

ORIGINAL ARTICLE

# Lower Eyelid Synechia: A Complication of Periorbital CO<sub>2</sub> Laser Resurfacing

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- 1 **Introduction:** Laser resurfacing of the lower eyelids is a popular option for rejuvenation. Lower eyelid synechia (adhesions) can occur with laser skin resurfacing, but literature searches for this topic failed to show any dedicated articles addressing this complication.
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**Materials and Methods:** The author routinely performs more than 120 procedures per year involving high-fluence, high-density, multipass CO<sub>2</sub> laser skin resurfacing to the lower eyelids (which includes full-face and periorbital treatment combined). This article discusses the author's clinical experience dealing with lower eyelid synechia. Health Insurance Portability and accountability Act guidelines as well as the World Medical Association Declaration of Helsinki regarding ethical principles for medical research were followed.

**Results:** Lower eyelid synechia are an uncommon complication in the reepithelialization phase of laser resurfacing. If recognized and treated early, permanent tissue adhesion is rare; if allowed to totally reepithelialize; however, permanent deformity may occur.

**Conclusion:** Laser resurfacing remains a popular option for rhytid effacement, skin tightening, and dyschromia improvement of the lower eyelids whether performed as an isolated procedure or as part of full-face laser resurfacing. Lower eyelid synechia are an uncommon but potential complication that can lead to permanent disfigurement if not diagnosed and treated early in the healing period after laser treatment. All physicians and staff that perform laser resurfacing should be familiar with the early diagnosis and early treatment of lower eyelid synechia.

The author has treated numerous cases of lower eyelid synechia secondary to periorbital (and/or full face) ablative CO<sub>2</sub> laser resurfacing for cosmetic purposes. Although a minor complication, lower eyelid tissue adhesion can lead to an undesirable cosmetic situation resulting in disfigurement of the lower eyelid. This condition is simple to treat but relies on early recognition by the practitioner and staff.

The term “synechia” (plural, “synechia”; also referred to as “synechium”), which is derived from the Greek word for continuity, coherence, or holding, is used to describe pathologic adhesion of tissues, most commonly occurring in the eye (iris to cornea or lens)<sup>1</sup> and uterus.<sup>2</sup> Various histologic synechia have been described in the multispecialty literature.<sup>3–14</sup>

Although commonly reported in other disciplines, there is a dearth of literature relating to cosmetic laser resurfacing and lower eyelid synechia. Searching PubMed for “synechia” yields 1159 citations, of which only 4 articles relate to cosmetic laser surgery.<sup>15–18</sup> All 4 of these articles are from the pioneering era of CO<sub>2</sub> laser skin resurfacing and describe laser complications; only brief mention is made of lower eyelid synechia as a resurfacing complication. No searches yielded any dedicated articles on laser-induced lower eyelid synechia, and it appears that this article is the first comprehensive discussion of this complication and treatment.

In 1997, Roberts et al<sup>15</sup> described 907 patients who had undergone CO<sub>2</sub> laser skin resurfacing and reported that the small epithelial bridges were observed in 7 of 907 patients for a complication rate of 0.8%. They also stated that the synechia occurred 3–11 days after the operation, during reepithelialization. Weinstein<sup>16</sup> described a series of 625 patients who underwent erbium:yttrium aluminum garnet (Er:YAG) ablative laser resurfacing patients in whom reported complications included 1.3% (8 of 625 patients) synechia

Received for publication October 23, 2014.

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DOI: 10.5992/AJCS-D-14-00051.1



**Figure 1.** (Left) A preoperative patient squinting, which illustrates the creases that can potentially produce synechia after laser treatment. (Right) A patient 72 hours after upper and lower blepharoplasty with simultaneous CO<sub>2</sub> laser resurfacing. The swollen skin on either side of the crease is in contact with and subject to adhesion.

3 under the lower eyelid, which required minor correction. In a study of 257 patients who underwent Er:YAG ablative resurfacing with simultaneous face-lift, Weinstein et al<sup>18</sup> found a 2% (5/257) rate of lower-lid synechiae, which were treated with no residual effect.

