



**Fig. 2.** The two calibration points drawn on the patient's face before surgery.

The detachment of the lateral canthal tendon may result in an asymmetric repositioning of the canthus as compared with the contralateral side.<sup>4,5</sup> This new application of augmented reality is simple, reproducible, and inexpensive. It allows the surgeon to evaluate canthal position, especially alignment or misalignment in all phases of surgical planning, execution, and follow-up on a live image-based system. This is probably the beginning of the rapid development of new applications.

Augmented reality is a growing area in virtual reality research. An augmented reality system generates a composite view for the user. It is a combination of the real scene viewed by the user and a virtual scene generated by the computer that augments the scene with additional information. In this article, the authors describe one of the first applications of augmented reality in oculoplastic surgery: the evaluation of the position of the lateral canthal ligament.

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#### DISCLOSURE

The authors have no financial interest in any of the products or devices mentioned in this article.

#### REFERENCES

1. Hansen C, Wieferich J, Ritter F, Rieder C, Peitgen HO. Illustrative visualization of 3D planning models for augmented reality in liver surgery. *Int J Comput Assist Radiol Surg.* 2010;5:133–141.

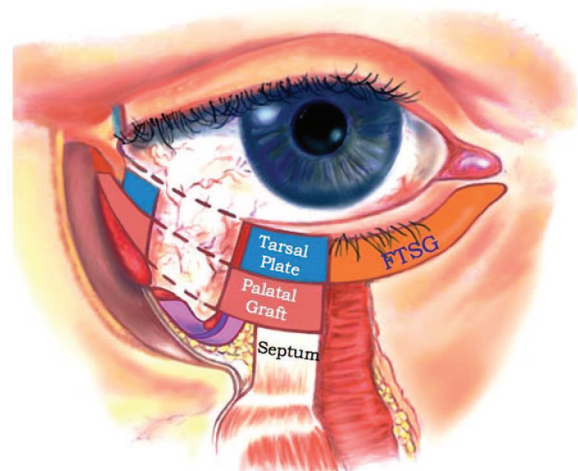
2. Freschi C, Troia E, Ferrari V, Megali G, Pietrabissa A, Mosca F. Ultrasound guided robotic biopsy using augmented reality and human-robot cooperative control. *Conf Proc IEEE Eng Med Biol Soc.* 2009;1:5110–5113.
3. Ukimura O, Gill IS. Image-fusion, augmented reality, and predictive surgical navigation. *Urol Clin North Am.* 2009;36:115–123, vii.
4. Manson PN, Ruas E, Iliff N, Yaremchuk M. Single eyelid incision for exposure of the zygomatic bone and orbital reconstruction. *Plast Reconstr Surg.* 1987;79:120–126.
5. Eppley BL, Custer PL, Sadove AM. Cutaneous approaches to the orbital skeleton and periorbital structures. *J Oral Maxillofac Surg.* 1990;48:842–854.

### Reconstruction of the Scarred and Displaced Lower Eyelid following Violation of All Three Lamellae

**Sir:**

**P**roblematic scarring and retraction of the lower eyelid may occur following full-thickness traumatic laceration or as a result of transconjunctival access incision after partial-thickness injury.<sup>1</sup> For this difficult problem of cicatricial ectropion, entropion, and/or lower eyelid displacement, we describe a staged approach using (1) elevation of the malar soft tissue, palatal graft below the tarsal plate after transconjunctival scar release, and full-thickness skin graft superficial to the tarsal plate after subciliary scar release and (2) subsequent autologous fat grafting.

Through a transconjunctival incision and preseptal plane, the periosteum of the orbital rim was identified. Subperiosteal dissection was performed, and a back cut was made in the periosteum along the orbital rim to fully release the posterior lamella scar. Next, a subciliary incision was made and a skin muscle flap was raised to free the anterior lamella from scar (Fig. 1).



**Fig. 1.** Illustration of lower eyelid anatomy (labeled), with a cross-section demonstrating reconstruction of the anterior lamella with a full-thickness skin graft (FTSG) and the posterior lamella with a palatal graft.

