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TECHNICAL NOTE

Use of the SMAS Flap in Benign Parotid Gland Surgery: Review and 5 Years Experience

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Abstract
Introduction Superficial parotidectomy is considered the gold standard for the treatment of the benign lesions of the parotid gland. However, the procedure is burdened by various complications such as sialocele, facial palsy, salivary fistula, and Frey's syndrome. The SMAS flap is widely used in plastic surgery for the face-lifting procedure. This surgical technique allows to obtain, in comparison with the traditional technique, a better redistribution of the tension forces during the traction of the skin. Rarely the SMAS flap is used for the surgical approach to the parotid gland which is, generally, directly approached.
Materials and Methods After a brief description of the SMAS anatomy and a short review of the SMAS flap procedure, we propose our experience about the use of the SMAS flap in the parotid gland surgery. We describe the details of the technical procedure through an explicative clinical case of a 73-year-old woman with pleomorphic adenoma of the left parotid gland. The description is attended by the images of all the surgical phases.
Conclusions The procedure we propose presents a lower risk of complications and better aesthetic outcomes in comparison to the traditional approach to the parotid gland.

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Introduction

Superficial parotidectomy (SP) is considered the gold standard for the treatment of the benign lesions of the parotid gland [1]. The surgical technique was first described in 1949 by State [2], but it was quite clear that the procedure could present several complications as sialocele, transient or definitive facial palsy, salivary fistula and Frey's syndrome [3–7]. Enucleation and extra-capsular dissection (ECD) are associated with the same complications [8, 9]. In this work, we propose a surgical technique which consists in a double approach to the parotid gland, first by a skin flap, followed by a SMAS flap which allows a wide access to the parotid gland and to the covering parotid-masseteric fascia.

SMAS Anatomy

The face is organized in five different layers which are continuous with each other from the neck to the scalp.

The acronym SCALP is useful to identify each layer:

- Layer 1: Skin,
- Layer 2: Connective tissue or subcutaneous fat layer,
- Layer 3: Aponeurosis also musculo-aponeurotic layer,
- Layer 4: Loose connective tissue also areolar connective tissue,
- Layer 5: Periosteum or deep fascia [10].

It was first described by Mitz and Peyronie in 1976 [11]; they just distinguished two types of SMAS: the parotid one,

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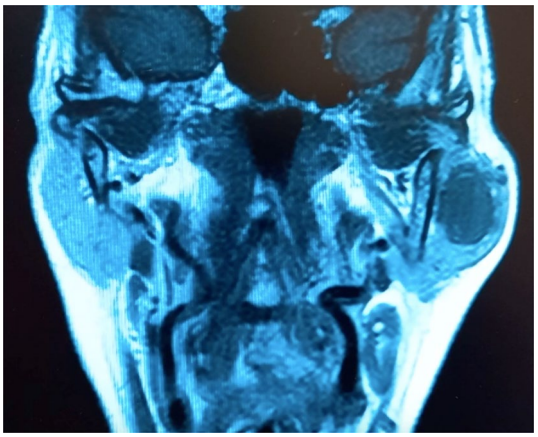

Fig. 1 MRN showed the lesion in the superficial lobe of the left parotid gland

overlying the salivary gland, and the cheek one which lies anterior to the gland.

Although the SMAS concept is accepted in daily clinical practice, the lack of a precise definition has led to controversies concerning its morphological composition and its real topographical extension [12].

According to Watanabe et al. [13], two types of SMAS must be considered: the Surgical SMAS and the Anatomical SMAS. The Surgical SMAS is a thin layer composed by facial muscles, connective tissue and poor of adipose tissue that lies between the superficial fat and the deep fat of the face, dividing the two layers. Instead, the Anatomical SMAS includes the Surgical SMAS and the overhang superficial fat. Further, the Surgical SMAS can be divided into three sublayers: sSMAS (superficial), mSMAS (parenchymal) and dSMAS (deep). The mSMAS is the real SMAS layer, composed by facial muscles, while sSMAS and dSMAS are two very thin layers composed by connective tissue which separate the SMAS from the superficial fat (sSMAS) and from the deep fat (dSMAS).