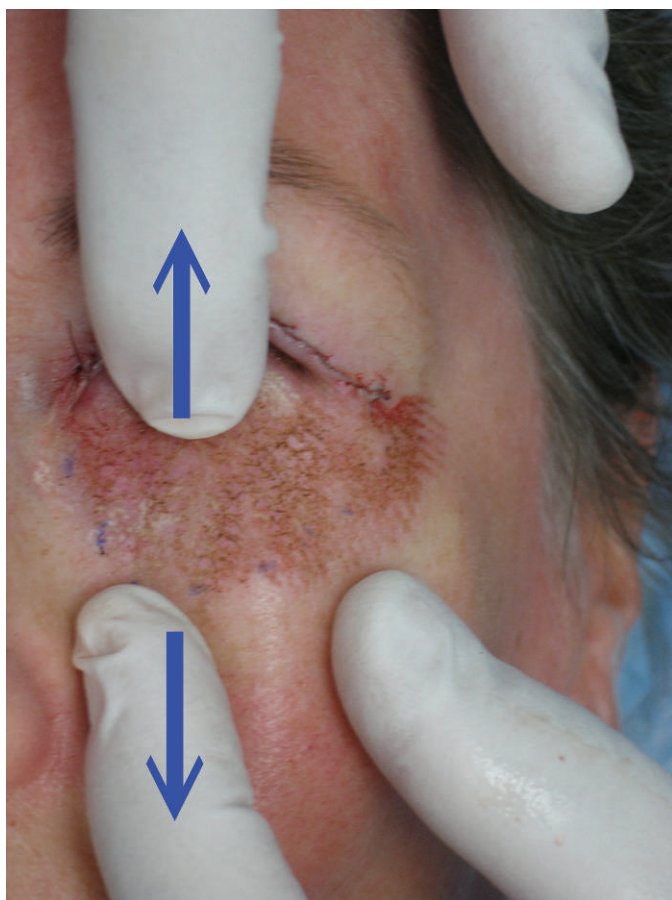
The aforementioned references suggest a 0.8–2% occurrence of lower eyelid synechiae associated with nonfractional ablative CO<sub>2</sub> and Er:YAG resurfacing. No articles relating to fractional laser and synechiae were found in the literature.

### Pathophysiology

Traditional ablative laser skin resurfacing vaporizes the entire epidermis and frequently extends into the dermis. Reepithelialization generally occurs between 9 and 12 days after the laser treatment. During the healing time, if adjacent tissue surfaces contact each other and remain in contact for an extended period of time, the reepithelialization process can fuse these tissues and produce a healed interface. Once this fused interface occurs, it can heal as a single unit that produces an unsightly bulge or crease on the lower eyelid. In severe cases it may produce traction on the lower lid and cause lower eyelid malposition. The synechial process is simple to correct or reverse if diagnosed in the early healing phase but if unrecognized can require surgical intervention to correct.

Some patients may be predisposed to possible synechiae because of lower eyelid anatomy. Careful examination of patients shows that some have deeper horizontal creases on their lower lids. These creases are a result of the action and correspond with the underlying orbicularis oculi muscle. This most frequently represents the junction of the pretarsal skin with the preseptal skin (the most common synechia site) and the preseptal skin with the cheek skin. Synechial development can involve single or multiple creases. This junction (and possible synechial proclivity) can be observed preoperatively by having the patient squint, which produces crevices that may be predisposed to adhesion of adjacent lasered edges (Figure 1). Edema after laser treatment can be especially significant in the lower lid, and this, coupled with an extended time in the recumbent position while healing, can cause the adjacent tissue surfaces to contact each other and initiate the synechial process.

Any maneuver or condition that would allow the inferior and superior lower-lid surfaces to come into extended contact would theoretically contribute to adhesion formation. I have encountered this complication numerous times with full coverage, ablative, multipass, high fluence skin resurfacing. All treatments were made with a Lumenis Encore Ultrapulse CO<sub>2</sub> laser (city, state) in fully ablative setting of 80 mJ, density of 6, with 2



**Figure 2.** *The laser eschar being stretched immediately after the laser procedure to distract the amount of heat contraction and discourage bonding of adjacent surfaces of folds.*

4 or 3 nondebrided laser passes. Synechiae can occur with full face or periorbital laser skin resurfacing. As I frequently perform blepharoplasty, face-lift, and cheek implants with concomitant laser resurfacing, the increased edema may be a potentiating contributor. In addition, conventional resurfacing (full coverage, ablative, multipass, high fluence) produces significant exudate. Synechiae affect the lower eyelids more commonly than other structures, in part because of accumulation of this exudate, edema, and skin debris, which produces a more facilitated environment for adjacent tissue adhesion. The unique anatomy and thinness of the lower-lid skin, coupled with the propensity for this region to swell, are also contributing factors.

One maneuver that appears to decrease the incidence and or severity of synechiae after laser treatment is vigorously stretching the skin immediately after the laser procedure (Figure 2). This distracts the

contracted skin, which in theory would discourage folds from binding together.

