Parotid Fascia and Face Lifting: A Critical Evaluation of the SMAS Concept

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This report critically evaluates the SMAS concept. It is based on findings related to the parotid fascia during face lifting operations.[1]

To obtain a thicker, stronger flap during a face lifting operation, it was decided, more than 4 years ago, to substitute deep dissection below the parotid fascia for the *true* sub-SMAS procedure. Instead of freeing above the white membrane of the parotid fascia, dissection was made below the membrane to obtain exposure of the reddish-brown glandular parenchyma.[2]

Problems connected with this type of dissection were expected, since conventional anatomic teaching had presented the parotid fascia as being part of the deep fascia, suggesting that the operation would involve structures that were too deep and belonged to the masseteric fascia (itself a part of the deep fascia). However, three unexpected findings were (1) that beyond the parotid zone the dissection continued freely anteriorly without evidence of any adherence to the masseteric fascia, (2) that the parotid fascia flap was continuous with the platysma, and (3) that the parotid fascia was not a true fascia but contained muscle fibers that ran parallel to the uppermost fibers of the platysma. The presence of these muscle fibers was confirmed by histology. Moreover, confirmation of these operative findings was sought by dissection of cadavers.

This report contains a description of this muscle layer, which we have termed "primitive platysma" to avoid confusion with the platysma muscle of human anatomy, which is only one of the components. The anatomic data discussed are of major importance during plastic surgery, details of the true anatomy conditioning the choice of detachments in face lifting on which will depend the strength of the flaps and the safety with respect to the facial nerve.

Details to be presented will demonstrate that the *sub-SMAS dissection* is too superficial and that the originators of this procedure have been mistaken in their description. However, it has to be emphasized in their support that they adopted erroneous information presented by the classical anatomists of the beginning of the century.[3–8]

The principal error was in failing to observe the true anatomic and histologic nature of the parotid fascia. The latter is actually only one element of a muscular layer that specialists in comparative anatomy call the platysma. We must admit that we shared in these errors until 1982.[2]

Materials and Methods

Twenty-one fresh human cadavers were dissected, some of them by serial dissections, and various specimens were removed for histologic examination. Full-thickness (from skin to bone) specimens to include all planes of the parotid gland and masseter muscle region were obtained from two cadavers. Three other mammals were dissected: a chimpanzee, a mandrill, and a lagothrix (in these three animals the platysma muscle covers all the external surface of the parotid). A hedgehog was also dissected because this animal's anatomy might possibly provide an explanation for the origin of the fascia superficialis.

Anatomic and Histologic Findings

Three dissection findings were of primary importance (Figs. 1 and 2). First, the parotid fascia is muscular and not totally fibrous in nature, muscle fibers being scattered throughout the structure, rare above but numerous below. Sec-

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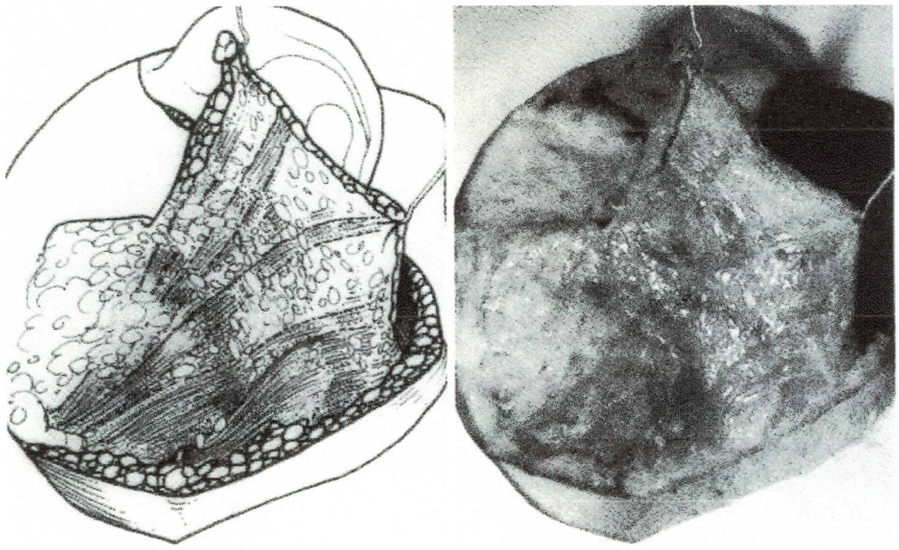


FIG. 1. Parotid fascia of a 56-year-old man. The solid muscular structure of the lower part is in continuity with the platysma. The muscular sheet is weak and discontinuous at the upper part.

