Anatomy for Facial Fillers: The Skin Surface and Beyond

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Abstract

The popularity of facial fillers for aesthetic rejuvenation is growing. The demands of the patient population for 'minimally invasive' alternatives and improvement in the physical characteristics of the products has fueled this to a large degree. Practitioners administering these products should be highly competent in the nuances of performing these procedures. The most important aspect of successful facial filler injection is competence in understanding the relevant anatomy which enhances outcomes and minimizes complications. This chapter highlights the pearls of facial anatomy as it relates to filler injection techniques.   © 2018 S. Karger AG, Basel

The use of facial fillers has been steadily increasing over the past several years. This increase is due to several factors. These include the development of many new and improved filling products and increasing patient demand for noninvasive methods to improve facial appearance [1].

With the rise in incidence of facial filler injections, complications related to these injections have also increased in number. Complications have ranged from minor issues such as surface irregularities ("lumps and bumps") and minor surface discolorations to more devastating problems, such as vascular skin compromise and blindness. These complications have underscored the need for all injection practitioners to have a strong knowledge of both the surface skin landmarks as well as the soft tissue and vascular anatomy below the skin surface.

Table 1. Layers of the face

I	Skin
II	Subcutaneous tissue/superficial areolar tissue
III	Superficial fascia
IV	Loose areolar tissue
V	Deep fascia

This chapter will discuss the common anatomical relationship of the facial tissues. The layered anatomy of the face will be outlined, as will the typical position of muscles and neurovascular structures. Applied anatomy related to surgical and injectable procedures will be highlighted.

Surface Anatomy

Injectors of facial fillers must understand both the surface and deep anatomies. The surface anatomy can be considered in graph analogy as "x and y," while the underlying layered anatomy may be analogous to the "z" vector. During the injection, the practitioner must have an intrinsic knowledge of the z vector, while only having to observe and palpate the x and y.

The surface skin landmarks that identify the important structures that lie beneath are relatively constant. For instance, it is straight forward to identify the facial artery (FA) and vein as they cross the mandible. This is done by having the patient clench his/her teeth and by palpating the masseter muscle. The FA lies just anterior to the anterior border of the masseter muscle in a small depression in the mandibular surface, termed the antegonial notch. The facial vein is always just posterior to the artery as they cross the mandible [2].

The size and position of other structures, such as muscles of facial animation, can be approximated by having the patient perform various expressions and by using the position of other facial surface features.

Layers of the Face

Although the position of various deep structures in a 2-dimensional grid can be noted on the skin surface, a thorough knowledge of the layered anatomy of the face is necessary to maximize efficiency and to minimize complications with any facial filler injection. The skin, subcutaneous tissues, and superficial and deep fascial layers of the face are consistent in their relationships and can be designated with a common numbering system. These layers can be numbered I–V, with each layer being consistent in tissue type throughout different regions of the face. The numbering system of the facial layers is shown in Table 1.
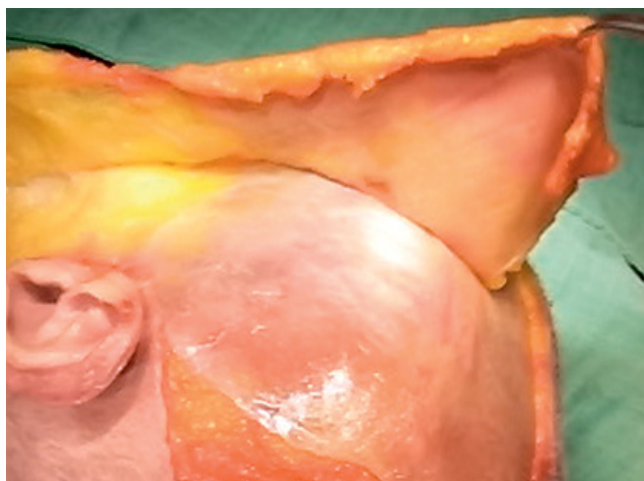
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Fig. 1. The interface between layer III and V.

The thickness of tissue layers differs in different facial regions, but the relationship between layers is consistent. The attachment of the skin (layer I) to the superficial fascia (layer III) is tightly adherent, while the connections between the superficial fascia (layer III) and the deep fascia (layer V) are relatively loose (Fig. 1). When performing surgery between skin and superficial fascia, the dissection plane is sharp and dissection needs to be accomplished with a scalpel or scissors. If a filler is injected into this superficial plane, it will usually require a needle. On the contrary, surgical dissection between superficial and deep fascial layers is blunt and can be performed either by sharp or blunt dissection. Similarly, filler injections between superficial and deep fascia can be performed by either a needle or with a blunt cannula.

