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Part III: Energy-Based Devices

Video Contents

1 Overview of Facial Tissue Anatomy

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Abstract
The key to safety in surgical dissection of the face is an accurate understanding of soft tissue anatomy. While two-dimensional branching patterns of the facial nerve are variable, the plane of the facial nerve is constant within the architecture of the facial soft tissue. Recognition of the plane of surgical dissection and its relationship to the plane of the facial nerve provides the surgeon with the ability to provide safe and consistent outcomes in both aesthetic and reconstructive facial procedures.

Keywords: facial soft tissue anatomy, facial nerve

The primary focus of this textbook is to assist physicians operating within the face to improve their understanding of the nuances of facial anatomy, increasing both consistency in result and patient safety. Understanding facial soft-tissue anatomy is pertinent to both reconstructive and aesthetic surgery, and a three-dimensional comprehension of the architectural arrangement of facial soft tissue is essential when dissecting facial flaps for reconstructive purposes or performing procedures to expose the craniofacial skeleton, and more specifically when performing aesthetic surgery procedures.

Preventing facial nerve injury is the most important aspect of both safety and preserving function when performing facial procedures. The critical element to avoid motor branch injury is an accurate understanding of the three-dimensional architecture of facial soft tissue.

While much has been written about facial nerve anatomy, many investigations have focused on two-dimensional branching patterns of the facial nerve. Unfortunately, two-dimensional facial nerve anatomy is not particularly relevant when dissecting within the face, as there is a great deal of variation in terms of branching patterns among patients as well as variations in branching patterns between the right and left side of the cheek. The key to avoiding facial nerve injury is to understand the three-dimensional architecture of the soft tissue planes of the face, as well as recognizing the plane of dissection in relation to the plane of the facial nerve. THINK THREE DIMENSIONALLY.

1.1 The Architectural Arrangement of Facial Soft Tissue

- Facial soft tissue is arranged in a series of concentric layers, similar to the concentric layers of an onion.

1.1.1 The Layers of Facial Soft Tissue from Superficial to Deep

- Skin
- Compartmentalized subcutaneous fat
- Superficial facial fascia (also termed SMAS; these terms will be used interchangeably)
- Mimetic muscles (superficial muscles invested by the SMAS)
- Subsmas fat
- Deep facial fascia (also regionally known as parotid capsule, masseteric fascia, or deep temporal fascia)
- The plane of the facial nerve, parotid duct, and buccal fat pad (▶ **Fig. 1.1a,b**).