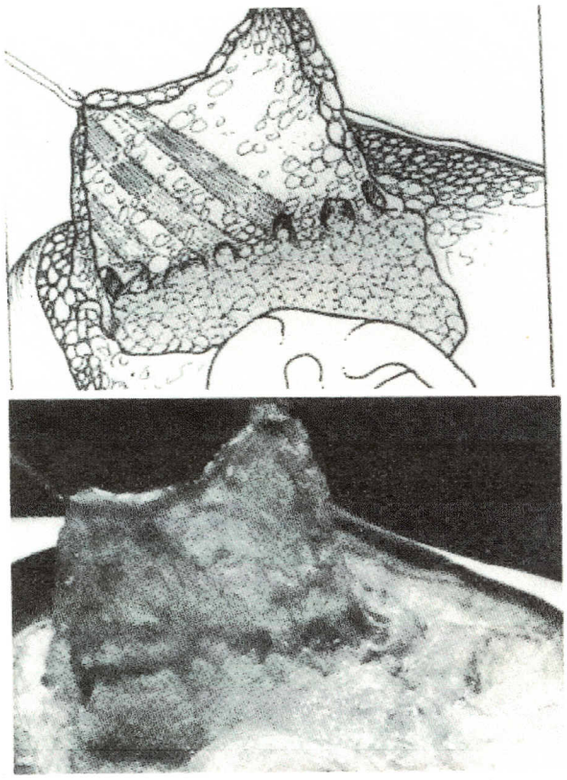


FIG. 2. Parotid fascia of a 70-year-old woman. Only the inferior part is macroscopically muscular.

ond, this muscle layer is continuous, without any dividing line, with the platysma at the lower pole of the parotid. Third, this muscle layer, which is attached to the parotid gland, continues freely anteriorly in the masseteric zone; superficially it is separated from the fascia superficialis by a layer of fat, while more deeply it is separated from the masseter by a cellular layer containing Stensen's duct and the facial nerve (Fig. 3, *right*).

Confirmatory histologic findings were as follows: First, the parotid fascia is definitely muscular in nature. The muscle fibers are sheeted in a dense connective tissue, the deeper layers of which are fused with the capsule. This parotid capsule is freely identifiable only at the inferior pole and deep surface of the gland, is extremely thin, and undergoes fatty degeneration in certain areas. It is unsuitable, therefore, for surgical use either for cleavage or *a fortiori* as a flap. Second, the solid deep fascia lines the deep surface of the parotid only and then continues anteriorly to form the masseteric fascia. Third, the parotid fascia and platysma are continuous structures (Fig. 3).

These findings led us to doubt the validity of the classical anatomic description of the parotid and masseteric regions (Fig. 4). Classical anatomy created two false continuities of structure—one

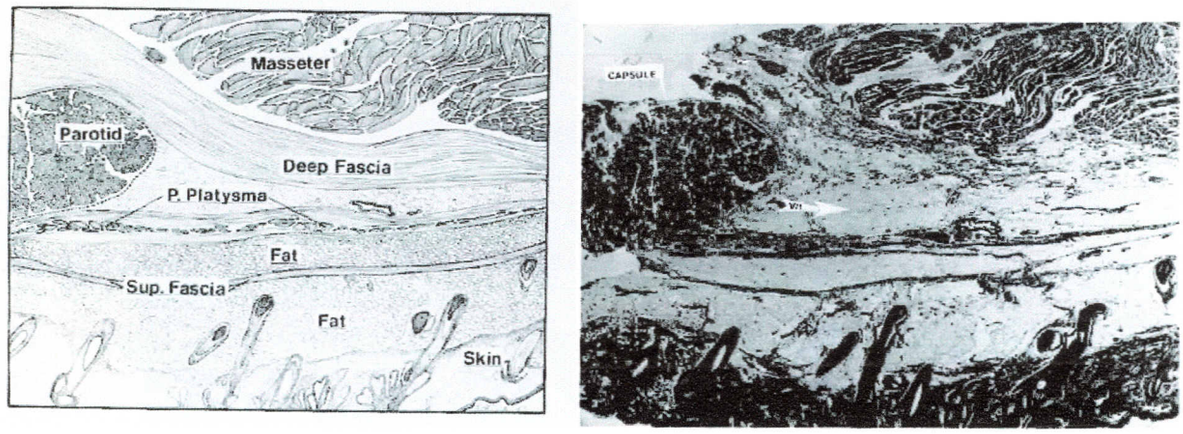


FIG. 3. Horizontal section of masseter and parotid regions. The thin fascia superficialis separates two levels of fat. The parotid fascia has an anterior prolongation. Both of them belong to the primitive platysma (muscular fibers sheeted in a fibrous tissue). The deep fascia lines the deep part of the parotid gland only.

