

The Submuscular Aponeurotic System (SMAS): A Histologic and Comparative Anatomy Evaluation

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The submuscular aponeurotic system (SMAS) has been steeped in controversy. The goal of our anatomic study was to further clarify the existence of the SMAS. With an operating microscope, we performed dissections in 10 fresh cadaver heads (20 hemiheads) exposing the SMAS through a face lift incision. Through the operating microscope we were able to identify the SMAS and its relationship to other anatomic structures. Full-thickness longitudinal sections were obtained for routine histologic studies along various surgically relevant regions of the SMAS. In addition, dissections were accomplished with the operating microscope on 12 rhesus monkey fetuses ranging in age from a few weeks to 8 months. Data obtained from the fresh cadaver microdissections, topographic histology, and comparative anatomy revealed the presence of the SMAS as a distinct fibromuscular layer composed of the platysma muscle, parotid fascia, and fibromuscular layer covering the cheek.

In 1974, Mitz and Peyronie¹ published the first clinically relevant anatomic description of the superficial fascial layers of the cheek area. Subsequent investigations further elucidated the so-called SMAS as a discrete fascial layer that divides the subcutaneous fat into two distinct layers. Superficial to the SMAS, the fat lobules are observed to be divided by multiple fibrous septa extending from the SMAS layer to the overlying dermis. Deep to the SMAS is another layer of yellow fat laying between the fascial layer and the investing fascia of the parotid gland, the masseter muscle, and anteriorly, the muscles of facial expression. Superiorly, the SMAS is connected to the frontal fascia, and inferiorly, to the platysma muscle.

Although many studies have been performed over the last 10 years, there are two prevailing opinions that remain in the literature. In their initial report, Mitz and Peyronie¹ divided the SMAS into two separate and distinct areas: the pretragal region located over the parotid and the anterior cheek region. Jost and Levet,² on the other hand, described the so-called SMAS as merely an anatomic dissection of the superficial fascia. They proposed that the appropriate plane of dissection is beneath the parotid fascia. Some surgeons still do not believe that the structure even exists.³

The term *submuscular aponeurotic system (SMAS)* has achieved almost universal recognition both within the plastic surgical literature and in clinical practice. At this time, approximately 50 percent of practicing plastic surgeons include a variety of SMAS dissections as a component of their rhytidectomy. SMAS-platysma face lift has been variously described by a number of authors.⁵⁻¹⁰ Many contend that the creation of two distinct flaps, by utilizing a combination of sub-SMAS and subcutaneous undermining, results in a bidirectional rhytidectomy, thereby improving the long-term surgical outcome and prolonging its effect.

A number of anatomic discrepancies still exist. For example, the terminology defining these layers remains unclear, and the exact topography of the fascial layer, especially in the clinically relevant sections, remains lacking. The precise boundaries and interconnections between the fa-

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cial muscles and overlying dermis, as well as the relationships of the facial nerve branches, require further investigation. Careful and critical reexamination by means of detailed analysis of these disputed points will eventually direct us to its proper role in surgery.

MATERIALS AND METHODS

Through a Zeiss operating microscope, we carefully performed dissections to identify the SMAS layer through a face lift type of incision. We attempted to define its boundaries and its relationships to surrounding facial structures through dissections in 10 fresh cadaver heads (20 hemiheads). Findings were recorded and photographed with a 35-mm camera. Full-thickness specimens were taken for histologic studies with standard hematoxylin and eosin stains from areas of special interest, especially the pretragal, parotid, zygomatic, and nasolabial fold areas. Similar dissections also were done with the operating microscope on 12 rhesus monkey fetuses ranging in age from a few weeks to 8 months. Findings were recorded, and full-thickness specimens were obtained for histology from areas coinciding with the human specimens.