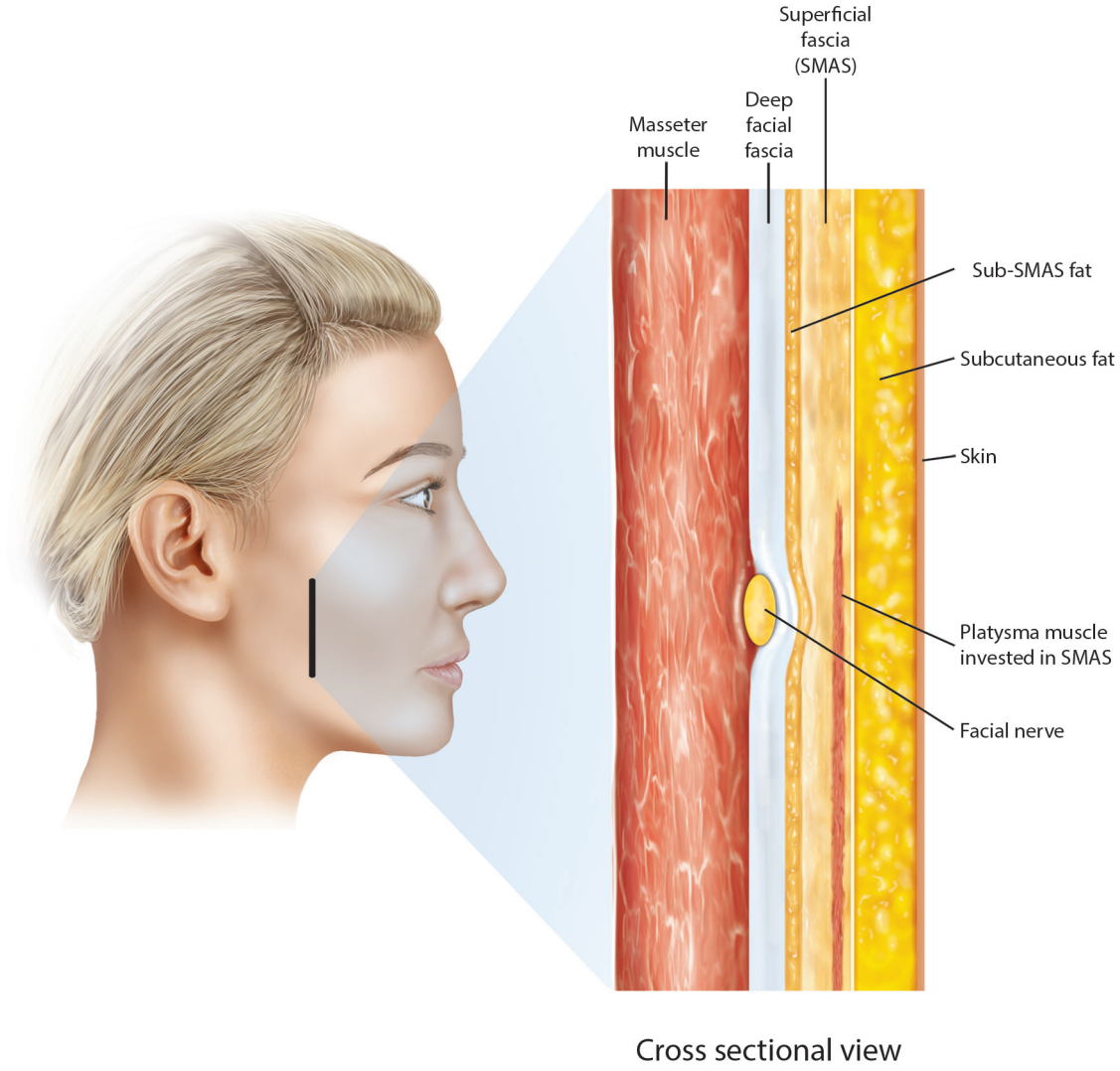

Fig. 1.1 (a) Cross section of the lateral cheek illustrated just anterior to the parotid gland. The architecture of the facial soft tissues of the cheek is three-dimensional and is arranged in a series of concentric layers. From superficial to deep, these layers are 1) skin 2) subcutaneous fat (which is compartmentalized) 3) superficial facial fascia-better know as SMAS 4) superficial mimetic muscles (invested by SMAS) 5) sub-Smas fat 6) deep facial fascia (also regionally termed parotid capsule, masseteric fascia, or deep temporal fascia 7) the plane of facial nerve, parotid duct, masseter, and buccal fat pad. The KEY to SAFETY when operating in the face is to recognize the plane of dissection and its relation to the plane of the facial nerve.

1.1.2 The Plane of the Facial Nerve

- While there is a good deal of variation in terms of two-dimensional facial nerve branching patterns, the plane of the facial nerve in relation to the other fascia layers of the face is anatomically constant.
- The critical step to avoid facial nerve injury is to accurately identify the plane of dissection as it is performed. If dissection is carried out either superficially or deeply to the plane of the facial nerve, motor branch injury will be prevented.

compartment to an adjoining facial fat compartment, bleeding from these perforators is noted.

- Both the thickness and fascial consistency of the fat within each compartment varies as the cheek is dissected, from laterally in the preauricular region more anteriorly toward the nasolabial fold.
  - The lateral compartment, in the preauricular region, tends to be thin, dense, and vascular, while the fat within the middle compartment tends to be thick, fluffy, avascular, and easy to dissect.
  - Transiting from the middle to the malar compartment, zygomatic ligaments and perforators from the transverse facial artery are encountered such that dissection along the lateral malar eminence tends to be both fibrous and bloody.
- Each facial fat compartment has its own tendency toward deflation, with the lateral compartments showing evidence of deflation in patients in the 40 to 50 year age group, while malar deflation tends to occur a decade later. The anatomic nature of deflation (which is compartment-specific) explains why facial deflation tends to occur regionally, rather than homogenously across the cheek in facial aging (See Chapter 2 on Facial Fat Compartments) (▶ **Fig. 1.3**).