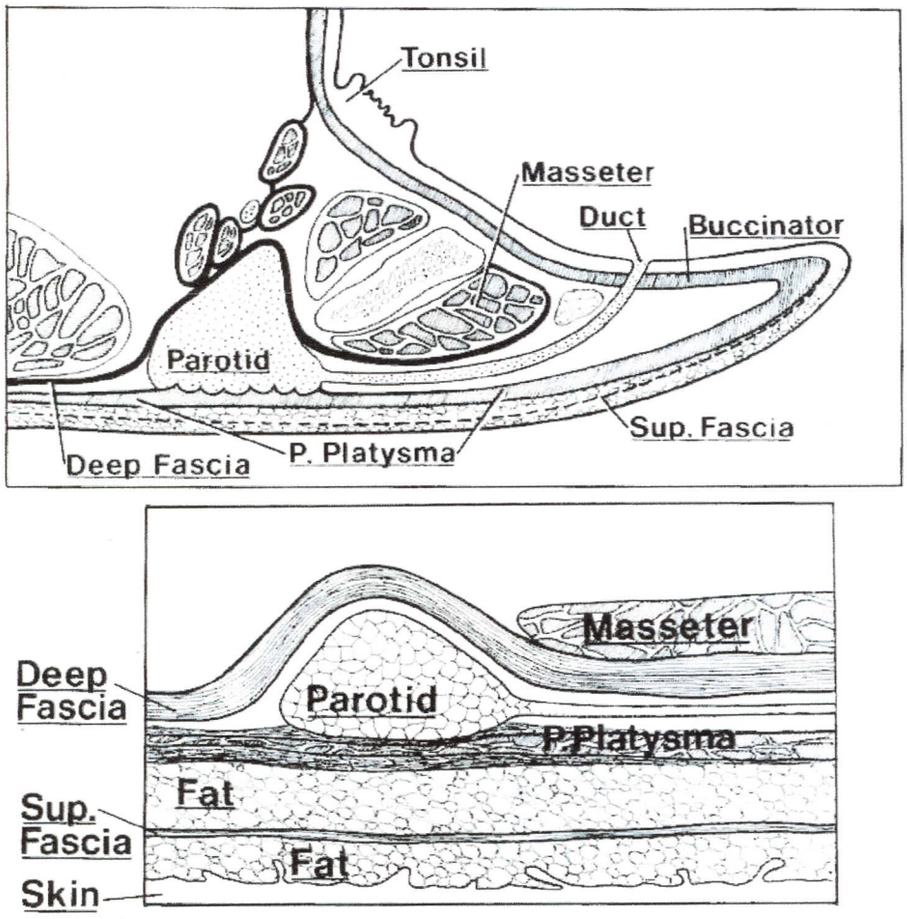


FIG. 4. Diagrammatic representation of the true anatomy of the masseter and parotid regions.

between the parotid and masseteric fascias (this would require Stensen's duct and the facial nerve to perforate the deep fascia anteriorly in order to leave the parotid fossa) and one between the fascia superficialis and the platysma[3–8] (Fig. 5). Final confirmation of these errors was sought by embryologic and comparative anatomy studies.

Embryology

An absolute contradiction exists between classical anatomy descriptions and embryology of the parotid gland—the parotid fascia is not a part of the deep fascia.[9–12] At 7 weeks, the mucous bud that will form the parotid gland passes around the anterior border of the primitive mandibular and masseteric structures and then migrates backwards between the masseter muscle and the platysma. It then reaches an obstacle presented by the temporal bone. Being unable to develop toward the exterior, where it is strongly checked by the platysma, it therefore passes deeply, acting as a cork, between the mastoid and mandible, displacing the styloid muscles ensheathed by the deep fascia.

The parotid gland cannot, therefore, be covered by the deep fascia, since from the early stages of its migration it lies outside of the masseteric fascia, which is part of this deep fascia (Stensen's duct is the anatomic vestige of this superficial migration) (Fig. 4, *above*). Exteriorly, the parotid fossa is formed by the platysma only, this providing a clear explanation of the muscular nature of the parotid fascia.

Comparative Anatomy Study

Comparative anatomy provided confirmation of these data and was of particular importance in obtaining precise details of the muscle from which the parotid fascia originates.[13–18] The parotid fascia is, in fact, none other than the upper part of the platysma that is strongly attached to the parotid gland and has undergone fibrous