The SMAS also varies in thickness depending on the region of the face, with denser tissue in the lateral part of the face and thinner tissue medially [14]. Ghassemi et al. [15] explained the existence of two different types of SMAS morphology: the type 1 of SMAS, laterally to the nasolabial fold, rich in fibrous septa, and type 2 of SMAS with an architecture composed by a more dense collagene-muscle fibers meshwork which lies medially to the nasolabial fold. Sandulescu et al. [16] proposed to consider also the SMAS type 3 that is the SMAS covering the lower eyelid cranial to the infraorbital fold. However, recently, the same authors proposed the type IV SMAS [17]. The last concept of SMAS takes hold from an histological analysis and a three-dimensional reconstruction performed with SEM of the SMAS layer obtained from cadaver donor faces. The authors reported the presence of a parotideal SMAS and a pre-parotideal SMAS, where the type IV SMAS corresponds to the parotideal SMAS. According to these recent acquisitions the traditional layers 2 and 3, subcutaneous fat layer and musculo-aponeurotic layer, respectively, form a singular functional unit with different morphological architectures that are the result of ontogenic development. The SMAS develops ontogenetically together with the mimic musculature but, due to the lack of mimic muscles into the parotideal SMAS, the last is pulled toward by mimic muscles developing of the pre-parotideal region. That explains the different architectural alignment of the fibro-muscular septa that are horizontally oriented in the parotideal region.

State of Art About the "Use of SMAS Flap in Face Surgery"

Actually, the main use of SMAS flap is in facial aesthetic surgery. The surgical technique was first described by Rees and Aston in 1977 providing a better redistribution of the tension forces in comparison with the traditional musculocutaneous flap during rhytidectomy [18] and, still today,

Fig. 2 Hydrodissection of the skin

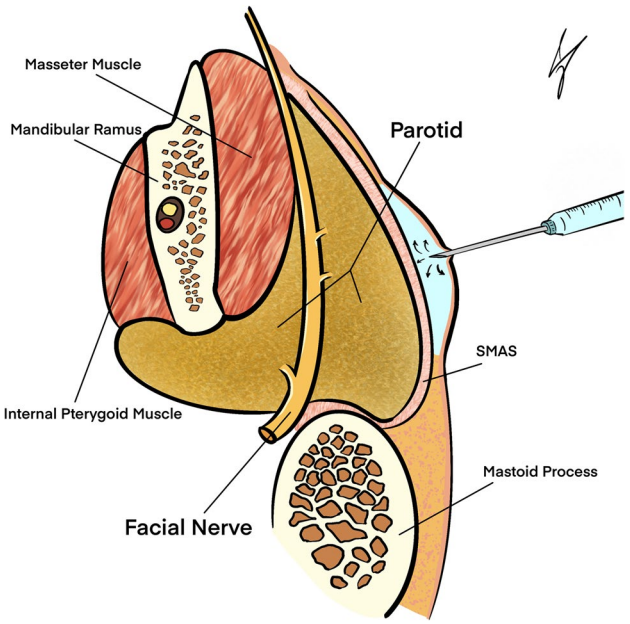

Fig. 3 Hydrodissection, separation of the superficial skin layer from the SMAS layer with subcutaneous fat tissue obtained by the infiltration, at constant pressure, of a fluid between the two layers

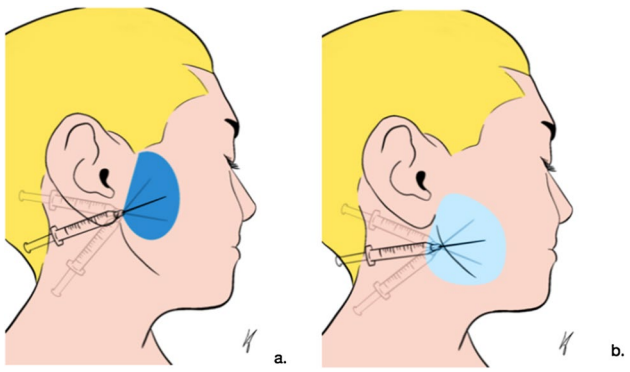

Fig. 4 **a** Superior and **b** Inferior infiltration

it is widely used in surgical rejuvenation facial treatment [19–21].

Our Experience and Technique Description

We report our experience of the last 5 years, since 2017, about the use of the SMAS flap in the surgical treatment of benigne parotid lesions.

The main advantages of the procedure are the following:

- Best aesthetic outcomes;
- Lower incidence of Frey's syndrome;
- Lower incidence of salivary fistula;
- Lower risk of flap necrosis;
- Faster healing time of the surgical wound;
- Lower incidence of facial paralysis.

We have treated 46 patients, 25 men and 21 women, with prevalent diagnosis of Pleomorphic Adenoma in FNAB cytology (Fine Needle Aspiration Biopsy), always confirmed by the post-operative histopathological examination, following by Warthin tumor. Minor diagnosis was Spindle Cells Lipoma, Cavernous Angioma, Oncocytic Cells Adenoma, Basal Cells Adenoma, Lymphocytic infiltrate, Fibroadipose tissue. We observed any complications, except just transient paralysis of the frontal branch and the marginalis mandibulae branch in three cases. The follow-up period was between 6 months and 5 years.

