PARTICIPATION OF SUPERFICIAL MUSCULO-APONEUROTIC SYSTEM OF THE FACE IN CORRECT DENTAL OCCLUSION

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ABSTRACT
Facial SMAS is a unitary structure with both general and particular characters, specific for each topographic region, with alternating of tension zones with others more lax. Authors have proposed to follow, through various methods of exploration, anatomy of musculofascial formations and of terminal branches of facial nerve with perioral topography. Dissection of anatomical pieces, intraoperatory and imagistic studies, bring arguments about the role of support provided to superfi cials layers of the face, affecting indirectly, but decisively achievement of correct occlusion and therefor mastication. Dermal insertion of perioral superficial facial muscles allow lip mobili zing and their zygomatic and mandibular attachments provides symetric occlusion in all 3 axes of space. Supporting force vectors of SMAS in zygomatic and temporal attachments act as levers for proper contraction of masticatory muscles.

Key words: facial fascia, facial muscles, dental occlusion, SMAS

INTRODUCTION
Knowledge and understanding of subcutaneous layers in different regions of the face is important in various surgical specialties, but especially for the plastic surgeon, for which superficial musculo-aponeurotic system of face (SMAS) is a guiding structure. The latter was the first to recognize the existence of this complex structure, some anatomist and surgeons contest, even now the presence of SMAS.

Overlooking on anatomy of musculo-fascial layers of the face
At the face level are described two fascial layers with different topographic relations, according to functional particularities of each region:

1. Superficial fascia covers superficial muscles of facial expression (platysma, orbicularis oris, major and minor zygomaticus);
2. Deep facial fascia represents a continuation of cervical fascia cephalized to face, most important being the relation with terminal branches of facial nerve located deep to it;
3. There are two types of relations between superficial and deep fascia: in some regions fascial planes are separated by an areolar plan, while in other regions the two
fascia are intimately adherent to each other through a series of dense fibrous attachments.

It was described two distinct types of SMAS, differentiated by the presence or not of fat lobules separated by connective tracts (2), repercussions being of functional nature.

Perioral SMAS insertions give the muscles annexed to orbicularis oris the possibility of mobilizing the lips. This is extremely important because it allows both the correct sound articulation and occlusion. Lip movements leads, in turn, a normal dental occlusion and a proper mastication.

SMAS involvement in making a correct dental occlusion reveals most clearly when is altered the innervation of its muscular component. Thus, in Moebius syndrome (congenital atresia of facial nerve) patients can reach an advanced state of cachexia due to the fact that in time (15-20 years), the muscles supplies by the trigeminal nerve (masticatory muscles) will also be suffered. They will be subjected to abnormal demands because they have to support also the superficial layers of the face. The suffering is longer, the masticatory muscle tone decreases more. In this situation, reconstructive surgery will be required as early as possible. Present study continues previous research (3, 4, 5) regarding functional anatomy of the superficial layers of the face (SMAS). We intend to follow, through various methods of exploration, anatomy of musculofascial structures and terminal branches of facial nerve with perioral topography.

MATERIAL AND METHODS

The material used was represented by 12 formolized cephalic extremity (24 parts) and 10 operatory pieces from Maxillofacial Surgery Clinic of the Emergency Hospital ”St. Spiridon” (dr. G. Mihalache) and Department of Plastic Surgery and Reconstructive Microsurgery of Emergency Hospital ”St. Ioan” (dr. A. Lazăr) from Iași. People have been explored imagistically (MRI) at Medical Imaging Center “Arcadia” (dr. Tiutiucă Iuliana).

On pieces conserved in formol was performed meticulous bilateral dissection of the face, under the operator microscope SOM 62 Kaps, plan by plan. It was revealed fascial plans, adipose and muscular, ligament attachment formations, representative images being acquired.

Surgical interventions have allowed parceling anatomical studies, according to objective of surgical intervention, providing live view of fascial and muscular structures, the possibilities of plans dissociation, but also assessments regarding their vasculature.