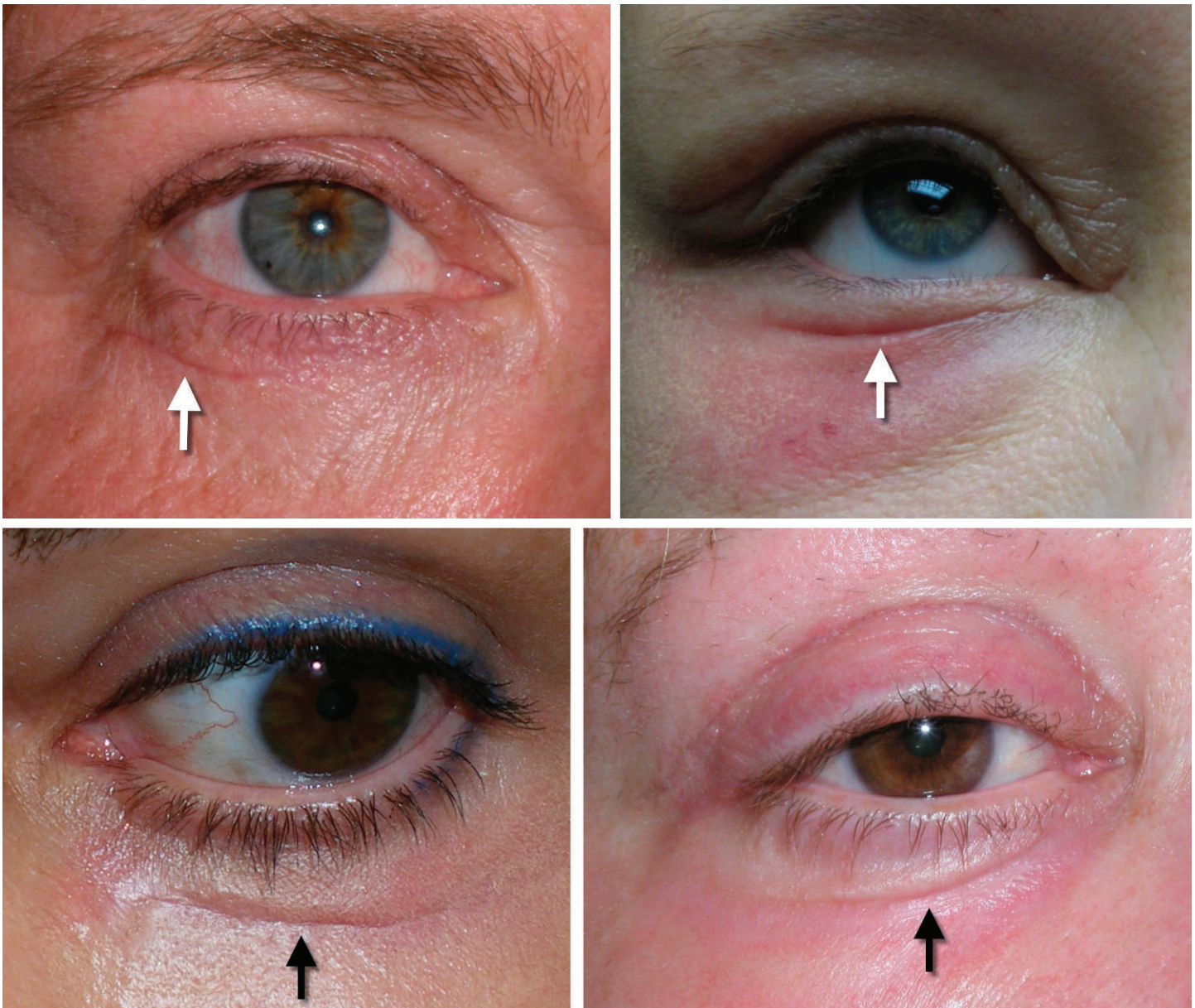
The most important response is early recognition and treatment, which in virtually all cases will reverse the condition and lead to normal healing. Lower eyelid synechiae form during the reepithelialization phase, which lasts up to 2 weeks. I have observed what I term “pre-synechial” formation as early as 3 days (Figure 1B) and actual adhesion as late as 11 days. Astute clinicians and staff must be vigilant for ensuing synechial formation during the first week to 10 days of healing.<sup>19,20</sup> Edematous lasered lower eyelid skin that forms a deep crease should be retracted to discourage contact, and all surfaces should be continually coated with petrolatum to prevent tissue-on-tissue adhesion. The patient is instructed to distract the crease every several hours, clean the crevice with hydrogen peroxide or a suitable cleansing preparation, and keep it dressed with petrolatum or a suitable healing preparation throughout the healing process. If the complication is not recognized and the raw tissue adheres and heals into a synechial adhesion, invasive treatment may be required (Figure 3).