Below, we report an explicative case which demonstrates the easiness and the reproducibility of the procedure. *(The images below came from our operating room activities and are a courtesy of the Head of Specialization School in Maxillofacial Surgery, Prof. F.S. De Ponte, G. Martino University Hospital of Messina, Italy).*

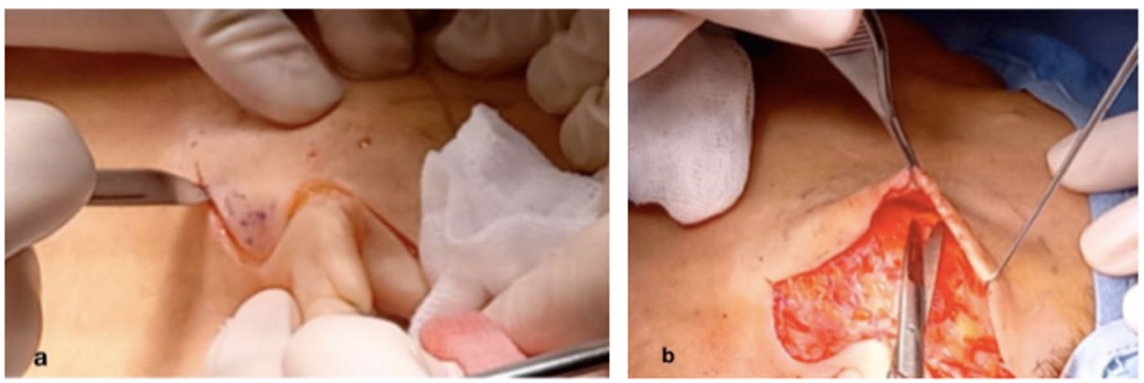

Fig. 5 **a** Redon's incision and **b** dissection of the skin plane

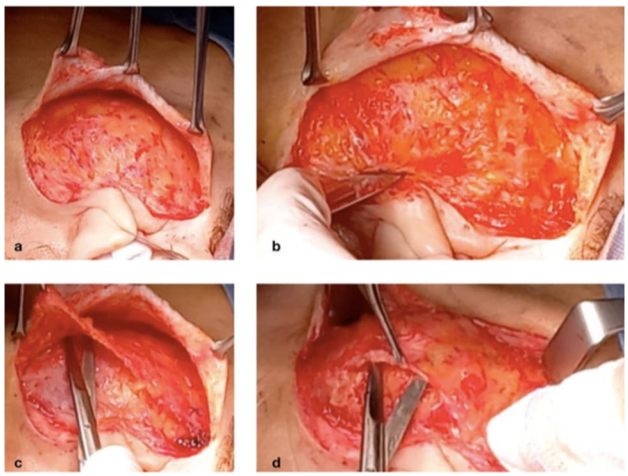

Fig. 6 **a** SMAS plane exposed covered by adipose tissue; **b** incision of the SMAS plane; **c** SMAS deep dissection; **d** dissection of the parotid fascia

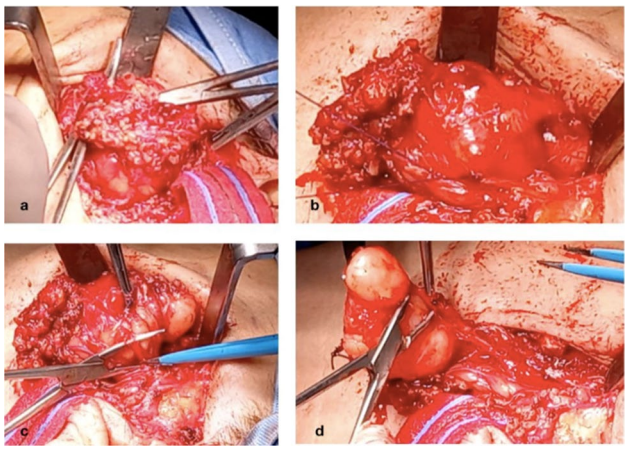

Fig. 7 **a** Removal of the glandular tissue covering the adenoma; **b** exposing of the adenoma and isolation of its vascular peduncle; **c** releasing of the mass tumor; **d** removal of the adenoma

F.M., 73 year-old woman, left parotid lesion in the superficial lobe, with cytological diagnosis of Pleomorphic Adenoma obtained by parotid needle biopsy (Fig. 1).

