The Malar Septum: The Anatomic Basis of Malar Mounds and Malar Edema

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The anatomy of malar mounds and malar edema is evaluated in a series of 18 fresh cadaver dissections. Dye injection, histologic evaluation, and gross anatomic dissection are used to identify a previously unrecognized fascial structure of the lower eyelid and cheek. The malar septum originates from orbital rim periosteum superiorly and inserts into cheek skin 2.5 to 3 cm inferior to the lateral canthus. This fascial structure acts as a relatively impermeable barrier that allows tissue edema and hemoglobin pigment to accumulate above its cutaneous insertion. The malar septum, which acts as both a functional and a structural barrier, defines the lower boundary of several clinical entities: malar mounds, malar edema, malar festoons, and periorbital ecchymosis.

The permeability characteristics of the malar septum suggest that, at least in some persons, malar mounds may be accentuated by chronic lower eyelid edema, and these characteristics may imply a time course in the progressive development from malar edema to malar mounds and, ultimately, to malar festoons. The anatomy of the malar septum is clinically relevant because it defines the four anatomic compartments of the malar mound that should be considered during surgery: the superior compartment of suborbicularis oculi fat, orbicularis oculi muscle, and superficial cheek fat and cheek skin superior to the cutaneous insertion of the malar septum.

Malar bags, or mounds, have been difficult for the aesthetic surgeon to correct. Current surgical approaches used to improve this feature of the aging face are skin excision, direct or liposuction-assisted fat removal, and orbicularis oculi muscle removal or repositioning. Despite the use of these techniques, knowledge of the anatomy of malar mounds has been incomplete.

Several clinical observations led to the present study. Malar mounds have a constant anatomic location between 2.5 and 3 cm below the lateral canthus, regardless of the person’s age (Figure 1, A). In addition, typical posttraumatic periorbital ecchymosis, a so-called “black eye,” is seen in this same location with a sharply defined lower border (Figure 1, B).

After facial surgery, swelling and edema mimicking malar mounds may develop in some patients (Figure 1, C). Malar festoons are also seen in a similar position 3 cm below the lateral canthus (Figure 1, D).
These seemingly disparate clinical entities—malar mounds, edema, festoons, and periorbital ecchymosis—share a common inferior boundary located approximately 3 cm below the lateral canthus, which suggests the existence of a relatively impermeable membrane at this location that traps tissue fluid and hemoglobin pigment and acts as a functional and structural barrier.

Pilot Study

To explore the possible existence of a membrane that defines the inferior boundary of malar mounds, tissue specimens of the cheek area of several cadavers were examined grossly and microscopically. No specific ligament or membrane was observed (Figure 2).

Because hemoglobin pigment from periorbital ecchymosis was trapped in this specific malar area, we reasoned that dyes could be used to facilitate identification of this proposed structure. A number of dyes were used initially, including India ink, methylene blue, and isosulfan blue. The isosulfan blue dye yielded the best tissue penetration and diffusion, and when injected into the lower eyelid, it sharply defined the lower limit of malar mounds (Figure 3, A and B). This pilot study led to a more comprehensive study.

Materials and Methods

The anatomy of malar mounds was investigated as a three-part study. Eighteen cadaver dissections were performed within 72 hours of death. In the first part of this study, 1 ml of isosulfan blue dye was injected into the lower eyelid in a subdermal location at the level of the orbital rim of five cadavers. Dissection was performed after 4 hours to allow for uniform dye distribution.

In the second part of the study, the histologic features of the malar septum were evaluated. In each of 11 cadavers, a vertical full-thickness section of tissue was removed at the lateral canthus and processed for histologic study. Subperiosteal dissection facilitated removal of the specimen, which included all layers of cheek tissue. Specimens were fixed in Bouin’s solution for 48 hours and then stained with either Masson’s trichrome, or van Gieson’s stain.