Imaging method that provides the most convincing images regarding the structure of cervicofacial soft tissue is magnetic resonance imaging (MRI). MRI is able to demonstrate sectional anatomy data in detail (6) and better differentiate soft tissue on transversal, sagittal and coronal sections.

RESULTS AND DISCUSSIONS

In the following we approach functional anatomy of the face from a relatively new perspective: that of a continuous superficial layer, which is closely related to both the skin region and the subjacent muscle layer. The latter is the defining characteristic of separating it from the other region. The concept of unique superficial layer is of extreme importance, both in anatomy and reconstructive medical practice.

By dissection of anatomical and intraoperatory pieces we watched the relation of SMAS with skin region, the architecture of superficial muscles of the face (muscles of facial expression), and also the relation with deep fascia and with subjacent neurovascular elements. From a functional perspective are of utmost importance paramount ways of attachment of SMAS to viscerocraniu, these
offering facial skin firmness and acting the role of fixed point in facial muscles contraction (Fig. 1).

In nasolabial groove, superficial fascia of nose adheres to the cheek fascia, forming a thickening which adheres by periostum. Laterally of the groove, there are fibrous extensions of superficial fascia which covers high fat lobules (Fig. 2).

Figure 1. Ligaments adhesions that secures SMAS to deep fascia. Dissection piece.

Figure 2. Perioral muscles and nasal region; levator anguli oris muscle, alae nasi, orbicularis oris muscle, SMAS in the upper and lower lips.

Deep muscular layer of the nasolabial groove is formed by buccinator muscle. At the nose wing that provision of layers is no longer maintained. Under the dermis we will find collagen fibers, fat cells and muscle fibers mixed with nasal muscle fibres. All this forms a layer between the dermis and the nasal muscles (Fig. 3).

Medially to nasolabial groove, zygomatic muscles, levator labi superioris, levator anguli oris have dermal insertion. In addition, orbicularis oris muscle intimately adheres to the deep surface of dermis (Fig. 2). Nasolabial groove is the result of dermal insertion of zygomatic muscles, levator labi superioris and levator anguli oris.

Other authors (7) consider that in nasal region there are five layers, which, from superficial to deep are: subcutaneous adipose tissue, fibromuscular layer, deep adipose layer, a fibrous longitudinal layer and a layer that contain interdomal ligament. They believe that at this level SMAS is represented by a second layer, the fibromuscular one, which interconnects with alar muscles and distribute them power to the dermis. We conclude that the role of SMAS in the nose is intimately linked to a proper oral occlusions in close contact with perioral muscles.

Buccal region has as main characteristic the existence of on infraSMAS space filled with adipose tissue. This space is a way of spreading for an infection into neighbouring regions. The infraSMAS connective tissue from here contains fibers organized as conjunctive tracts which separate adipose
lobules (Fig. 4).

Figure 4. Adipose connective tissue in the perioral region. Dissection piece.

Perioral muscles adhere closely to the deep dermis region, crossing the superficial fascia. Here, into the thickness of the musculo-aponeurotic system there is adipose tissue divided by conjunctive septa and labial vascular nervous structures, superior and inferior. The insertion is firm, almost impossible to dissect. Because of this, superficial fascia is extremely difficult to be shown by classic anatomical dissection, of choice for examination of this region and also for nasal one being the operator microscope (Fig. 5).

Figure 5. SMAS on the lips; mesoscopic dissection.

Relations of SMAS with nasolabial fold are still controversial. Mitz and Peyronie (8) described the anterior continue of SMAS into upper lip, overlying muscular layer. Barton (9) describes a thin fascial layer which covers zygomatic muscles and extends into superior lip but does not identify subcutaneous extension of SMAS. Pensler et al. (10) identified SMAS medial to nasobial fold, meanwhile Yousif et al. considers there is an adipose supraSMAS layer on the cheek and upper lip.