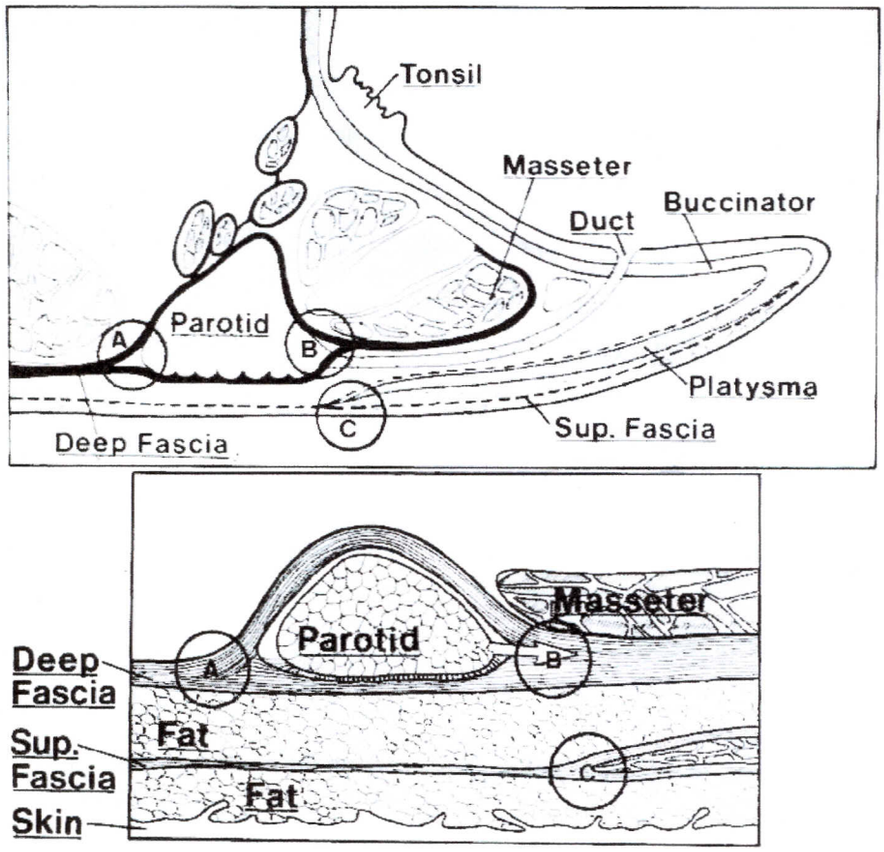


FIG. 5. The three classical errors. (*A*) The deep fascia does not divide at the posterior border of parotid gland. It lines its deep face only. (*B*) Stensen's duct and the facial nerve do not perforate (or split) the deep fascia; they are not "trapped" in the parotid fossa. (*C*) The fascia superficialis is not in continuity with the platysma.

involution. Improved understanding of human anatomic findings can be obtained by studying the development of the platysma in mammals. All mammals except insectivores and marine mammals possess similar cutaneous muscles divided into two systems that intersect at right angles at the buccal commissure (Fig. 6).

The *primitive platysma* is a large muscle sheet that covers the neck and the lower part of the face. Its uppermost fibers are parallel to the zygoma, while its lowest fibers are vertical and interspersed between those of the opposite side. In platyrrhine monkeys (Fig. 7) it totally covers the back of the neck. The primitive platysma is a unique structure in that it is superficial and has no direct bone insertion. It is, however, attached strongly to the parotid and the auricular cartilage by true "insertions." In humans, it is formed by four muscles—the true platysma, the risorius, the triangularis oris, and the auricularis posterioris—and a fascia—the parotid fascia.

The *sphincter colli profundus* includes all the other cutaneous muscles grouped around the orbicular muscles. It covers the skull in the shape

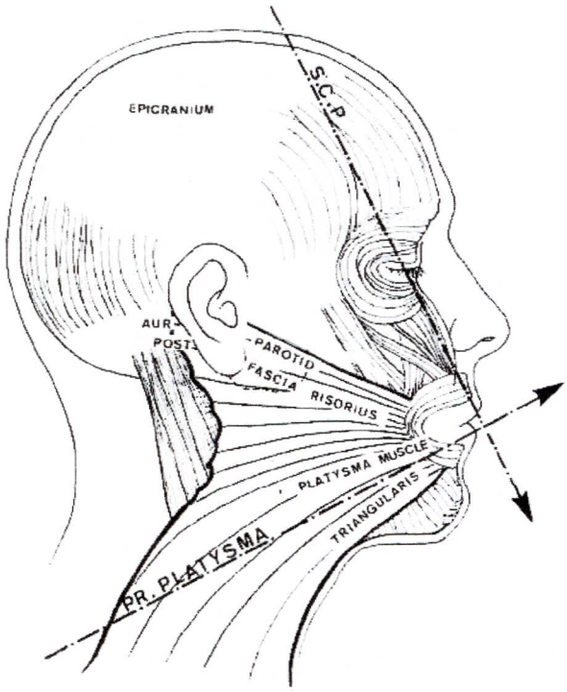


FIG. 6. Diagrammatic representation of the primitive platysma and the sphincter colli profundus. The primitive platysma is a superficial fan formed from four muscles (platysma, risorius, triangularis, auricularis posterior) and one fascia (the parotid fascia). It lacks a direct bony attachment. The sphincter colli profundus is formed from all the other cutaneous muscles and has direct bony insertions.

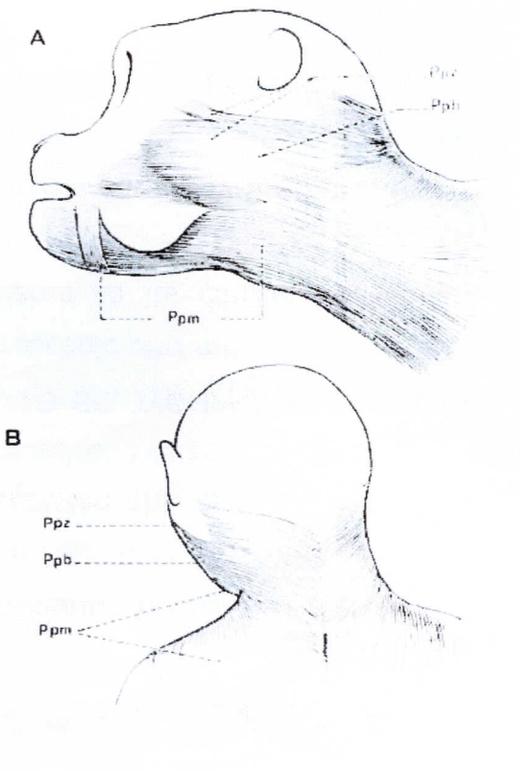


FIG. 7. The platysma of the *Papio* conceals the parotid. It covers the neck and the shoulder and is interspersed between the opposite muscle at the nape of the neck.

of a helmet and the face as a mask. It is covered by the primitive platysma below. Of primordial importance is the fact that this sphincter colli profundus, in contrast to the platysma, possesses direct bone insertions (occipital for the occipitofrontalis, malar for the zygomatic, mandibular for the quadratus labii inferioris muscle. . .).