RESULTS

The skin and subcutaneous tissue were totally dissected free. The SMAS was found to be a distinct fanlike structure covering the face. The boundaries were identified as follows: *Superiorly* it is attached to the internal aspect of the frontalis muscle; *inferiorly* it is continuous with the platysma muscle; *anteriorly* it is contiguous with the orbicularis oculi muscles. Within the nasolabial fold region, it is connected to the levator labium superius oris, orbicularis oris, depressor anguli oris, and risorius muscles. Posteriorly, its attachments include the perichondrium of the tragal cartilage and the sternocleidomastoid muscle on the mastoid.

Once the SMAS is completely separated, the so-called superficial temporal fascia is identified as a component of the SMAS within the temporal region composed of almost no muscle fibers. Within the confines of the temporal SMAS are located the superficial temporal artery and vein, as well as the temporal and zygomatic branches of the facial nerve (Figs. 1 and 2). It also was noted that within this locale the SMAS was extremely thin; however, in two obese fresh cadav-

LIMITES

dentro de los límites

fascia temporal superficial es parte del SMAS

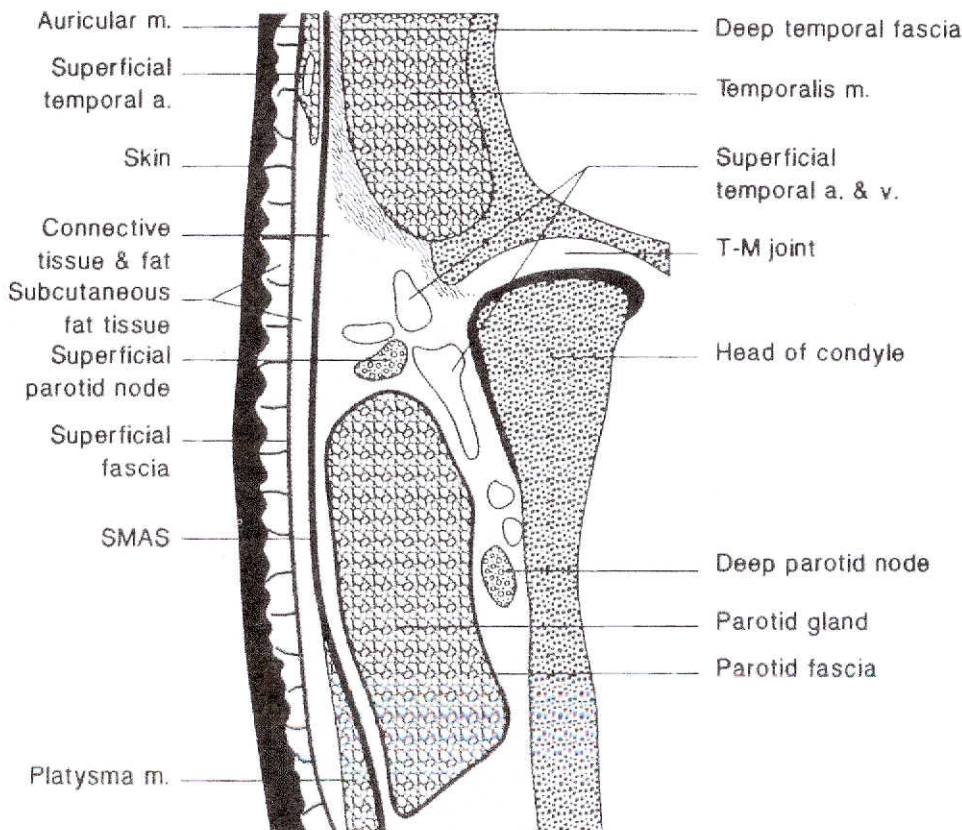


FIG. 1. Illustration of coronal section from the region of the parotid gland.

ers, it was observed to be very thick and included abundant fatty tissue.

The platysma muscle looked remarkably well developed where it covered the inferior portion of the parotid gland. The SMAS itself contains

ample muscle fibers that run transversely and parallel with the platysma muscle.

