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Research Article

Morphological Features of Superficial Musculoaponeurotic System (SMAS) in the Anterior Aspect of the Face

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Received: February 25, 2020; **Published:** March 20, 2020

Abstract

The layers of the facial soft tissue are from the superficial to the deep skin, subcutaneous adipose tissue, fascia superficialis, superficial musculoaponeurotic system (SMAS) and mimic muscles, deep adipose tissue, deep fascia and periosteum. SMAS and facial relations are very important in facial rejuvenation. Of course, its proximity to nerves is the most avoidable factor in surgical intervention. In our study, we tried to show these relationships with cadaver dissections.

Keywords: *Superficial Musculoaponeurotic System; Anatomy; Face*

Introduction

The facial area is a critical region for the communication, senses and expressions of members of the animal kingdom, including man. It is also important for man to define one's identity. The vitality of our ability to recognize the human face can be supported by the presence of a specialized region in our brain that is only aimed at recognizing the human face. Specific facial morphology emerges with the maxillofacial skeleton and a three-dimensional and mobile soft tissue cover that we can separate into certain anatomical layers and spaces. These layers are connected by ligaments of various strength and density. These ligaments, together with their mimic muscles, form cavities, the content of which is dominated by adipose tissue. Whether it is in the reconstruction of the facial area morphology after congenital anomalies, trauma, infection, or tumor treatment, it is critical to detail this transitional anatomy, whether in aesthetic surgery attempts to restore the developmental or especially aging-changing components of the face [1-3].

Layers of the face

The layers of the facial soft tissue are from the superficial to the deep skin, subcutaneous adipose tissue, fascia superficialis, superficial musculoaponeurotic system (SMAS) and mimic muscles, deep adipose tissue, deep fascia and periosteum. Facial skin has a number of unique features compared to other parts of the body. The thinness of the stratum corneum layer, the density of pilosebaceous glands, its sensitivity to hormones, especially androgens, and its full exposure to environmental factors such as the sun. In addition, due to its close relationship to the fixed (maxillofacial skeleton, parotidomaceteric fascia) and moving parts (mimic muscles SMAS) of the face with various ligaments, it undergoes changes such as wrinkling, fluctuation and sagging with gravity and muscle movements [3].

Superficial and deep adipose tissue of the face shows different distributions according to the regions of the face. Preseptal, prezygomatic and premaxillary spaces are mobile soft tissue sections located on SMAS. Suborbicularis school, retroorbicularis school, buccal and parapharyngeal adipose tissues are areas where deep adipose tissues cluster. The borders of these areas determine the carrier ligaments of the face [1-4].

Ligaments of the face

Although the idea that the face is the sum of the anatomical layer, plan and spaces (full of oil) seems correct, the face carries a wholeness as the Gestaltian psychology movement emphasizes. This wholeness is in the sense that the mobile SMAS with the immobile hard elements (facial skeleton) and the mimic muscles of the immobile soft elements add to it. It is the carrier ligaments of the face that reflect this movement to the outside. In addition to determining the integrity of the face, it also has important places in the emergence of the effects of age and in aesthetic surgery of the face [1-6].

Macroscopically, these ligaments originate from the periosteum of the underlying skeleton or rigid fibrous fascia and attach at a right angle to the superficial layers and attach the skin and soft tissues as hooks to these areas [1,2].

Microscopically, they are seen as fibrous structures that branch out from the area they originate in, branching like a tree and branching towards the SMAS and/or dermis. Zygomatic and mandibular ligaments are classified as osteocutaneous ligaments, and masseteric and parotid cutaneous ligaments are classified as fasciocutaneous ligaments. Apart from this classification, they can also be classified as true carrier ligaments, septa and adhesions [3-7].

The neurovascular anatomy of the face shows a wholeness with these plans, layers and ligaments. This causes them to be seen as very important guides for the practitioner in facial operations, injections and other interventions. It is important to clarify the structural features of the SMAS, which is of great importance in the surgical procedures on the face, and to be known by the practitioners. The aim of this study is to reveal the morphological features of the mentioned region [4-6].

Methods

The head areas of 7 cadavers was dissected bilaterally in Anatomy Laboratory within the Department of Anatomy of Ege University, Faculty of Medicine. Dissections took place under the magnifying loop. We performed our dissections from parotid to anterior region of face. After the skin was removed and the first subcutaneous fat was shown, deep dissection was started. The close relationship between fibrous ligaments of the anterior part of face, SMAS and nerve branches were demonstrated (Figure 1).