Having gained some understanding of the approximate location of this fascial septum, two additional gross anatomic dissections were performed in the third part of this study to document the presence and exact anatomic location of the facial septum.
Results

Part One

The periorbital region of five cadavers was dissected after the injection of 1 ml of isosulphan blue dye. The dye was allowed to distribute evenly, and the lower limit of dye diffusion was marked along its horizontal dimension (Figure 4, A). The limit of dye penetration was approximately 3 cm below the lateral canthus in all five specimens. This region was incised and dissection carried beneath the dye-stained tissue superiorly (Figure 4, B). The dye-stained tissue was followed up to the level of the inferior orbital rim where fascial fibers were noted to originate from the arcus marginalis at the orbital rim (Figure 4, C).

In the five cadavers studied, the results were consistent: dye was always confined to the area superior to this fascial network. It is of interest that orbicularis oculi muscle, sometimes with multiple fenestrations, was noted below the level of dye staining and even draped down onto the lower cheek.

This information gave preliminary evidence of a fascial network that originated at the level of the orbital rim and acted as an impermeable barrier to injected dye.

Part Two

The histologic features of malar mounds were studied in 11 fresh cadaver dissections. A vertically oriented tissue section was removed from the lateral canthus above to the cheek below. Each specimen was full thickness and contained all layers of cheek tissue, including periostium.

Trichrome stain was used to highlight the fascial components of the microanatomy (Figure 5, A and B). A thin fascial structure originating from the orbital rim periostium was seen. This fascia crosses the suborbicularis oculi fat and divides this fat into superior and inferior compartments. The fascia then interdigitates with a fibrous septa of superficial cheek fat at the level of orbicularis oculi as it crosses this muscle. The cutaneous insertion point occurs roughly 3 cm inferior to the lateral canthus. Van Gieson’s stain confirmed that this structure is in continuity with and arises from orbital rim periostium (Figure 6, A and B).

Part Three

Having gained an understanding of the approximate location of this fascial septum, two additional fresh cadaver dissections were performed to further identify
the gross anatomy. In these specimens, an ultra-thin fascial structure was clearly seen (Figure 7, A). This fascia is separate and distinct from the orbital septum, which inserts at the same location along the orbital rim at the common fusion point, the arcus marginalis (Figure 7, B). This septum can be seen to travel to the level of orbicularis oculi muscle, at which point it interdigitates with a fibrous septa of the superficial cheek fat. This fascia can be dissected as a distinct structure from its suborbicularis muscle position, although it was not possible to separate out the supraorbicularis fascia in either specimen, even with 3.0 loupe magnification.

**Discussion**

This study defines a structure of the lower eyelid and cheek not previously described in the anatomic literature. We chose the name *malar septum* to identify this structure. Malar, from the Latin *mala*, *male*, refers to the jaw or cheekbone and denotes the origin of this structure. Septum describes the partitioning nature of this membrane, which acts as a barrier to fluid and pigment.

Finding the malar septum involved a bit of detective work. It seemed evident that a structure had to exist at the lower limit of malar mounds, because malar mounds, edema, testoons, and periorbital ecchymosis all occur in the same anatomic area (Figure 1, A-D). The question was how to identify this struc-
ture. Examining superficial cheek fat and random histologic sections failed to identify a structure (Figure 2).

The model of the “black eye” suggested the technique of dye injection. The dye first demonstrated the fascia arising from orbital rim periosteum; full-thickness subperiosteal specimens were then studied histologically. Once the microanatomy of the malar septum was known, finding the structure macroscopically was straightforward, and with use of the model of periorbital ecchymosis, the question of why a black eye forms where it does was answered as well.

The combined information gained from dye injection, histologic examination, and gross dissection provides a detailed picture of the malar anatomy. The malar septum originates from the orbital rim, specifically along the arcus marginalis. The arcus marginalis is the fusion point of several fascias along the rim: orbital rim periosteum, orbital septum, and the periosteum of the maxilla.16 The malar septum fuses here as well. From its origin, the malar septum then divides the suborbicularis oculi fat described by Aiache and Ramirez2 into superior and inferior compartments; the inferior compartment is confluent with the lower cheek fat. It seems that the superior compartment contributes to the formation of malar mounds (Figures 5 and 6).