These structures were studied by dissections performed systematically and completed by histologic examinations in different species of monkeys (Fig. 8). In the platyrrhine monkey (Fig. 8, *above, left*), a species distant from humans, the primitive platysma is entirely muscular; the external wall of the parotid fossa is therefore formed of a muscle layer. However, and this is a fact of primary importance, *there is no evidence of a fascia underneath the muscle*, which is attached directly to the glandular parenchyma. In the catarrhine cynomorphe monkey (Fig. 8, *below, left*), the muscle layer has undergone the initial stages of fibrous involution. The catarrhine anthropomorphe monkey (Fig. 8, *right*), a species closer to humans, shows evidence of a parotid

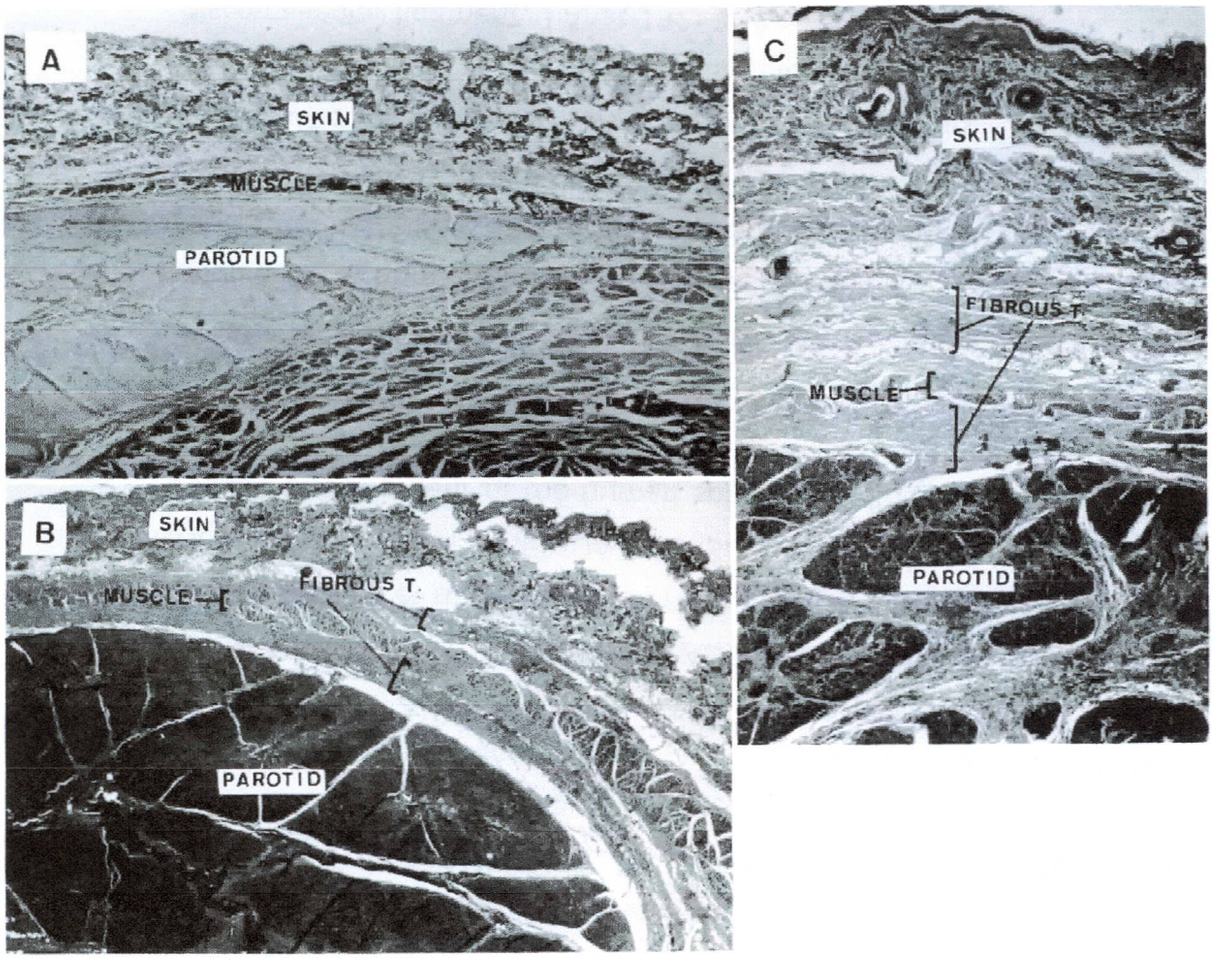


FIG. 8. Evolution of the primitive platysma in primates. (*Above, left*) Lagotrix: completely muscular (H&E and safranine staining, ×20). (*Below, left*) Mandrill: half muscular, half fibrous (H&E and safranine staining, ×13). (*Right*) Chimpanzee: very close to human aspect (we can already speak of parotid fascia) (H&E and safranine staining, ×25).