The cheek was elevated by placing a 3-0 Prolene suture from the soft tissue of the malar prominence through a drill hole through the lateral orbital rim through an upper supratarsal fold incision. A hard palate mucoperiosteal graft was harvested to the size



**Fig. 2.** (Above) A patient with a severely scarred, retracted left lower eyelid underwent staged correction. After initial repair of the displaced zygomaticomaxillary complex, orbital floor fractures, and soft tissue, full-thickness lower eyelid laceration repair was performed. (Center) The patient is shown 3 months after the initial injury, with lower eyelid retraction and scar. (Below) The patient is shown postoperatively, 6 months after lower eyelid reconstruction with cheek elevation, palatal graft, full-thickness skin graft, and fat grafting.

of the posterior lamella defect (6 mm × 25 mm). This palatal mucosal graft was then inset into the transconjunctival defect with interrupted 5-0 chromic sutures. A full-thickness skin graft was taken from either the contralateral upper eyelid or the postauricular area based on a template for the anterior lamella defect. The full-thickness skin graft was then sutured in with a running 5-0 plain gut suture. A lateral canthoplasty was, at times, performed. Finally, a Frost suture was placed for 5 days for lower eyelid immobilization.

Three to 6 months later, autologous fat grafting to the lower eyelid was performed for volume expansion. The Coleman technique of fat transfer was used with atraumatic abdominal harvest, centrifugation for 3 minutes at 3000 rpm, and small aliquot injections into different depths of the eyelid. At times, repeated fat injections were used for further improvements.

Management of the scarred and displaced lower eyelid using the above operative technique over the past decade at our institution led to dramatic improvements in eyelid position and appearance (Fig. 2). Patients also reported improvement or complete resolution of their symptoms, including epiphora, tearing, redness, blurry vision, and dryness.

An understanding of lower eyelid anatomy is essential for reconstructing the severely scarred and displaced lower eyelid. The lower eyelid has three layers, or lamellae. The anterior lamella contains skin, subcutaneous tissue, and the orbicularis oculi.<sup>2</sup> The middle lamella includes the orbital septum and subseptal fat.<sup>3,4</sup> The posterior lamella includes lower eyelid retractors, the tarsal plate, and conjunctiva.<sup>2</sup>

Previous publications focused on reconstruction of either the anterior or posterior lamellar plane, but not both.<sup>1,5</sup> We describe an approach that emphasizes release of lower lid scar tissue, elevation of the soft tissues of the cheek, lengthening of the contracted septum, support of the posterior lamellae with a palatal graft, and replacement of the anterior lamella with a full-thickness skin graft. We have documented success and symptomatic improvement using this approach.

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**REFERENCES**

1. Ridgway EB, Chen C, Colakoglu S, Gautam S, Lee BT. The incidence of lower eyelid malposition after facial fracture repair: A retrospective study and meta-analysis comparing sub-tarsal, subciliary, and transconjunctival incisions. *Plast Reconstr Surg*. 2009;124:1578–1586.
2. Pfeiffer MJ. Update on upper lid blepharoplasty. In: Guthoff R, Katowitz JA, eds. *Essentials in Ophthalmology: Oculoplastics and Orbit*. Berlin, Germany: Springer; 2006: 123–142.
3. Patipa M. The evaluation and management of lower eyelid retraction following cosmetic surgery. *Plast Reconstr Surg*. 2000; 106:438–453.
4. Meyer DR, Simon JW, Kansora M. Primary infratarsal lower eyelid retractor lysis to prevent eyelid retraction after inferior rectus muscle recession. *Am J Ophthalmol*. 1996;122: 331–339.
5. Millman AL, Katzen LB, Putterman AM. Cicatricial entropion: An analysis of its treatment with transverse blepharotomy and marginal rotation. *Ophthalmic Surg*. 1989;20:575–579.