#### **Interventional Treatment (Synechiolysis)**

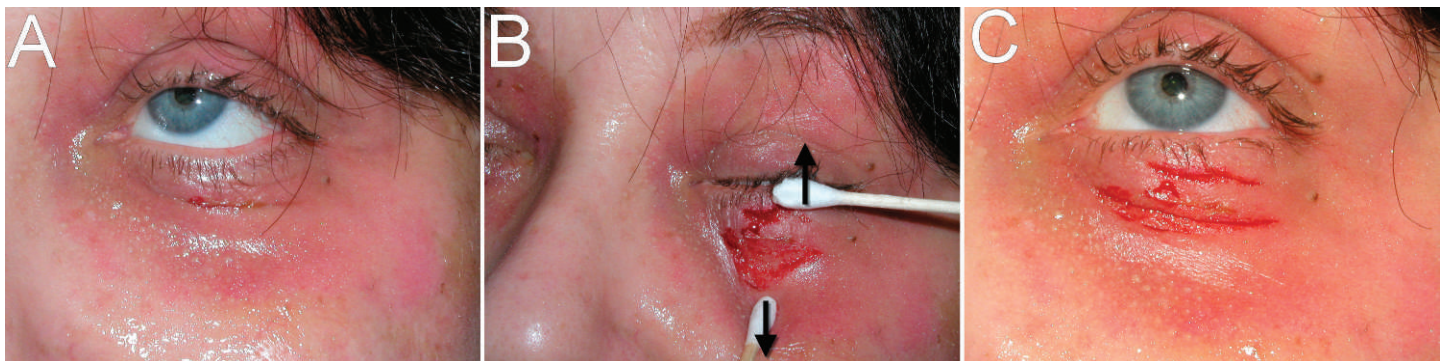
As stated, early recognition of ensuing adhesion is paramount for intervention and reversal of the adhesion process. When incipient adhesion is observed, the lower eyelid tissues are stretched to break up any early tissue bridging and to allow ointment to be applied to prevent raw surfaces from adhering. Synechiolysis can be an uncomfortable process for the patient and may require topical or local anesthesia. Distracting the adherent surfaces produces bleeding and raw tissue (Figures 4 and 5). Employing wound care in the crevice and dressing the previously adherent surfaces with a nonstick preparation will discourage readhesion. Some patients may require several sessions of synechiolysis, especially those who are less compliant with home stretching (Figure 6).

#### **Late Treatment**

Failure to recognize and treat the developing synechia can result in permanent lower eyelid deformity, as shown in Figure 3. Although synechiolysis is simple and easy in the early healing process, it becomes difficult or impossible to separate the fused surfaces after 10–15 days. Healed synechiae can be treated by excision of the redundant tissue (assuming there is adequate skin so as not to produce ectropion) (Figure 7).



**Figure 3.** Multiple examples of posttreatment resurfacing synechiae that were not treated interventionally and resulted in permanent deformity.



**Figure 4.** The adhesion process can be reversed by stretching and distraction during the early healing phase. Cotton-tipped applicators are used to distract the forming synechia (A), which disrupts the adhesion and leaves a raw surface (B). (C) The disrupted synechia.