In transverse histologic sections at the level of the earlobe continuing onto the oral commissure, the arrangement is skin, subcutaneous fat, super-

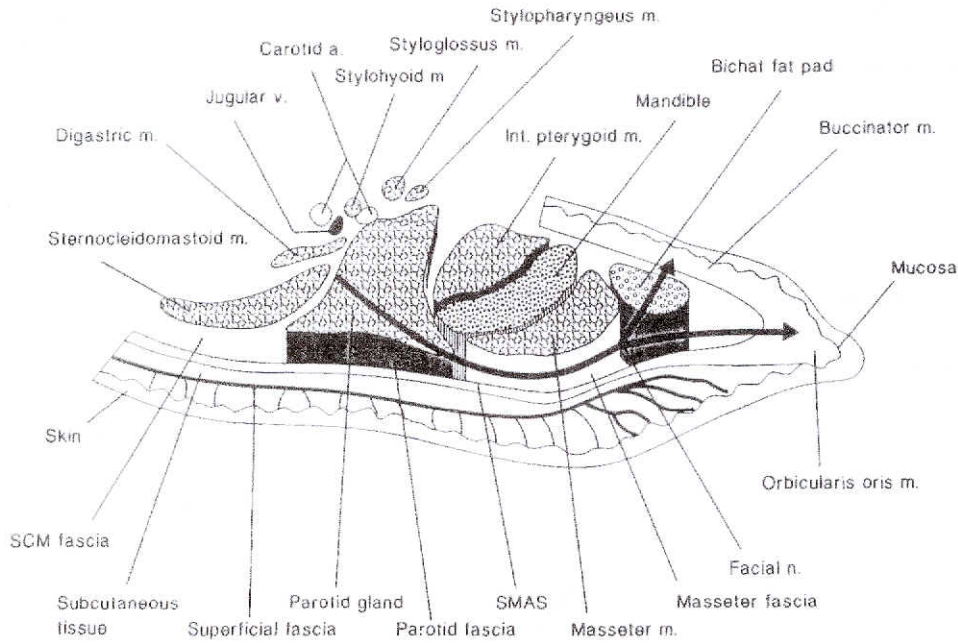


FIG. 2. Illustration of a transverse section from the level over the earlobe to the oral commissure showing arrangement of letters.

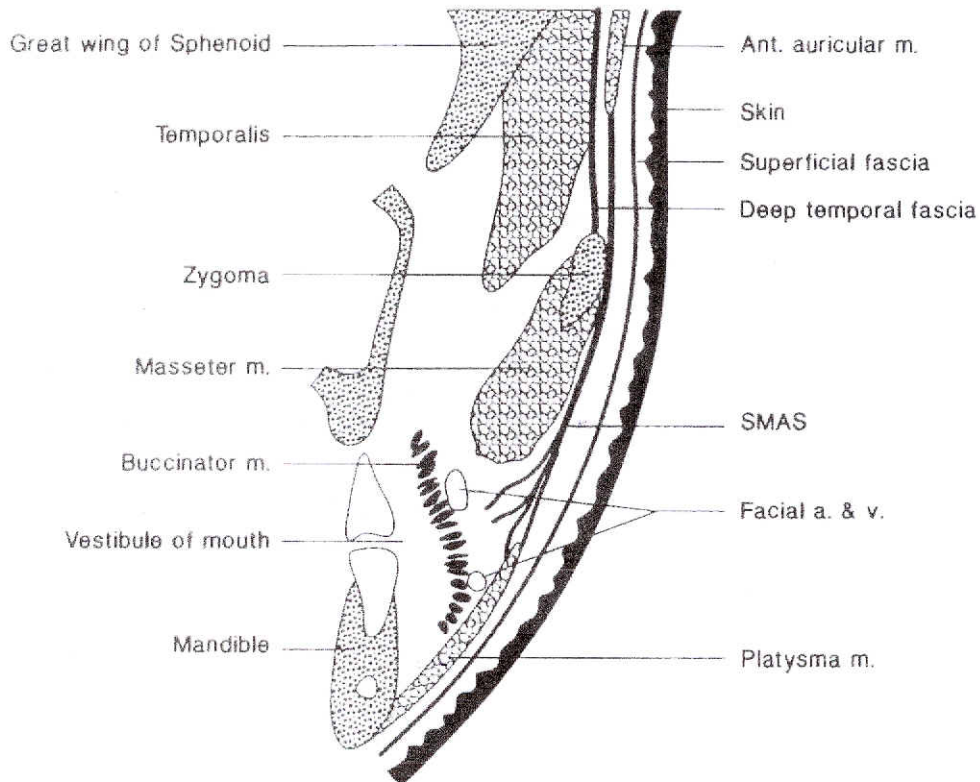


FIG. 3. Illustration of a transverse section beyond the parotid gland.