fascia, although it is of muscular origin and is still partly formed of muscle tissue.[18]

CRITICAL EVALUATION OF THE SMAS CONCEPT

As we have seen, the cutaneous muscles of the face and neck possess a structure that is both muscular and fibrous. In order to emphasize this mixed type of structure, the term *superficial musculoaponeurotic "system" (SMAS)* was created. In reality, however, there is not one "system," but rather two very different systems that have to be distinguished—a deep one, the sphincter colli profundus (which includes the epicranium), and a superficial one, the primitive platysma (which includes the parotid fascia) (Fig. 6). Unfortunately, this was not the description applied to the SMAS in 1976.[1] The SMAS was said to consist of (1) a longitudinal fibrous structure, (2) separating two layers of fat, and (3) *independent of the parotid fascia* to which it would be adherent only in front of the tragus. These first three characteristics are, in fact, those of the fascia superficialis.

The SMAS was also said to be in continuity with the platysma and to include muscle fibers, but these two characteristics are those of the parotid fascia (and furthermore, the muscle fibers are sagittal and not longitudinal). Finally, the parotid fascia and the fascia superficialis are both too superficial to possess bony attachments or to be in continuity with the frontalis. In other words, an "intermediary tendon" between the frontalis and the platysma does not exist.

In view of these findings, the SMAS as described in 1976 is an anatomic impossibility. The

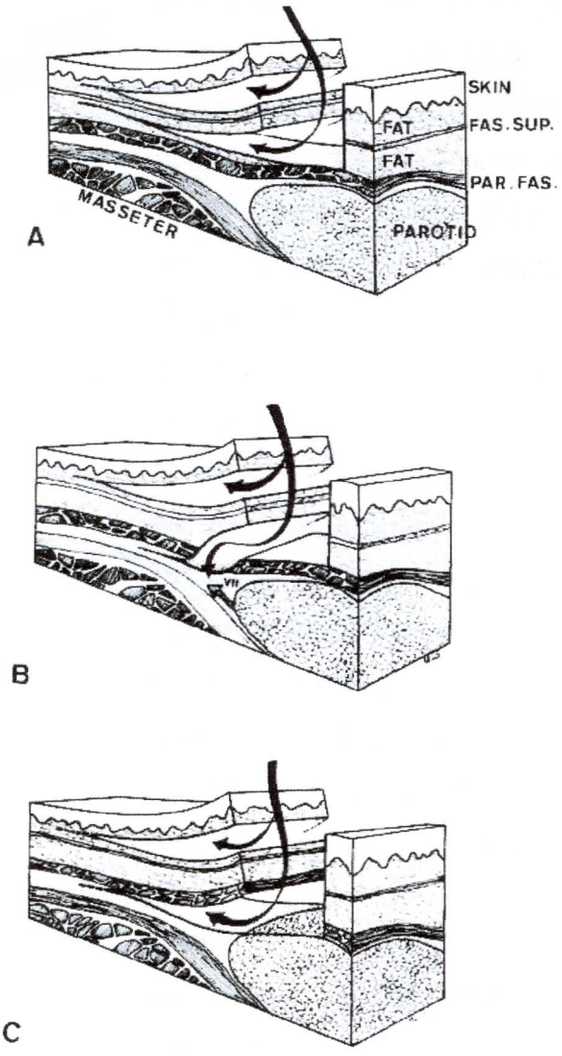


FIG. 9. Undermining of the flap. (*Above*) Freeing above the parotid fascia. The flap is thin, composed of fat only. It becomes thinner anteriorly. (*Center*) Freeing above the parotid fascia with change in plane to thicken the flap. There is a risk of injury to the facial nerve and small ducts that are crossed perpendicularly. (*Below*) Freeing below the parotid fascia. The flap is thick, strong, and includes the whole muscle layer of the primitive platysma; there is little risk of injuring the facial nerve, which lies parallel to the dissection plane. An invaluable guide to dissection is the reddish-brown color of the parenchyma.

danger from the surgical point of view lies in the fact that this description could suggest to the reader that two solid, distinct fibrous layers exist between the skin and the parotid gland. This is false; there is only one solid layer—the parotid fascia. (The fascia superficialis is more a histologic structure than an anatomic one.)

SURGICAL IMPLICATIONS

Plane of Undermining

We are greatly perplexed by the many imprecisions and contradictions among the surgical literature.[19–24] In Mitz and Peyronie,[1] the drawings and text are concordant: "The dissection of the SMAS in the parotid area must respect the parotid fascia." In Bonnefon and Fogli,[24] it is even more precise: "We must leave the parotid fascia in place and avoid exposure of glandular lobules." In Rees,[19] the drawings seem to demonstrate that undermining is done beneath the parotid fascia, but the text contradicts this: "Dissection of the SMAS in the cheek area can be started by inserting scissors between the SMAS and the parotid fascia, where a natural plane exists." Owsley[20,21] never speaks about the parotid fascia or the deep fascia. Moreover, he uses several words to define the superficial layer: SMAS, superficial facial fascia, facial fascia, or fascial aponeurosis. After careful examination of his drawings, we are convinced he uses the right plane of undermining, elevating the parotid fascia from the glandular parenchyma.

