along the superior orbital rim and less consistently along the boundary with the lateral face.

**Layer five**

The deepest soft tissue layer of the face is the deep fascia. This is in the form of periosteum overlying the bony skeleton, which has, for the most part, a mobile covering of preperios- teal fat through which pass the attachments for the deep facial muscles and the facial ligaments. In the mobile soft tissue shutters covering the bony cavities, there is no periosteum and the fifth layer is not a structural layer but a mobile lining layer derived from the cavity. That is conjunctiva or oral mucosa.

Over the lateral face the muscles of mastication largely conceal the skeleton and here the deep fascia equivalent is the deep temporal and masseteric fascia, which also provide attachment for retaining ligaments. The investing layer of deep cervical fascia is the corresponding layer in the neck. The
Most of the movement of the face results from the muscular activity in the soft tissues overlying the spaces, and the surrounding periorbital tissues for the orbits. The movement occurring on the lateral face is essentially passive, secondary to active movement of the muscles on the anterior aspect of the face around the eye and the mouth, and to jaw movement.

Retaining ligaments are a feature of the skeletal anatomy and are not present in the spaces. Because layer 5 deep fascia is not present over the bony cavities, there is no base for ligament attachment. As ligaments do not exist over the cavities, there is not the same vertical reinforcement through to the retinacular cutis.

Around the bony rims there are anatomical and functional transitions between the relative stability over the fixed area of skeletal attachment and the high mobility of the soft tissue shutters over the bony cavities. This is mainly in layer 4, where there is a concentration of ligaments around the bony rims, at the last available place for soft tissue ligament fixation before the void of the bony cavity.

The generic 5 layer concept also explains the soft tissue anatomy where it overlies the bony cavities. The submuscular space of the lower lids, between the septum orbitale and the overlying preseptal orbicularis, allows mobility of the lids. This space contributes to the pattern of aging changes, particularly the development of lower lid bags. The oral cavity is the largest of the facial spaces and allows movement of most of the midcheek as well as of the lips.

The layers undergo significant adaptations as they leave the bone surface and continue over the orifices. Only the outer three-layer composite superficial fascia forms these soft tissue extensions that are in the form of a composite flap. The SMAS layer within the flap extension has the sphincteric orbicularis muscle around the free edge of the soft tissue aperture of the lids and lips. The facial ligaments in (layer 4) that normally support the composite soft tissue shutters do not exist over the cavities. They are remote where they are condensed along the rim of the bone. This is the basis for the periorbital ligament around the orbital rim, of which the lower lid part is the orbicularis retaining ligament, which stabilizes the overlying orbicularis to the orbital rim periosteum (Fig. 6.11). The orbicularis does not have any attachment to the septum orbitale, (deep fascia) directly beneath, other than the attachments of the orbicularis to the medial and lateral canthal tendons and the nearby orbital rim periosteum.

The lining layer beneath the composite shutters is derived from the underlying cavity (conjunctiva, oral mucosa).

The extent of the oral cavity has a major impact on the facial structure and on aging of the face. The vestibule of the oral cavity covers a large area of the surface of the maxilla and of the mandible (Fig. 6.13). The part of the skeleton underlying a space is unavailable for ligamentous attachment for support of the soft tissue cover over this large area. Accordingly, the non-attached cheek overlying the oral cavity is the least supported and most mobile part of the face. The indication for a facelift is largely to correct the changes that occur in this poorly supported part of the cheek around the lips.

**Anatomy and aging of the face**

The youthful face has the appearance of rounded fullness. Laxity gradually develops in the boundaries of the spaces consequent on the repetitive movement that occurs with expression and jaw function. The laxity develops most in the roof of the spaces (level 3). The membranous lining of the spaces undergoes distension in proportion to the degree of laxity developing in the adjacent retaining ligaments, although these are not uniformly affected by laxity. For example, in the lower face the lower masseter ligaments at the anterior boundary of the premasseter space undergo attrition, yet the nearby mandibular ligament remain strong and resist laxity (Fig. 6.15).

As aging changes progress, the bulging over the spaces contrasts with the restriction imposed by the ligaments at the boundaries. These do not bulge as much and form the cutaneous grooves (Fig. 6.3).

### Principle

The pattern of laxity in the roof and walls of the spaces largely determine the characteristic appearance of the changes of aging.