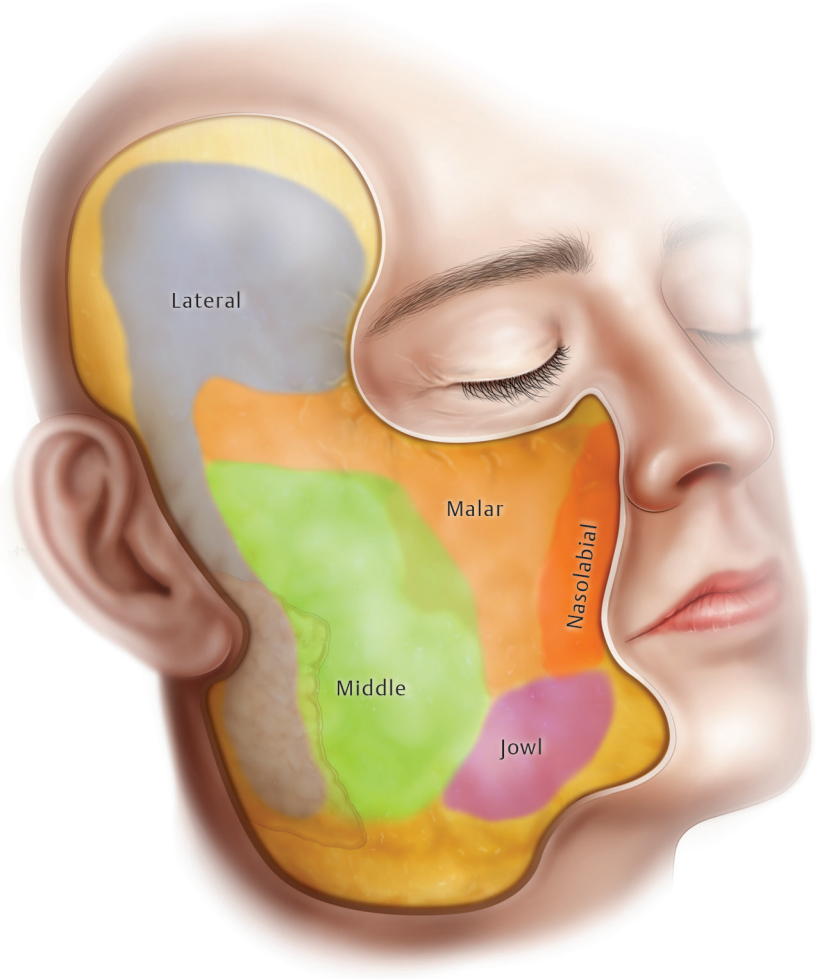

Fig. 1.3 Facial subcutaneous fat is not a homogeneous layer, which is dissimilar to subcutaneous fat in other regions of the body. The subcutaneous fat of the cheek is divided into fibrous compartments by the distal ramifications of the retaining ligaments as they transit from deep-fixed structures to insert into the skin as the retinacular cutis. The superficial compartments of the cheek (from lateral to medial) are the lateral compartment, middle compartment, malar compartment, jowl compartment, and nasolabial compartment. Each fat compartment has a distinct fascial consistency, thickness, and a specific tendency toward deflation with age.