Mesoscopic dissection shows up the continuation of the SMAS with the superficial fascicles of orbicularis oris muscle, suggesting that this layer represents SMAS into superior lip, separated by the overlying fascial layer (Fig. 5).

Dissecting downward to inferior lip, we have easily revealed a musculofascial infradermic layer on anterior mandibular surface. It offers attachment support for mental muscles (Fig. 6).

Figure 6. SMAS on anterior mandibular surface.

Imaging methods for revealing the soft cervicofacial tissues bring us a completely new and clear light over the organization and the functionality of SMAS. They demonstrate once again its existence and regional particularities. I will illustrate using MRI the superficial musculo-aponeurotic system of the face.

MRI aspects of SMAS on healthy persons are the first step in diagnosing pathological
lesions (inflammations, tumors, malformations etc).

Right above superior border of mandibula SMAS behaves differently:

- medially gives attachment to orbicularis oris muscle (inferior fascicle) and then to depressor anguli oris.
- laterally it becomes mobile, ascending first above jugal fat pad, buccinator and than maseter muscle (Fig. 7).

![Figure 7. Horizontal section through inferior mandibular border; transSMAS insertion of orbicularis oris's inferior fascicle.](image)

At the level of superior lip, superficial layers become fixed once again. This happens due to attachment of orbicularis oris muscle (superior fascicle) and levator labii superioris on the profound surface of the skin, transfascially. Even if superficial fascia gets thinner and thinner to modiolus its thickness is still enough to appear as a clear tissue blade on MRI. The same thing is revealed on dissected specimens.

Looking up to the nasal septum, the two fascias (superficial and profound) are united into a dense conjunctive network. Going to the nasolabial fold in its medial part we’ll see that superficial fascia becomes more clearly, offering protection for the superior branch of angular artery and for superior labial fascicles of buccal branch from facial nerve. Injures of these branches of facial nerve or of its trunk cause static deformities of this region, alimentation and phonetic difficulties, depending by the scale of the injury. Their appearance is caused by dermic attachment of the muscles and the continuity SMAS to the other regions involves their step by step transmission. Dissection and imaging allow us to state that the SMAS are identical in the two lips.

![Figure 8. Transversal MRI which illustrates transSMAS insertion of levator labii superioris muscle.](image)

CONCLUSIONS
1. Facial SMAS, anatomical and surgical entity is an unitary structure with general and particular characteristics, specific to each topographic region alternating tensioned areas with more lax.
2. Facial dermis is fixed on facial bones by a fibrous multiligamentary support system, with fixing ligaments and superficial
fascia which includes SMAS and retinacula cutis.

3. Central portion of each hemifacies is the highest mobility area and lateral portions are fixed as a result of fixation structures, cutaneous muscular attachments and the different thickness of the infraSMAS layer. Central regions of the face (orbital, nasal and oral) are “of relationship”, being attached to the lateral regions (“of sustaining”) by intermediary areas (jugal).

4. In most of anterior regions of the face (zygomatic, oral and mental) the number of their layers is reduced. Profound part of dermis becomes densely, offering support for attachments of superficial facial muscles and laterally being mobile and ascending.

5. At the superior mandibular border SMAS behaves differently: medially is fixed, allowing muscular attachments and to the lateral side is mobile and goes upwards.

6. SMAS gives support to superficial layers of the face, indirectly influencing but decisive the achievement of proper occlusion and thus mastication. SMAS supporting forces vectors in the zygomatic and temporal attachments act as levers for proper jaw muscle contraction.

7. Dermal insertions of the superficial facial muscles allow movements of the lips and their zygomatic and mandibular attachments assure a symmetrical occlusion in the 3 axes of the space.

8. Dental occlusion is modified by action of superficial perioral muscles (“relational”) on one hand and on the other hand is weighty influenced by sustaining structures (ligaments and ligamentary adhesions) which are close to temporomandibular joint.

REFERENCES