### Application of anatomy to surgical technique

Many facelift techniques deliver comparable results. However, the difference on closer analysis is in the extent of harmonious facial shape achieved and the balance between skin tension and shape. Excessive tension flattens natural shape. This is anatomical, and specifically determined by the level in which the dissection has been performed and the layer used for redraping.\(^\text{16}\)

The dissection is performed to gain access to the lax tissues of the anterior face. The advancement is applied directly to the layer that has been mobilized on the upper surface of the dissection plane. There are three possible layers on which to apply the traction force: skin (layer 1); SMAS (layer 3); and periosteum (layer 5), this layer being the carrier for the overlying (undissected) tissue. When a subcutaneous dissection is performed, there is also the option to tighten the exposed surface of the deeper layer (SMAS because the underlying SMAS does not need to be dissected where it overlies a space). Here the SMAS is inherently mobile and laxity here can be tightened by plication or imbrication.

The more superficial the carrier layer for the overlying lax soft tissues, the more direct and the effective is the benefit of the redraping on layers 1 and 2. Accordingly, periosteal redraping has the least benefit for major laxity of the skin and subcutaneous layer.
Fig. 6.14 The anatomy over the skeleton and over bony cavities, showing the relationship of soft tissue spaces to bone cavity spaces.
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Fig. 6.15  The facial spaces and their role in aging of the face. Youthful (left), aged face (right). Distension of the facial spaces occurs secondary to laxity of their ligamentous boundaries. This process is most pronounced in the roof of the spaces: lower lid bags (preseptal space of lower lid), malar mounds (prezygomatic space), nasolabial folds (vestibule of oral cavity), jowls (premasseter space) and labiomandibular folds (masticator space). Greater laxity occurs in the lower facial spaces due to movement of the jaw. The masseteric ligaments, illustrated, along the anterior border of the masseter, undergo attrition with distension on aging, so that the overlying platysma loses its close relation with the masseter and mandible, leading to the development of jowls and labiomandibular folds.

Fig. 6.16  The alternative levels for dissection and redraping in facelifts. Dissection can be performed through any one of three alternate layers, namely: subcutaneous (layer 2), sub-SMAS (layer 4) and subperiosteal (layer 6) (for the upper two thirds of the face). With kind permission from Springer Science+Business Media: Eisenmann-Klein & Neuhann-Lorenz; Innovations in Plastic and Aesthetic Surgery, 2008 p.145–49, Advances in Understanding the Surgical Anatomy of the Face, Mendelson BC, Figure 18.1.
Application to facelift, levels of dissection

When a facelift is initiated over the lateral face, the level of dissection can be changed at the transition to the anterior face, e.g. subcutaneous for lateral face extended to sub-SMAS for the anterior face, or vice versa. Because the objective of the surgery is correction of the laxity of the mobile anterior face, the level of dissection used for the lateral face is of secondary importance.

Level 4: sub-SMAS

Understanding the anatomy of layer 4 allows sub-SMAS dissection to be utilized in a proactive manner. This provides many advantages based on the fact that the spaces are naturally predissected areas, so the surgical dissection is quick, easy and atraumatic. The surgical approach is commenced with a subcutaneous dissection, which is extended forward until over the posterior part of the roof of the appropriate space. The space is then entered, using traction on the layer 3 roof. Once inside the space, blunt dissection only is used to define the boundaries.

If dissection anterior to the space is required, the position of the ligaments and nerves is indicated by the knowledge that they are located within the boundaries. Precise dissection is now used to locate the residual retaining ligaments by their tethering effect and then to release the ligaments as is necessary. In younger patients this step is more difficult, as more ligament is present and it is tighter because of less aging attrition.

The anatomy of the relationship of the nerves to the ligaments here provides a guide to the technique. Because the facial nerve branches are immediately adjacent to the ligaments, precise dissection is now necessary. Blunt scissors are used in a gentle spreading motion oriented in a vertical, i.e. outward direction. This provides maximum effect on the ligament while having a nerve-sparing effect at the same time. The surrounding areolar and fatty tissues separate to clearly reveal the ligament and any related nerves. Now, under visual control, the ligament yields to the tissue stretching force while the nerve, being more mobile and obliquely oriented, is not tightened and can be dislodged out of the way, being unaffected by the controlled stretching force.