In order to be quite clear, we must try to be as precise surgically as we have tried to be anatomically—three kinds of undermining can be performed. If the conclusions of classical anatomy are adhered to, superficial dissection, between the fascia superficialis and the parotid fascia, has to be performed, and this should lead below the platysma. As we have seen, however, this is not the case. Dissection above the parotid fascia lies in subcutaneous fat only (Fig. 9, *above*). The result is creation of a purely fatty flap reinforced only by the thin fascia superficialis. This flap, which becomes thinner anteriorly, is too weak to support strong traction.

The danger arises when an attempt is made to thicken the flap and to dissect below the platysma. The dissection plane changes abruptly and approaches the plane of the facial nerve perpendicularly (Fig. 9, *center*). Evidence provided above has shown that the parotid fascia actually lies in the plane of the platysma. Consequently, the tissues should be freed below the parotid fascia (Fig. 9, *below*). The glandular parenchyma, easily recognizable from its reddish-brown color, should be deliberately exposed. Once the anterior edge of the gland has been reached, simple swab dissection can be performed without risk. The flap created in this way is solid, because it includes the full thickness of the primitive platysma (Fig. 10).

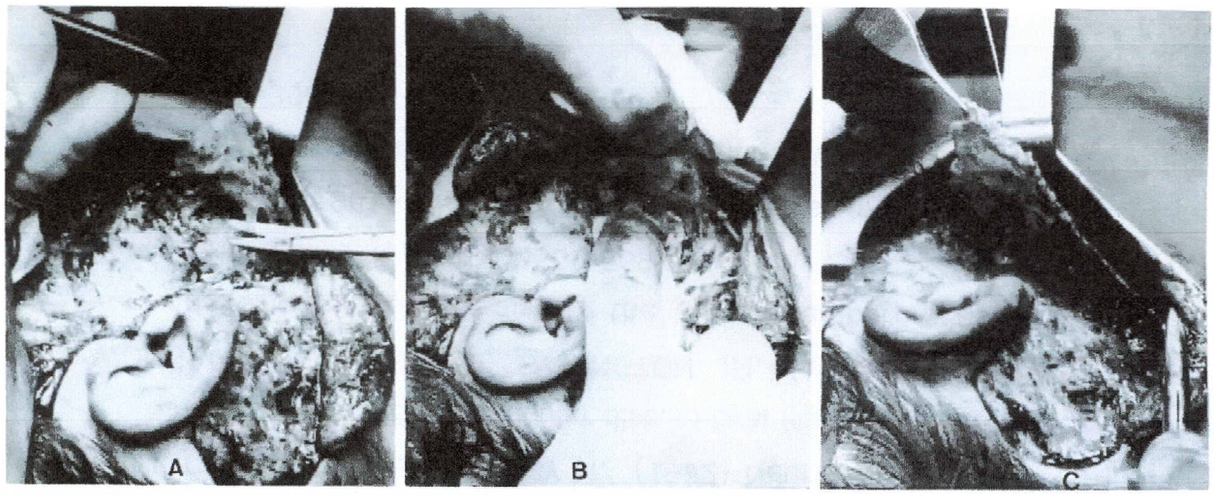


FIG. 10. (*Left*) Beginning of the undermining with sharp dissection (the reddish-brown color of the gland is a precious guide). (*Center*) As soon as the anterior border of the gland is reached, blunt dissection with a swab is used. (*Right*) The "primitive platysma" is elevated.