fascial fascia, fat tissue, SMAS, parotid gland, fascia, masseter muscle, and fascia. In coronal sections, the SMAS extends onto the platysma muscle and superiorly into the frontalis muscle (Fig. 3).

Dissections from four baboon fetuses were employed as comparisons. In these specimens, the platysma muscles were extraordinarily well developed and they completely enveloped the parotid gland. A definite SMAS does exist and was identified in each baboon specimen. In addition, we performed microdissections on 10 rhesus monkey fetuses, with all specimens providing further proof of the existence of the SMAS (Fig. 4).

HISTOLOGIC EVALUATION

The SMAS established itself to be a distinct anatomic entity regardless of where the sections

were obtained. In the specimens, the SMAS appeared to consist of muscle tissue comprised of one to three layers, while the platysma involved two layers (Figs. 5 to 8).

DISCUSSION

Dr. Paul Tessier is credited with originally coining the term SMAS. Its history has a much more extensive origin. In 1974, Dr. Skoog described a subfascial face lift that we now refer to as the *platysma rhytidectomy*. Guerrero-Santos et al.,¹¹ also in 1974, performed the so-called muscular lift in cervical rhytidectomy. In this procedure, they advocated incising the anterior segment of the platysma muscle horizontally, thereby establishing two muscle flaps that could be rotated and then sutured posteriorly. In 1974, Mitz and Peyronie¹ published their now classic article detailing the SMAS within the parotid and cheek regions. They felt that this was one and

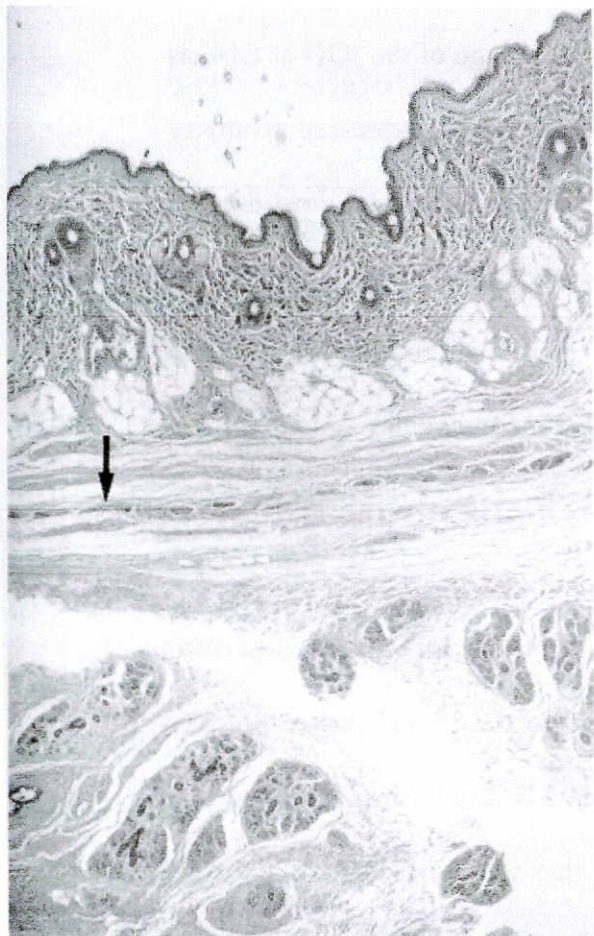


FIG. 4. Comparative anatomy specimen study from a rhesus monkey fetus. Routine H&E stains at $\times 10$ magnification showing skin, subcutaneous tissue, fascia, superficial fascia, and SMAS layer. Note in the monkey that the SMAS layer closely resembles muscle.