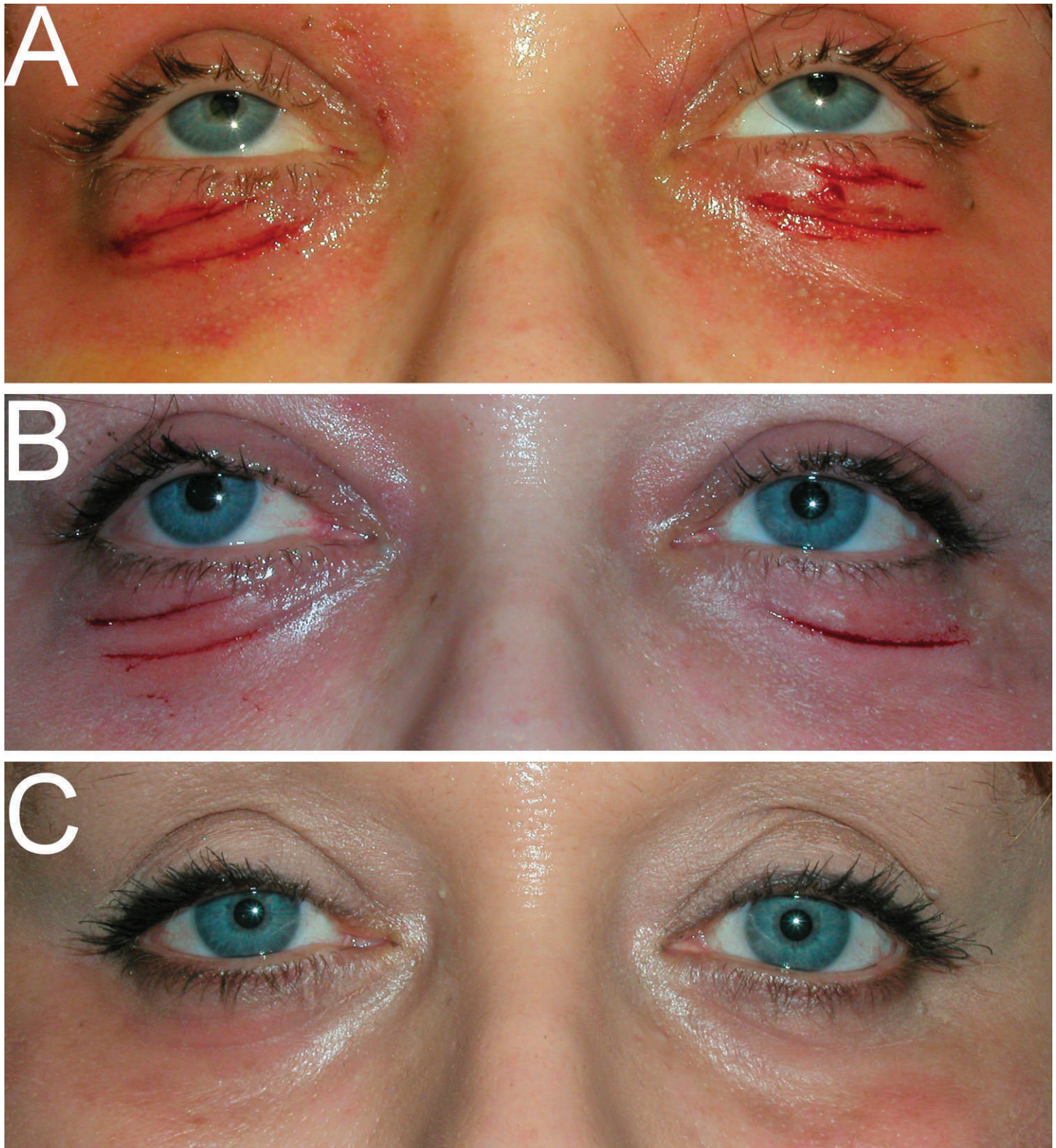
**Figure 5.** A bilateral synchia immediately after disruption of forming adhesions. Note the raw tissue surfaces.

### Conclusion

CO<sub>2</sub> laser resurfacing remains the gold standard for effacement of facial rhytids and is useful as a skin-tightening adjunct in lower eyelid skin resurfacing, with or without blepharoplasty. The eyelid has some of the thinnest skin on the body and produces significant exudate in the period after laser treatment. This area is also subject to significant swelling because of the vascular supply to this region. A combination of these factors creates an environment where de-epithelialized tissue surfaces can come into prolonged contact to the point of adherence. If allowed to heal, the resulting synchia can create an unaesthetic scar or

tissue deformity that may require surgical intervention to improve. This condition is preventable by prompt recognition of tissue adherence in the early period after laser treatment. Laser surgeons and staff need to understand this complication and be observant for the early formation of lower eyelid synchia.

This article would be more scientifically accurate if exact percentages of the described complications were calculated, which would involve the retrospective examination of more than 1000 charts to factor synchial incidence in CO<sub>2</sub> laser resurfacing, which is a future goal. This article was written as an overview of the condition based on clinical images gathered over



**Figure 6.** (A) Patient 8 days after periorbital laser treatment, immediately after bilateral synechiolysis. (B) The same patient after a second session of synechiolysis 12 days after laser treatment. (C) The patient shows normal healing 4 weeks after lower blepharoplasty with periorbital CO<sub>2</sub> laser resurfacing.



**Figure 7.** (Left) A deformity from healed synechiae resulting from lower-lid resurfacing. The folds of tissue are marked for excision. (Middle) Skin excision with the underlying orbicularis oculi muscle. (Right) The sutured incisions with the excised specimens.

a 12-year period as well as the experience garnered during that same time, and to ignore this information (incidence rate not specific) would be a loss to the surgeons, staff, and patients who experience this complication and may not be aware of it.

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