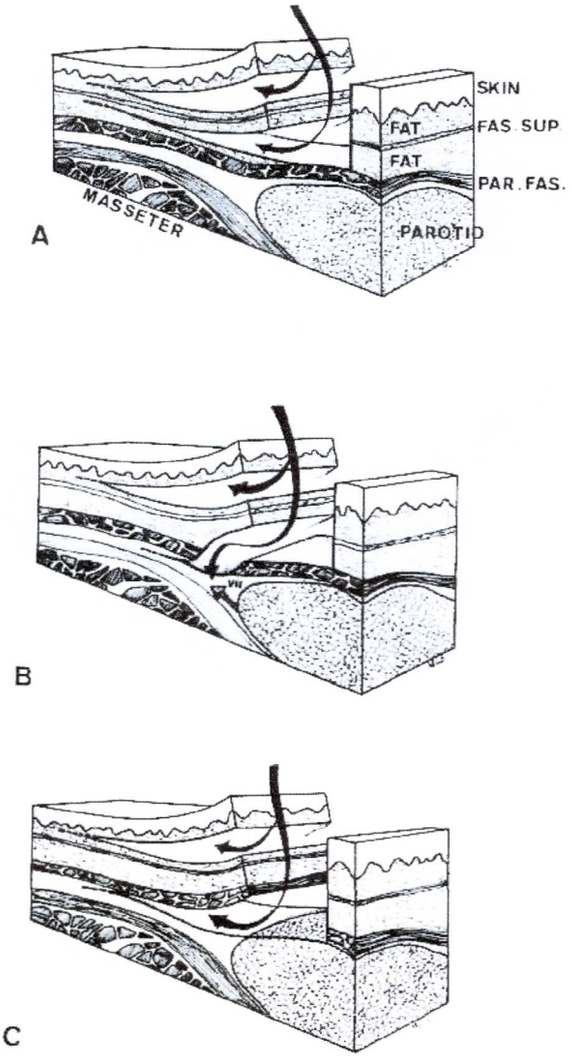
Fixation of the Flap

Four years ago we fixed the flap to the mastoid periosteum only, with good results, particularly for the correction of turkey gobbler deformities. For the last 2 years we have fixed it to the zygoma periosteum and then to the mastoid periosteum to avoid bulging of the parotid gland (Fig. 11).

This technique has been used in 167 lifting operations with the following results. Neither facial nerve lesions nor salivary fistulas were observed. Posterior incision healing was of better quality when compared with that after purely cutaneous lifting procedures. Early results were definitely more spectacular. One could even speak of overcorrection during the first 2 months, this overcorrection being obviously limited to the platysma region.

Confirmation of the long-term superiority of this method over cutaneous lifting operations requires comparative studies of large numbers of patients treated by different techniques. A difficult indication does exist, however, where suspension of the platysma is a significantly superior method to cutaneous lifting—correction of moderate turkey gobbler deformities in relatively young patients (Fig. 12). We have never obtained such permanent results with conventional procedures.

FIG. 11. Fixation of the flap. (*Left*) Tracing of the flap outline: (*A–B*) horizontal facing the tragus; (*C*) anterior to the posterior auricular nerve; and (*D*) variable position point always above the buccal commissure. (*Center*) Anterior fixation of flap: to the periosteum of the longitudinal root of the zygoma and to the temporal fascia. (*Right*) Posterior fixation of flap: to the mastoid periosteum and the sternocleidomastoid fascia.



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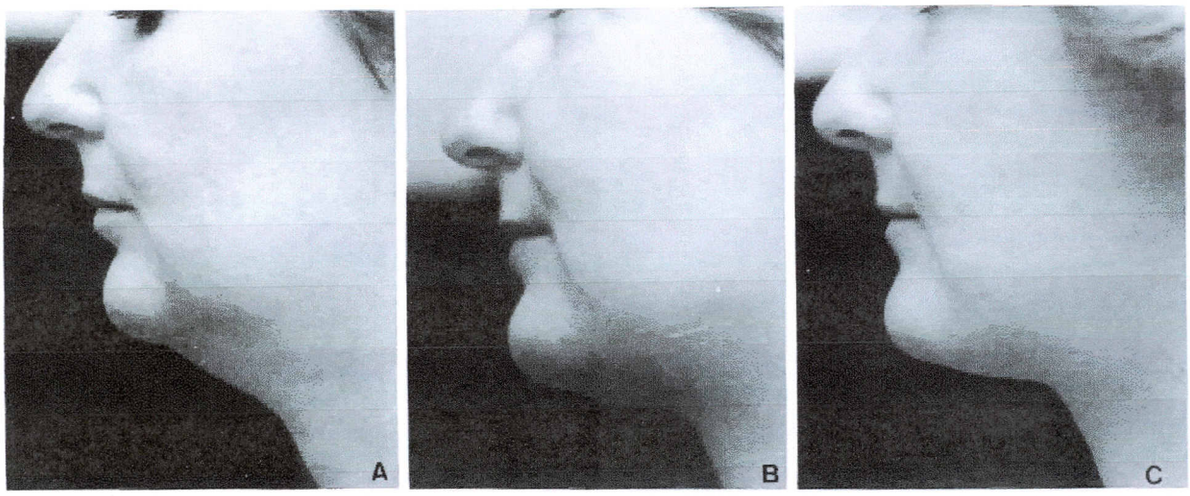

FIG. 12. (*Left*) Turkey gobbler deformity in a 35-year-old patient. (*Center*) Result after 1 year. (*Right*) Result after 3 years.

SUMMARY

Classical anatomists were mistaken in their description of the parotid and masseteric regions. According to their description, the fascia superficialis (or SMAS) would be in continuity with the platysma. Data from fresh cadaver dissections, histology, and embryology indicate, on the contrary, that it is the parotid fascia, which is continuous with the platysma. Comparative anatomy provides further confirmatory evidence, demonstrating that the parotid fascia is only the uppermost part of a muscle that has undergone fibrous degeneration. This muscle is the "primitive" platysma. In consequence, the *sub-SMAS dissection* plane is too superficial and creates a purely fatty flap. Conversely, deep dissection below the parotid fascia (and therefore below the primitive platysma) respects the true anatomic features and guarantees the solidity of the flap and the safety of the facial nerve.

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