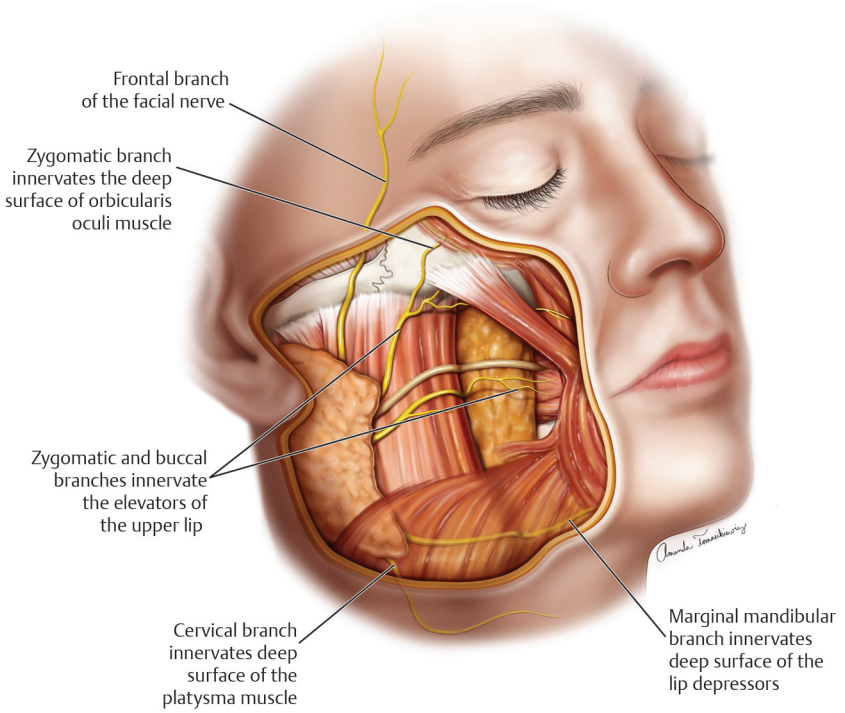

Fig. 1.4 Mimetic muscles are situated at different levels within the facial soft tissue, with muscles such as the orbicularis oculi situated directly beneath the skin (producing crow's feet in animation with aging) while deeply-situated muscles, such as the bucccinator, overlie oral mucosa. As most of the mimetic muscles lie superficial to the plane of the facial nerve, they receive their innervation along their deep surfaces. For this reason, if dissection is carried along the superficial surface of a mimetic muscle (i.e., superficial to the platysma in the cheek and neck), motor branch injury will be prevented.

In general, the facial nerve branches lie deep to the deep fascia until reaching the muscles, which they innervate. They then penetrate the deep fascia to innervate the muscle along its deep surface. The exceptions to this are the frontal and cervical branches. In this illustration, the deep fascia has been removed to demonstrate the depth of nerve branches in relation to the muscles, which are innervated.

Note that the cervical branch typically penetrates the deep fascia laterally and lies with the plane between superficial and deep fascia, just deep to the platysma, before innervating the platysma medially. Similarly, the frontal branch travels in the plane between superficial and deep fascia after it travels cephalad to the zygomatic arch.

Deep Facial Fascia

- Similar to the SMAS, the deep facial fascia represents a continuation of deep cervical fascia cephalad into the face and is anatomically similar to deep fascia elsewhere in the body.
- Despite existing as a continuous layer, regional variations of deep fascia have been given specific nomenclature. Overlying the parotid, the deep fascia is termed parotid capsule; overlying the masseter, the deep fascia is termed masseteric fascia; and in the temporal region, it is commonly termed deep temporal fascia.
- THE IMPORTANT POINT TO REMEMBER IS THAT ALL FACIAL NERVE BRANCHES WITHIN THE CHEEK LIE DEEP TO THE DEEP FACIAL FASCIA AFTER THEY EXIT THE PAROTID.
- Therefore, as long as the dissection is kept superficial to the deep fascia, motor branch injury will be prevented in most regions of the cheek. From an anatomic perspective, it is the presence of the deep fascia that