FIG. 5. H&E slide at $\times 10$ magnification obtained from the parotid region showing skin, subcutaneous fat tissue, fascia superficialis, fat tissue, SMAS layer, parotid fascia, and the parotid gland. Arrow is pointing to the SMAS.

the same with the fascia superficialis and further indicated that it acts to distribute facial muscle contraction. Rees and Aston⁷ described the musculoaponeurotic dissection, which was basically a modified Skoog method. They advocated similar sentiments to Mitz and Peyronie's—that the SMAS was part of the superficial fascia. In essence, they elevated this layer of fascia, pulled it posteriorly, and anchored it superiorly. Jost and Lamouche¹² stated that the SMAS is the fascia superficialis. Owsley⁸ described the SMAS-platysma face lift. Both authors postulated that the SMAS blankets the face like a net and ends at the nasolabial folds. An important article in the history of the description of the SMAS is credited to Jose and Levet.² They stated that the SMAS is not the fascia superficialis, but rather a primitive platysma. In addition, they discovered that the SMAS is a muscular structure at the inferior portion of the parotid gland that continues with the platysma muscle. We disagree with the theory

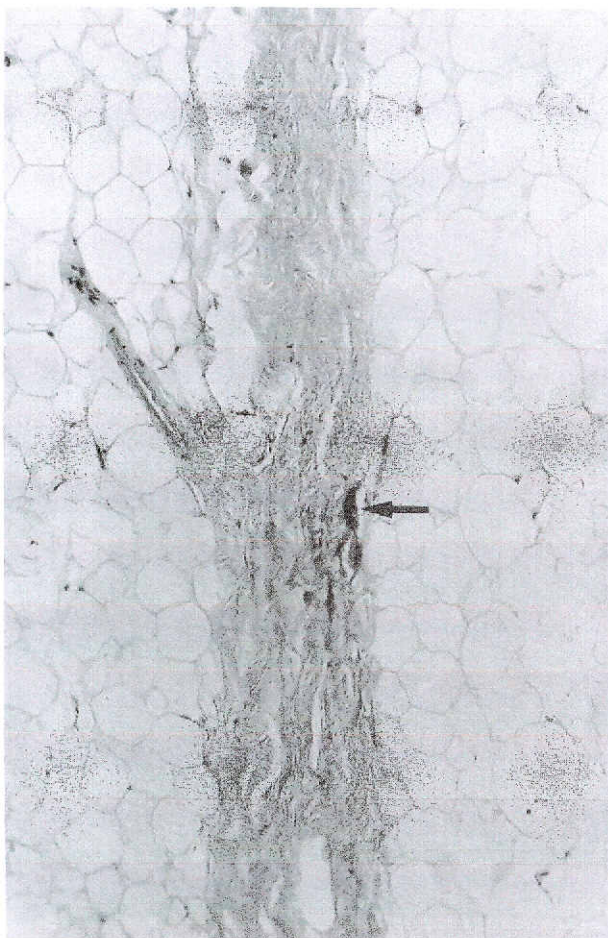


FIG. 6. H&E stain at $\times 10$ magnification from a fresh cadaver specimen demonstrating the SMAS with its three distinct layers.