Layer I: Skin

The skin varies in thickness, pigmentation, and amount of dermal appendages throughout the face and neck. The skin (epidermis + dermis) is thinnest in the upper eyelids (800 microns) and thickest over the nasal envelope (1,300–2,000 microns), upper lip (1,500 microns), and lower cheek (1,350 microns) [3]. The skin is firmly attached to the underlying muscles of the oral commissure and in the region of the nasal tip, while it is loosely attached to the underlying soft tissue in the eyelids and at the root of the nose. This variable thickness must be taken into account by the injector as regions with thin skin are more likely to reveal skin surface irregularities post injection. As the dermis of the skin thins with age, the underlying muscles cause rhytids, which generally are perpendicular to the direction of facial muscle contraction. The amount of skin wrinkling is variable, and relates to the skin thickness and elasticity.

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Layer II: Subcutaneous Tissue

The subcutaneous tissue varies in amount in relation to the patient's genetics, ethnicity, and body weight. The amount and composition of subcutaneous fat also varies between facial regions [4, 5]. In the eyelids, subcutaneous facial fat is nonexistent and the underlying muscle, the orbicularis oculi, is found immediately beneath the skin surface. For this reason, superficial filler injections in the eyelids often result in surface irregularities as there is no fat present to camouflage any deposits of filler agent. The subcutaneous fat is present in the cheek region; the greater the distance from the lower eyelid margin, the more dense is the fat. The fat in the subcutaneous region of the mentum and the lips are more dense, with the overlying skin being tightly adherent in these regions.

Layer III: Superficial Fascia

The superficial fascia of the face is fairly adherent to the overlying skin and subcutaneous tissues of the face in most regions, and therefore must be dissected sharply from the skin in order to surgically separate the tissue planes. The superficial fascia has different names in different facial regions.

In the forehead, the superficial fascia is termed the galea aponeurosis, while in the temple, it is called the temporoparietal fascia (TPF). Below the zygomatic arch, layer III is termed the superficial musculoaponeurotic system (SMAS), while in the neck, the superficial fascia is the connective tissue enveloping the platysma muscle. The SMAS and TPF are contiguous structures, but are discontinuous at the level of the zygomatic arch.

Layer IV: Deep Areolar Layer

In all regions of the head and neck, the superficial fascia (III) is connected to the deep fascia (V) by a loose areolar layer. This connection is variable and differs by age, genetics, and body weight. The attachments are typically comprised of loose connective tissue, and surgical dissection of this plane is therefore usually blunt. The specific structures which traverse this layer vary by region, and are covered below.

Layer V: Deep Fascia

The deep or investing fascia is a relatively immobile layer on which the superficial layers can slide. It is connected to the overlying mobile superficial fascia (III) by loose connective tissue (IV). In the forehead, the deep fascial layer is the frontal periosteum.

This layer is tightly bound to the underlying frontal bone. The deep fascia of the temporal region is the deep temporal fascia (DTF). The DTF has a superficial and deep layer. The temporal branch of the facial nerve courses through the superficial layer of the DTF. The deep layer of the DTF (or temporalis muscle fascia) overlies the temporalis muscle [6].

In the midface, the deep fascia is termed the parotidomasseteric fascia. This fascia invests the masseter muscle and the parotid gland. The parotid duct and the terminal branches of the facial nerve are located within the parotidomasseteric fascia [7]. The SMAS (superficial fascia) slides on the deep fascia of the midface. In the neck, the deep fascial layer is termed the deep cervical fascia.

Fat Compartments of the Face

The amount, consistency, quality, and density of facial fat differ in different regions of the face. In the upper and lower eyelids, subcutaneous fat is virtually nonexistent. In the midface, there is a moderate amount of facial fat and this fat consists of globules which are not densely arranged [4]. In the upper and lower lips and over the mentum, the subcutaneous fat is densely packed.

In general, when augmenting the face, injections of soft tissue fillers are placed into the deep, rather than the superficial fat pads [4, 5]. Although injections into the superficial layers are very efficient and change skin contours with small injection amounts, injections into the deeper layers are usually safer (from a vascular standpoint) and lessen the incidence of surface irregularities after injection.

Injection Planes – Applied Anatomy

The goal of facial filler injections is to change the facial surface contour. Facial convexities reflect light, and facial concavities create shadow. The objective of facial fillers is to change the light-shadow interface. The placement of any facial filler should maximize efficiency (utilizing as little product as possible), while minimizing the chance for any filler complications. The more superficial the placement of a filler, the greater the chance of secondary issues such as surface irregularities and skin discoloration (Tyndall effect). Additionally, the injector should have a thorough knowledge of the regional vascular anatomy to avoid intravascular filler injection and the associated skin and soft tissue compromise that accompanies intravascular injection of the filler material.

The surface contour of the forehead, temple, and face is affected by the position and volume of the superficial and deep fat pads of the region. Most filler injections are made into the deep fat pads, avoiding intravascular injections and creating a smooth surface contour.