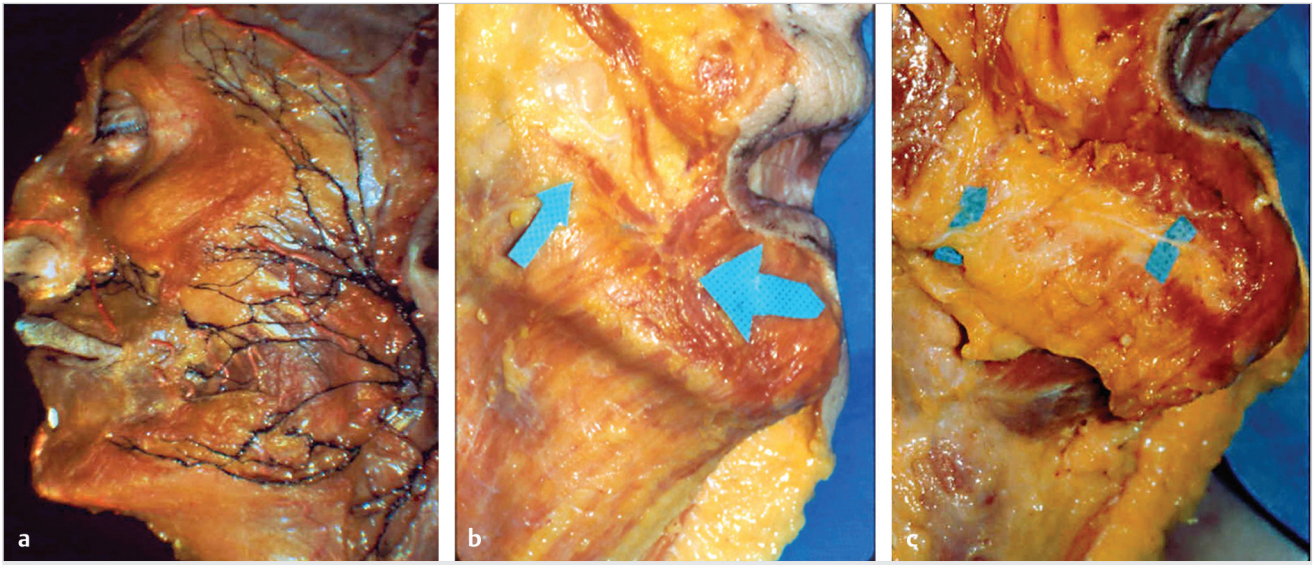

Fig. 1.5 **(a)** Cadaver dissection of the facial nerve (performed by Dr. Julia Terzis). Note that the malar region, directly overlying the zygomatic eminence, is a watershed between the frontal branches superiorly and the zygomatic branches inferiorly, such that dissection directly overlying the malar eminence is safe in terms of inadvertent nerve injury. Note also that the elevators of the upper lip receive their innervation along their deep surfaces, such that dissection along the superficial surface of these muscles is similarly safe.
(*From Surgical Rejuvenation of the Face. Baker, Gordon and Stuzin in 1996 published by Mosby*) **(b)** The mimetic muscles that might be encountered when perfoming dissection in the cheek are shown in this cadaver dissection. They include the zygomaticus major (which sends a slip of muscle to the modiolus), the risorius (*small arrow*), the platysma, the depressor anguli oris (*large arrow*), and the depressor inferioris. Note the relative size of the platysma in comparison to the other depressors of the lower lip. While the platysma does not have a direct insertion into the lip, its function for full denture smile and animation is important. These muscles are interrelated in terms of function by connections, which exist between the cervical and marginal nerves.
(*From Lambros, V, Stuzin, JM, The Cross-Cheek Depression: Surgical Cause and Effect in the Development of the "Joker Line" and its Treatment. Plast Reconst Surg. 122:1543, 2008*)
(c) The depressor angli oris and depressor inferioris are reflected to demonstrate the marginal mandibular nerve, which innervates these muscles along their deep surfaces.

allows sub-SMAS dissection to proceed safely, as the deep fascia serves as an interposition layer between sub-SMAS dissection and the underlying facial nerve branches (▶ **Fig. 1.6**).

Facial Nerve, Parotid Duct, and Buccal Fat Pad

- Deep to the deep fascia lies the plane of the facial nerve, parotid duct, and buccal fat pad.
- Obviously, this is a plane that is to be avoided during soft tissue dissection of the cheek.
- Deep to the plane of the facial nerve are situated the fixed structures of the face, including the parotid gland, masseter, deep fat compartments, and periosteum.

1.1.4 Retaining Ligaments

- Retaining ligaments of the cheek support the facial soft tissue against gravitational change and exist in specific locations.
- These ligaments originate deep to the deep fascia and travel from deep fixed structure, through the SMAS, and insert into the overlying skin via the retinacular cutis.