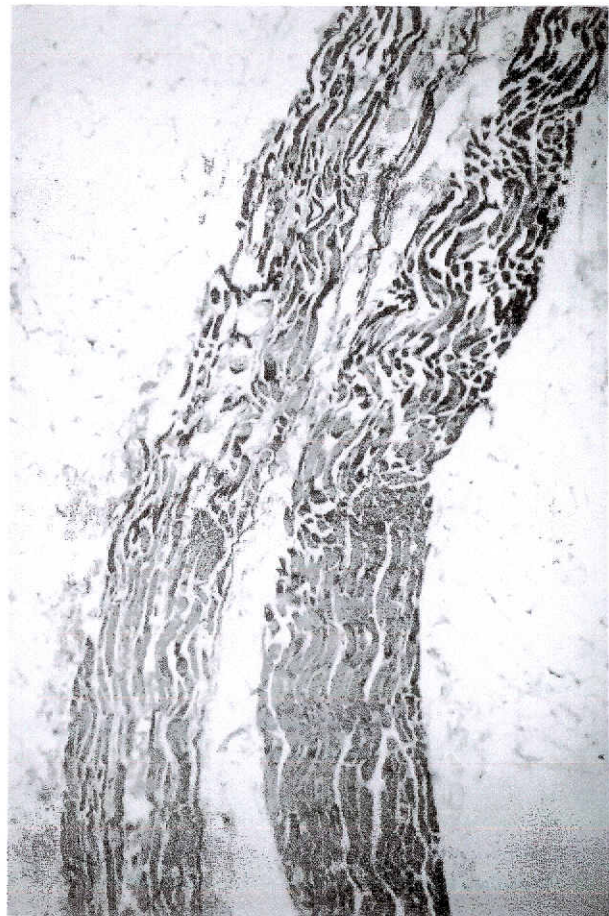


FIG. 7. H&E slide at $\times 10$ magnification from a fresh cadaver showing two layers of the platysma muscle.

that the parotid fascia is this primitive fascia. Our investigation clearly shows that the parotid gland is entirely enveloped by the parotid fascia. The SMAS is situated above the parotid fascia in both the human and primate specimens. Second, Jost and Levet stated that the parotid fascia is definitely muscular in character, but our studies demonstrated that it is fibrous in nature. We found the parotid fascia to be a connective fibrous sheath. The SMAS contained generous muscle fibers only in the parotid-masseteric area. We support the name *fibrous platysma* first coined by Jost et al.¹¹

Our findings confirm that the SMAS is a discrete anatomic entity with precise borders. The elevated SMAS and platysma complex are an extremely solid and distinct formation.

In transverse sections obtained at the level of the earlobe to the oral commissure, we found the following arrangement of tissue: skin, subcutaneous fat, superficial fat, fat, SMAS, parotid gland, fascia, masseter muscle, and fascia. Facial

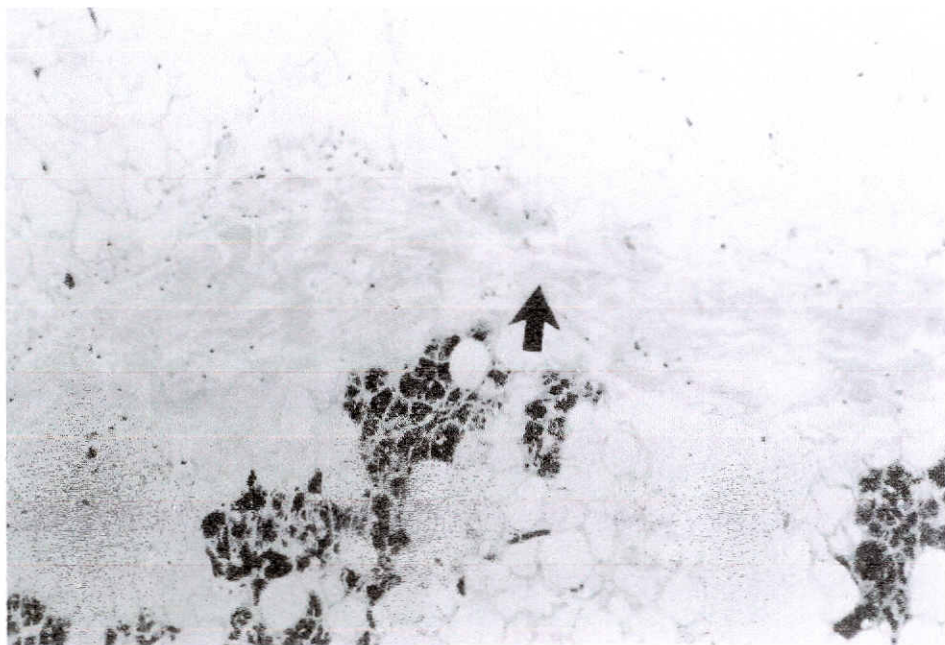


FIG. 8. H&E slide at $\times 10$ magnification from a fresh cadaver specimen. The arrow is pointing to the parotid fascia.

nerve branches exit through the parotid gland and fascia and therefore are located deep to the SMAS layer, a relationship that is extremely important to comprehend when performing a SMAS-platysma rhytidectomy.