The spaces can be used, like stepping stones, to safely navigate across the face. In fact, the spaces have long been used in facial surgery, without considering them in these conceptual terms. Some examples include:

- The transconjunctival (space) approach to access the preseptal space of the lower lid.
- The deep temporal lift dissection from the upper temporal space, around the lateral orbital rim, into the prezygomatic space.
- The premasseter approach to the masticator space, used to reduce displaced buccal fat and to tighten laxity of the overlying superficial fascia lateral to the oral commissure.
- The transconjunctival (space) approach to access the preseptal space of the lower lid.
- The deep temporal lift dissection from the upper temporal space, around the lateral orbital rim, into the prezygomatic space.
- The premasseter approach to the masticator space, used to reduce displaced buccal fat and to tighten laxity of the overlying superficial fascia lateral to the oral commissure.
- The transconjunctival (space) approach to access the preseptal space of the lower lid.
- The deep temporal lift dissection from the upper temporal space, around the lateral orbital rim, into the prezygomatic space.
- The premasseter approach to the masticator space, used to reduce displaced buccal fat and to tighten laxity of the overlying superficial fascia lateral to the oral commissure.
- The transconjunctival (space) approach to access the preseptal space of the lower lid.
- The deep temporal lift dissection from the upper temporal space, around the lateral orbital rim, into the prezygomatic space.
- The premasseter approach to the masticator space, used to reduce displaced buccal fat and to tighten laxity of the overlying superficial fascia lateral to the oral commissure.

Principle

It is inherently easier and safer to enter the SMAS where it overlies a space, rather than where it is fixed by ligament.

When the ‘deep plane facelift’ was introduced, the term ‘deep’ referred to dissection in level 4, deep to the SMAS. Although not clear at that time, the deep dissection was only over the lateral face as the level of dissection changed to more superficial (deep subcutaneous level 2) at the transition to the anterior face and over the level 3 muscles, orbicularis and zygomaticus major. The deep plane procedure evolved into the ‘composite facelift’, the difference being that the sub-SMAS plane of dissection was also used in the anterior face. Sub-SMAS dissection over the midcheek can be approached either through the lateral approach (extended SMAS), or directly through the anterior face via the lower lid (zygobulbaric dissection).

Level 2: subcutaneous

The subcutaneous layer is unique in having a thickness. This provides options regarding the level in the layer to perform the dissection.

Principle

The ease of dissection varies at different levels within the subcutaneous layer.

When performing a subcutaneous dissection, knowledge of the spaces in level 4 is beneficial in explaining the easier dissection where the subcutaneous layer overlies superficial muscle, especially over orbicularis oculi and platysma. The movement of the muscle is associated with lesser attachment of the subcutaneous layer at this interface, and the orientation of the retinacular fibers overlying the surgical spaces (beneath the muscle) is more horizontal.

Principle

At any point in the subcutaneous layer the orientation of the retinacular cutis fibers reflects the underlying anatomy of level 4.

The intended role for the fibrous retinacular cutis in the rejuvenation determines which level within the subcutaneous layer to perform the dissection. If the skin flap is to be used for the redraping, the fibrous retinacular component should be left on the flap by performing a ‘deep’ level of subcutaneous dissection. If external plication of the anterior SMAS is the objective, a deep subcutaneous level of dissection is required to visualize the outer surface of the SMAS. This level of deep subcutaneous dissection at the interface with level 3 has been given several names: the superficial musculoaponeurotic plane (SMAP) and the extended supraplatysma plane (ESP).
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Alternatively, when a ‘separate’ SMAS flap is to be used, it is advantageous to keep most of the retinacular cutis mass attached to the SMAS, as this optimizes the strength of the thin SMAS flap. This is achieved with a superficial level of subcutaneous undermining, the so-called, ‘thin skin flap’.\(^\text{24,25}\)

Principle

The shape of the face is the product of the shape of the facial skeleton and of the quality of attachment of the overlying soft tissues.

Summary

This chapter has been structured to assist the reader to develop a conceptual understanding of facial anatomy. It is the missing framework on which to attach the detailed anatomical information now available in the literature. Once understood, this anatomical information becomes the knowledge needed for clinical application, and when enhanced by surgical experience it provides the key for the advancement of the quality of facial rejuvenation.

References