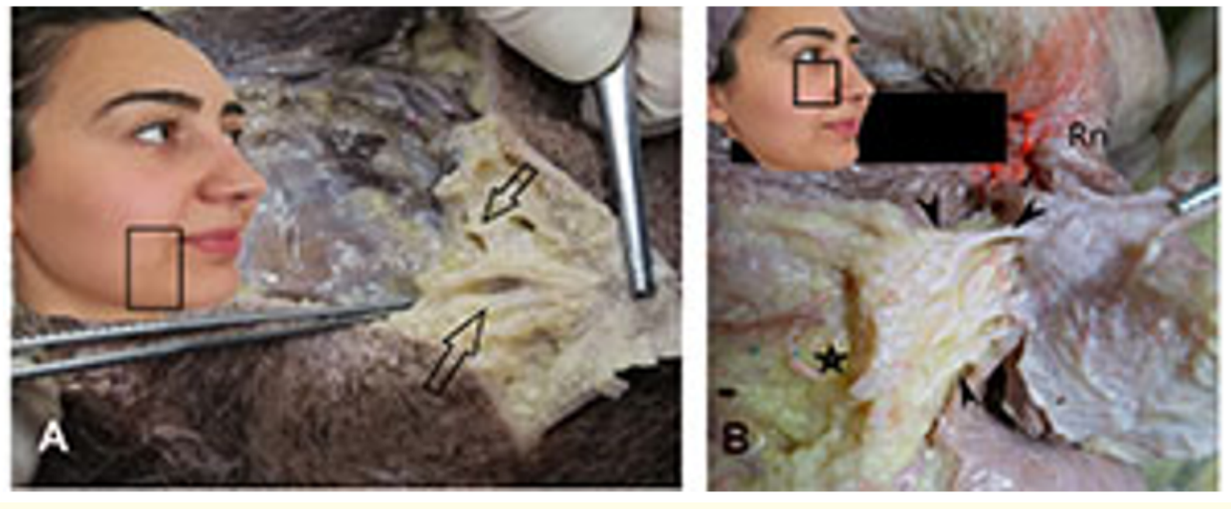

Figure 1: *A: Black arrows: mandibular ligaments. B: Black arrow heads: fasciacutaneous ligaments. Star: deep maxillary fat. Rn: Radix nasi.*

Results and SMAS

The SMAS is a thick membranous tissue that lies on the parotid gland and extends anteriorly, maintaining almost the same thickness until reaching the anterior border of the masseter. The subcutaneous fat tissue layer is relatively thin in this area. The fibrous septa within this layer basically run parallel to the SMAS and delineate long, oval shaped fat tissue in the horizontal plane. The SMAS becomes dramatically thinner beyond the anterior border of the masseter as it enters the cheek area; it can be barely traced by the position of split peripheral part of the platysma [4].

The circular ligaments on the edges of the orbital and extending to the skin are retaining ligaments. These prevent the inferior orbital oil from falling out against sagging skin. This facial power appears as an under eye bag (Figure 1C).

The subcutaneous fat layer has an intimate relationship with the SMAS. In the medial midface and lower face, zygomatic and mandibular ligaments are called true osteocutaneous ligaments in the category of retaining ligaments of face (Figure 2). In this area, many branches of the facial nerve run along the basal floor of the sub-SMAS plane, and some branches run in the vicinity of the ligaments. The sensorial cutaneous nerves also run with the ligament (Figure 3). Accurate intraoperative identification of these accompanying structures is very important to prevent complications [5,6].

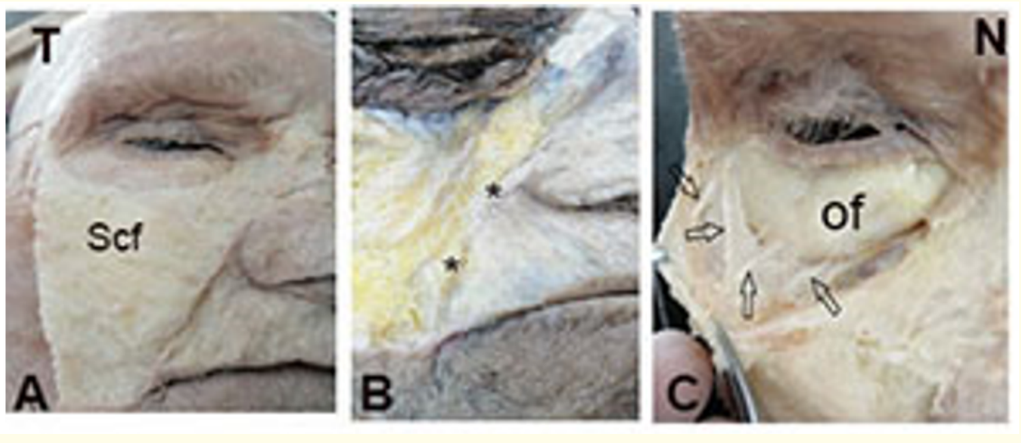

Figure 2: *T: temporal region, N: Nasal Region. A. Scf: Subcutaneous Fat Layer. B.*: Nasomalar fold. C. Of: Orbital fat. Black arrows: Orbital retaining ligaments (ORL). ORL is a bilaminar structure originating from the tear trough ligament. The ORL coalesces with the lateral orbital thickening as it traverses along the orbital aperture. The ORL separates the preseptal space from the prezygomatic space in the upper midface.*

