Many people desiring the improvement of periorbital skin that looks hollowed out and dark, causing an old and tired appearance, consult aesthetic surgeons. A variety of conditions have been noted to be responsible for this morbidity, including cutaneous hyperpigmentation, expanded superficial microvascularity, and slackness of periorbital anatomic structures. With aging, tear trough deformity naturally increases, but younger people may also complain about the lower eyelid. Recently, the authors reported the efficacy of new treatment protocols combining Q-switched ruby laser and topical bleaching treatment, using tretinoin and hydroquinone, for the improvement of periorbital hyperpigmentation, especially in the lower eyelid.

In Japan, the unflattering term Kuma indicates a lower eyelid darkness that lends an exhausted look. Many patients consult our department with lower eyelid concerns. However, the protocols are (of course) useless for lower eyelid darkness caused by structural changes of the periorbital anatomic components, such as relaxation of the skin, "baggy eyelid," or tear trough deformity.

The pathogenesis of structural disfigurement of the periorbital anatomy may be broken down into 3 distinct processes: (1) relaxation and redundancy of lower eyelid skin; (2) loosening of supportive soft tissue of lower eye-
fat constituents with the orbital fat tending to herniate; and (3) the last process, which is induced by the relative protrusion of the bony orbital rim. Hypoplasia of the suborbital malar bone and attenuation of lower eyelid subcutaneous tissues result from inferior cheek ptosis and triangular muscular defect. Terms for the deformities vary among authors. In this report, we use the following nomenclature: indentation and shadow conforming to the inferior orbital rim as a result of orbital fat and orbital septum overhang is referred to as baggy eyelid; the medial crease caused by an accentuated orbital rim is referred to as tear trough deformity.

Although these changes usually come about with aging, there are also young people who seek treatment for these conditions (Figure 1).

Procedures to correct these deformities include orbital fat removal, fat grafts, fat injections, plication or tightening of the orbital septum, and alloplastic implants. Because of the many anatomic variations among races, sexes, and patients, comprehensive algorithms have not yet been established. However, regardless of causal factors, surgical correction by orbital fat repositioning is one of the commonly accepted standard therapeutic options for the improvement of these deformities.

Because of the invisibility of the incision and low incidence of complications, fat repositioning through transconjunctival incision has been suggested as an effective and advantageous method that is preferable to a subciliary transcutaneous approach. While we concur for the most part in the application of this treatment, we differ in some respects. We agree that the procedure can be consistently applied to patients of all age ranges without fat removal, including Asians. However, our procedures for such fat repositioning include minor differences from previous authors—namely in the dissection plane and use of the orbital septum.

In this report, our method of transconjunctival fat repositioning is introduced along with the data from our study.

**METHODS**

In November 2004, to validate our past clinical experiences, we planned a prospective study in young Japanese Asians to assess the efficacy of orbital fat repositioning for the improvement of lower eyelid disfigurement. We included 20 subjects younger than 40 years of age who were referred to our department over a 1-year period.

The age restriction was based on our observation that a substantial proportion of older patients having lower eyelid concerns presented with slackness of lower eyelid skin, necessitating composite rhytidectomy with concurrent excess skin tightening, frequently including laser treatment and chemical peeling in addition to transconjunctival operation. Because the uncertainty of the operative indication would lessen the objectivity and consistency of our study data, we excluded these older patients. The study was scheduled to end 6 months after surgery was performed on the twentieth patient.

From November 2004 to December 2005, 20 patients (16 women and 4 men) ranging from 20 to 37 years of age (average age, 28.5 years) visited us with complaints of tear trough deformity or baggy eyelid. Among them, 14 presented with tear trough deformity caused by sunken eyelids and 6 with baggy eyelids. Informed consent was obtained from all patients.

**Evaluation of Results**

Patients were asked to follow-up at 1 week and at 3 and 6 months. Pre- and postoperative photographs were taken of each patient with a high-resolution digital camera (EOS-10D; Canon, Tokyo, Japan). To more clearly visualize shadows caused by eyelid hollows, photographs were taken under room ceiling light without a ring flashlight as well as with a flare of ring flashlight (MR-14EX; Canon).

The degree of improvement was evaluated by 2 experienced plastic surgeons, uninvolved in treating these patients, who examined pre- and postoperative photos. The mean data for each patient were classified in 4 categories: (1) excellent, denoting attractive and impressive change with nearly complete disappearance of tear trough deformity or baggy eyelid; (2) good, denoting some remaining evidence of tear trough deformity or baggy eyelid, but much improved from preoperative condition; (3) fair, denoting improved from preoperative condition but asymmetry or other permanent complications remained; and (4) poor, denoting no change or worse. All patients were interviewed about their degree of outcome satisfaction 6 months postoperatively by responding as (1) very satisfied, (2) acceptable, or (3) not satisfied. Complications, such as eyelid ectropion, eyelid retraction, diplopia, and ecchymosis, were checked at each visit and interview.