The procedure begins with the infiltration of the skin with a solution of Mepivacaine without adrenaline (Fig. 2).

Using a 27 Gauge needle and a disposable syringe, we use to infiltrate the anesthetic solution into the dermal layer by manual pressure.

We noted any difference between Local Anesthetic and physiological solution 0.9%. However, we advise against the use of Local Anesthetic with adrenaline because it could damage the small peripheral nervous fibers or, worse, the main nerve trunks of the facial nerve. For the same reason, we recommend not to use solutions other than the physiological one at 0.9%, for example the glucose solution or physiological solution 3% because of, due to their hypertonic effects; they could damage the nervous fibers irreversible.

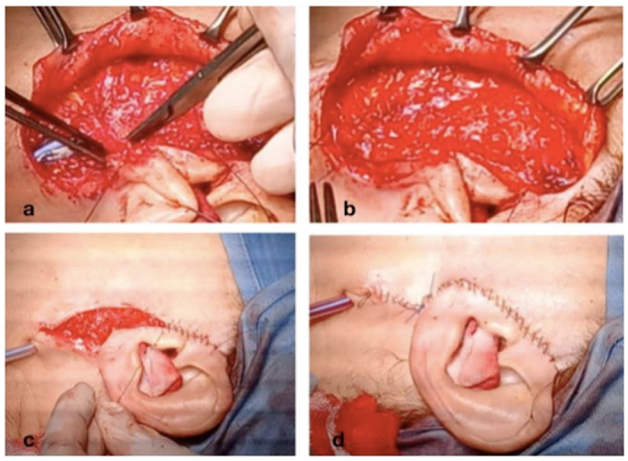

Fig. 8 Suture of the SMAS flap to cover completely the parotid gland and the drainage catheter (**a**, **b**); suture of the cutaneous flap (**c**, **d**)

The infiltration must be conducted with a constant manual pressure into the subcutaneous layer to obtain the hydrodissection, which consists in the separation of two layers: the superficial skin layer (connective derma) and the deep SMAS layer (with adipose tissue), as shown in Fig. 3

In our experience, there are two references that confirm the exact depth of the infiltration: the first is the "perception of the needle under the fingers" that is the needle must be clearly perceptible to be sure of inserting it into the dermal plane. If the needle is not well perceptible, it is likely to have insert it into the subcutaneous plane. The second mark that demonstrates the correct plane of the dissection is the "visual perception of the fluid infiltrated that must swell the skin."

In our experience, the hydrodissection must be conducted in two phases, with a superior and inferior infiltration, to involve the entire extension of the parotid gland, as shown in Fig. 4a, b

The needle must be positioned horizontally and 3–4 series of infiltrations are required for each of the two phases, changing the inclination of the needle. The tip of the needle must always be oriented downward.

Once the phase of the hydrodissection is completed, the procedure continues through a classic Redon's incision using a scalpel blade *n*° 10, as shown in Fig. 5. Here, it is possible to note the lower bleeding of the wound in comparison with surgery performed without hydrodissection, so that it is not necessary the mechanical aspiration. The next phase consists in the dissection of the superficial plane, using a blunt scissors. The flap is elevated using Ellis' anatomical forceps and Gillies' hooks.

After superficial dissection, SMAS plane is well exposed (Fig. 6a). The procedure continues with the incision of the SMAS (Fig. 6b), using a scalpel blade *n*° 10, and with the dissection of the deep surface of the SMAS plane, using

blunt scissors, so to create the SMAS flap (Fig. 6c). Finally, the dissection of the parotid fascia allows to expose the underlying parotid gland (Fig. 6d).

Once the surface of the glandular parenchyma is exposed, the parotid tissue covering the adenoma is removed (Fig. 7a), until the underlying tumor is exposed. Subsequently, the vascular peduncle of the adenoma is isolated (Fig. 7b), and the mass tumor is released from its capsule (Fig. 7c). Finally, the adenoma is removed (Fig. 7d).

The surgery is completed with the suture of the SMAS flap which totally covers the residual parotid gland (Fig. 8a, b) and with the suture of the cutaneous flap (Fig. 8c, d).

Conclusions

The SMAS flap is widely used for face-lifting technique in facial rejuvenation surgery, but it is less used for parotid gland approach. Actually the surgical approach to the parotid gland is a direct approach, but it is known, many complication risks are possible. Instead, the indirect approach which we propose, that is a first skin flap following by a SMAS flap, ensures a minimal risk of complications (in our experience close to zero), beyond that great aesthetic outcomes. In addition, it is our opinion that the procedure is easy and fast reproducible by operators with an average surgical experience.

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