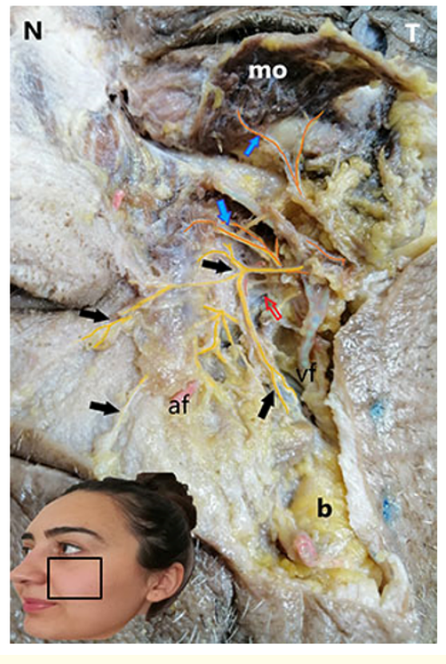

Figure 3: *N: Nasal, T: Temporal region, Mo: Musculus Orbicularis Oculi (pulled up and the entrance of the facial nerve is observed). Blue arrows: fasial nerve (highlighted in brown). Black arrows: infraorbital nerve (highlighted in yellow). Red arrows: maxillary ligaments. Af: Arteria facialis, vf: Vena facialis. b: Buccal fat.*

The SMAS is also difficult to dissect as a uniform layer. It is quite thick in the parotid-masseteric and zygomatic areas and is easily dissected in this region under gross visualization. Beyond the anterior border of the masseter muscle, however, the SMAS becomes quite thin and almost invisible, making it quite difficult to dissect, raising questions about the continuity of the SMAS [5,6].

Discussion and Conclusion

Three type of retaining ligaments are defined in Watanabe's book and Stuzin's articles: true ligaments, adhesions, and septa. True ligaments are almost identical to the so-called true osteocutaneous ligament described by Stuzin, which arises from either the deep fascia or the periosteum, pierces the SMAS. True ligaments are almost identical to the so-called true osteocutaneous ligament described by Stuzin, which arises from either the deep fascia or the periosteum, pierces the SMAS, and distributes the attachment of the ligament to the dermis by spreading like a branching tree. It is located mainly on the medial midface and lower face, and the zygomatic ligament and masseteric ligament are included in this category [3-6].

Below the zygomatic arch, all branches of facial nerve are deep to the SMAS. The zygomatic major and minor muscles as well as orbicularis oculi and platysma innervated by branches of the facial nerve on deep their facial surface. Therefore, surgical dissection along the superficial surface of this muscles will not result in injury to the nerve [8,9].

In studies, it has been shown that in nasolabial fold, the ligaments belonging to SMAS are progressing vertically and keeping the bone between the mimic muscles and adipose tissue. This anatomical structure explains nasomalar and nasolabial crease. With the gravity and aging, the ligaments here face the sagging formed and the fold becomes clearer. This fold deepens with the decrease of deep maxillary fat [1,8-13] (Figure 1B).

Studies suggest a selective atrophy of deep fat compartments and relative hypertrophy of superficial fat and this corresponds with larger adipocyte size in superficial fat compared to deep fat [2,6,12-14].

This information indicates that only SMAS intervention will not be sufficient in facial rejuvenation. Loss of deep fat and osteoporosis of the arcus alveolaris will cause a severe loss of volume in the anterior midface region. It should not be forgotten that the onset of osteoporosis is the upper and lower jaw region. This will reduce the bone support of the ligaments. In short, facial rejuvenation should be considered as a multifactorial treatment.

SMAS intervention is also among the facial rejuvenation techniques today [9,15]. The knowledge that SMAS is not a structure in a single plan and that it has ligaments and septa that go deep should shed light on surgical techniques. Otherwise, the complications of these surgical interventions to the face will also be serious. As we said at the beginning, SMAS is very important in expressing emotion.

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Volume 3 Issue 4 April 2020