Our comparative anatomy studies substantiate that the SMAS located in the parotid-masseteric area is the evolutionary platysma muscle in humans. Since we were able to ascertain that the SMAS is replete with muscle fibers that run transversely toward the platysma muscle, we propose that the SMAS situated within the parotid-masseteric area is an evolutionary platysma muscle in humans and propose renaming the structure the *fibrous platysma*. Our comparative anatomy studies corroborate that the platysma mus-

CONCLUSIONS

Our study confirmed that the SMAS is a distinct fanlike structure that maintains tension in the face. Histologically, it is discrete from the superficial fascia and consists of one to three muscle-like layers. On the temporalis muscle, the superficial temporalis muscle, the superficial temporalis fascia is an element of the SMAS. We suggest that the SMAS located in the parotid-masseteric area is an evolutionary platysma muscle in humans and propose renaming the structure the *fibrous platysma*. Our comparative anatomy studies corroborate that the platysma

muscle completely envelops the parotid gland and cheek.

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REFERENCES

1. Mitz, V., and Peyronie, M. The superficial musculoaponeurotic system (SMAS) in the parotid and cheek area. *Plast. Reconstr. Surg.* 58: 80, 1976.
2. Jost, G., and Levet, Y. Parotid fascia and face lifting: A critical evaluation of the SMAS concept. *Plast. Reconstr. Surg.* 74: 42, 1984.
3. McKinney, P., and Gottlieb, J. The relationship of the great auricular nerve to the superficial musculoaponeurotic system. *Ann. Plast. Surg.* 14: 310, 1985.
4. Rees, T. D. Audience Poll, Annual Meeting of American Society of Plastic and Reconstructive Surgeons, Dallas, Texas, October 1983.
5. Rees, T. D., and Aston, S. J. A clinical evaluation of the results of submusculoaponeurotic dissection and fixation in face lifts. *Plast. Reconstr. Surg.* 60: 851, 1977.
6. Lemmon, M. L. Superficial fascia rhytidectomy: A restoration of the SMAS with control of the cervicomental angle. *Clin. Plast. Surg.* 10: 449, 1983.
7. Adamson, J. E., and Tokso, A. F. Progress in rhytidectomy by platysma-SMAS rotation and elevation. *Plast. Reconstr. Surg.* 68: 23, 1981.
8. Owsley, J. Q., Jr. SMAS-platysma face lift. *Plast. Re-*

- constr. Surg.* 71: 573, 1983.
9. Owsley, J. Q., Jr. Platysma-fascial rhytidectomy: A preliminary report. *Plast. Reconstr. Surg.* 60: 843, 1977.
 10. Webster, R. C., Smith, R. C., Papsidero, M. J., Karolow, W. W., and Smith, K. F. Comparisons of SMAS plication in face lifting. *Laryngoscope* 92: 901, 1982.
 11. Guerrero-Santos, J., Espaillat, L., and Morales, F. Muscular lift in cervical rhytidoplasty. *Plast. Reconstr. Surg.* 54: 127, 1974.
 12. Jost, G., and Lamouche, G. SMAS in rhytidectomy. *Aesthetic Plast. Surg.* 6: 69, 1982.
 13. Levet, Y. Comparative anatomy of cutaneous muscles of the face. *Aesthetic Plast. Surg.* 11: 177, 1987.
 14. Jost, G., Wassef, M., and Levet, Y. Subfascial lifting. *Aesthetic Plast. Surg.* 11: 163, 1987.