### Auricle-to-Nasus Composite Graft Reconstruction: A Dimensionally Precise and Rapid Technique

Sir:

Nasal reconstruction poses great technical challenges to the surgeon to provide an aesthetically pleasing result in the most prominent area of the face and without affecting breathing. We write concerning a 44-year-old, nondiabetic, white, Caucasian woman with a punch biopsy-proven basal cell carcinoma on her nasal dorsum. This had developed over 18 months, measured  $32 \times 18$  mm, and was mainly restricted to the nasal tip. The patient refused to discontinue heavy smoking. Mohs micrographic surgery with immediate nasal forehead flap reconstruction for the ensuing defect, measuring  $38 \times 24$  mm, was performed. The flap was thinned and advanced distally after 3 months, and the pedicle was divided an additional 4 months afterward. The wound healed unaesthetically and a sinus also developed in the soft triangle over the course of 1 year, and this was excised and closed primarily.

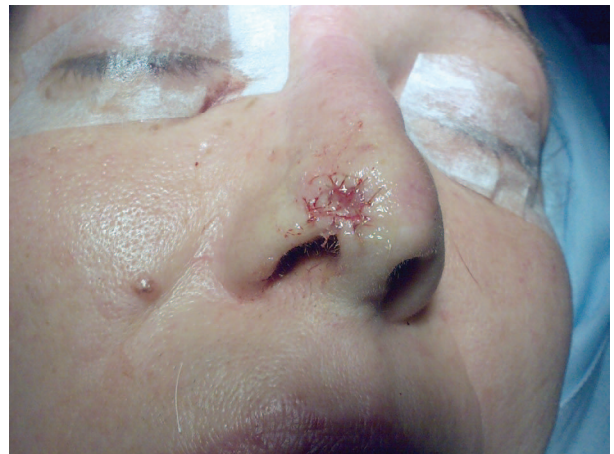
However, a new sinus developed over another year, and the area was excised down to the nasal mucosa and allowed to heal by secondary intention. Histologic analysis of this specimen concluded that a  $5 \times 6 \times 8$ -mm full-thickness sinus had developed following nasal reconstruction with no other abnormalities. The patient relinquished smoking at this point because of persuasion that the prolonged healing process was secondary to smoking. At 3 years since the

initial procedure, the area remained as a chronically inflamed, unhealed wound, and a lacrimal probe confirmed a fistula.

A novel method of nasal reconstruction was used, whereby the chronic lesion was removed in toto using a 6-mm punch biopsy corer, and another identical device was used to harvest a full-thickness composite graft from the superior pole of the antihelix. This free graft with identical planar dimensions from the pinna was inset into the nasal defect that had just been created and secured with 4-0 Vicryl Rapide (Ethicon, Inc., Somerville, N.J.) (Fig. 1). The donor site was closed posteriorly with 4-0 Vicryl Rapide. Chloramphenicol ointment was applied and the wounds were left exposed to air. Histologic analysis of the excised tissue showed a punch biopsy tissue sample with a central fistula and prominent dermal scarring consistent with previous surgery. Review in the wound care clinic 1 week later was promising, with 100 percent graft take and a healing donor site.

At 6-week follow-up, the wound had healed very satisfactorily and the patient was happy with the outcome (Fig. 2). Six months since auricle-to-nasus composite graft reconstruction, there have been no new lesions in the area.

Areas of full-thickness loss in the region of the nasal ala and dorsum can be difficult to reconstruct, in part because of the lack of locally elastic tissues that would provide a distortion-free closure. The soft triangle of the nose is composed of two layers of skin sandwiching cartilage; therefore, to reconstruct this area, it is suitable to use auricular tissue, as it provides both skin and supporting cartilage. Patient suitability is paramount when using composite grafts, wherein the impact of vascularity and oxygen tension become magnified. One must therefore consider the possibility of previous local irradiation and surgery, and coagulopathies. Factors that affect healing must be optimized, such as smoking status, nutritional status, and glycemic control. This alternative technique for



**Fig. 1.** Immediate postoperative photograph obtained after inset of composite graft.