At the level of the orbicularis oculi muscle, the malar septum fuses with a fibrous septa of the superficial cheek fat (Figures 5 and 6). This is significant because it appears that the malar septum is primarily a suborbicularis oculi muscle structure. It is the interdigititation of the malar septum with the fibrous septa that creates an impermeable barrier from the orbital rim to cheek skin.

This anatomy is consistent from person to person, and malar mounds tend to occur in a relatively constant location throughout life. Almost regardless of the person’s age, malar mounds are located between 2.5 and 3 cm inferior to the lateral canthus, which suggests that orbicularis muscle prosthesis probably does not occur, or at least has little influence on the development of malar mounds. The constancy of the location of malar mounds suggests that one of the primary changes in the aging face in this area must occur in the anterior-posterior dimension rather than in the superior-inferior dimension. Again, this suggests that gravity and ptosis probably have little to do with the development of malar mounds in the aging face.

Patients with co-existing lower eyelid fat pads (pseudoherniation of infraorbital fat) and malar bags often state that whereas their fat pads tend to diminish as the day goes on, their malar bags tend to become worse. Perhaps the malar bags do not actually become worse, but rather that as the lower eyelid fat pads become less obvious, the malar mounds become more apparent. Taking this thought a step further, it is possible that in the majority of patients, malar mounds do not become worse with age but rather are simply “unmasked” by changes in the surrounding soft tissues (e.g., atrophy). In any event, these thoughts tie in with our understanding that it is important not to over-resect fat pads in patients who have co-
existing malar mounds lest the malar bags become more apparent (James H. Carraway, MD, personal communication, April 1994).

It appears that a subset of persons are more prone to having malar mounds early in life. The fact that the malar septum is impermeable to fluid and hemoglobin pigment suggests that the malar mounds in these persons may be aggravated by recurrent swelling of the lower eyelid. Blepharochalasis, a term introduced by Castanarés20 to describe recurrent swelling of the upper eyelid, may also affect the lower eyelid. Frequently, blepharochalasis of the upper eyelid and malar mounds co-exist in the same patient (Figure 1, D).

Malar mounds and periorbital swelling are also found in patients with hypothyroidism,21,22 dermatomyositis,23 and systemic lupus.24 One patient who had malar mounds early in life noted that her malar mounds became more prominent after she ate a salty meal, presumably because of fluid retention.

The most likely function of the malar septum is to partition the eye, the most important sensory apparatus, from the lower face. Ascending infections from the oral cavity gain limited access to the orbital region. A similar concept is postulated for the orbital septum; that is, as a watertight barrier, it protects the eye from potential infection and edema.25

It is possible that the malar septum also functions in a lesser role as a retaining ligament in the face to stabilize the lower lid. The cutaneous insertion of the malar septum allows the force from swelling or traction on the lower face to be diffused over a greater area, so there is less chance of distorting the lower eyelid. The anatomic arrangement described for the levator aponeurosis26 may function in a similar fashion.

In discussing the treatment of malar mounds, there are four anatomic components that should be considered: the superior compartment of suborbicularis oculi fat, orbicularis oculi muscle, superficial cheek skin, and cheek fat, all of which lie superior to the cutaneous insertion of the malar septum. Current techniques for treating malar mounds have often focused on one specific compartment.

A time course may exist in the development of malar mounds. In certain persons predisposed to recurrent eyelid swelling, chronic malar edema may become a malar mound. With progressive distention of skin and muscle, a malar festoon may be the end stage of this process. The question then becomes not so much which technique is best, but rather which technique is most applicable at the time. For example, malar mounds that appear early in life might respond to suborbicularis fat removal, either by liposuction or direct excision, whereas malar mounds that appear later in life may require skin and/or muscle excision as these tissues become distended. Long-term clinical follow-up will be necessary to answer such questions.

The identification of the malar septum adds another piece to the puzzle of how the face changes with age. It is hoped that knowledge of this anatomic will augment our clinical treatment of malar mounds and malar edema.

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References