**Operative Technique**

The infraorbital rim was marked on the lower eyelid skin with a surgical marker while the patient was in a supine position. Ocular anesthesia with 0.4% oxybuprocaine hydrochloride was applied to each eye. Then 2% lidocaine with 1:80,000 epinephrine was injected into the lower conjunctiva and over the inferior orbital rim. The conjunctiva was incised at 2 to 3 mm from the inferior edge of the tarsus (Figure 2A). Traction sutures were placed at the posterior conjunctival edge to protect the cornea. Blunt dissection with scissors was performed along the preseptal plane to just above the arcus marginalis, keeping the orbital septum intact. A supraperiosteal pocket was then created above the frontal surface of the maxilla, using a retractor or scissors, to a 7- to 8-mm depth from the inferior orbital rim. The levator labii superioris alaeque nasi muscle was partially dissected at the medial side of the operative field.

The orbital septum was cut at the arcus marginalis by cautery (Figure 2B). The fat was retracted from the sep-
tal fissure and shaped into a thin, elongated form using a gentle force. No dissection was made inside the septum. Both the upper stump of the orbital septum and the pedicled fat pad were repositioned over the orbital rim with multiple sutures of 5-0 polyglactin (Vicryl; Ethicon, Inc., Somerville, NJ; Figure 2C). The conjunctival incision was then closed with 6-0 polyglactin buried sutures. Postoperatively, adhesive tape for securing skin closure (Steri-Strip Skintone Tape; 3M, Minnesota, MN) was applied over the entire lower eyelid. Patients were advised to remove the tape 3 to 4 days postoperatively.

RESULTS
In all 20 patients, no slackness of lower eyelid skin was noted and eyelid skin excision was unnecessary. All patients were treated uniformly in the manner described above. One patient also received treatment of a combined therapy of Q-switched ruby laser and bleaching to improve periorbital hyperpigmentation. Another patient had undergone transconjunctival orbital fat resection on the right lower eyelid at another clinic 4 years previously. The remaining patients had no antecedent interventional history or traumatic episodes. Results for 18 of the 20

Figure 1. A, Preoperative view of a 21-year-old woman with tear trough deformity and evidence of a concave lower eyelid hollow with a depression deformity. B, Preoperative view of a 28-year-old woman with a baggy eyelid and evidence of convex lower eyelid herniated fat.

Figure 2. Illustrations of operative procedure. A, Transconjunctival incision 2 to 3 mm from the inferior edge of the tarsus and cutting off the orbicularis-retaining ligament through a preseptal route. B, The orbital septum is opened at the arcus marginalis by cautery. C, The stump of the orbital septum and pedicled fat are advanced over the rim with multiple 5-0 polyglactin sutures.
patients were rated as excellent (90%), one patient was rated as good (5%), the remaining patient was rated as fair (5%), and no patients were rated as poor. Ecchymosis was observed in 9 patients on the first follow-up consultation (1 week postsurgery), but disappeared soon after. There were no significant complications, such as lower eyelid retraction, lower eyelid ectropion, or diplopia. All patients with tear trough deformity or baggy eyelid showed positive results, both physiologically and aesthetically, with good patient satisfaction (Table 1). Results are shown in Figures 3 to 6.

**DISCUSSION**

Recently, the trend for lower blepharoplasty treatments has been changing from a transcutaneous to a transconjunctival approach. This is because of the recognition of a decreased incidence of complications (such as lower eyelid retraction or ectropion) and decreased risk of later onset of hollowness. Although advocated by many authors, transconjunctival orbital fat repositioning has not been well documented in Asian subjects. Asians have a tendency toward brachycephaly, and the structures around the orbit differ from those of white patients. Kawamoto et al pointed out that Asians with a brachycephalic face may not be good candidates for transconjunctival orbital fat repositioning unless it is performed concurrently with fat removal. However, we did not incorporate this suggested modification in our treatments, and the results of our study validate our insight into the effectiveness of the procedure without supplemental procedures.

![Figure 3](image_url)

**Figure 3.** A, C, Preoperative views of a 34-year-old woman with baggy eyelids. B, D, Postoperative views 1 year after transconjunctival orbital fat repositioning. Note: A and B were taken using the ring flashlight; C and D were taken under room ceiling light without the ring flashlight.
The reported details of transconjunctival orbital fat repositioning procedures differ, as does our report. The basic features regarding the dissection plane and repositioning site are summarized in Table 2. Goldberg used a postseptal route to reach the arcus marginalis with redistribution of fat in the subperiosteal pocket. Kawamoto used a postseptal route and the supraperiosteal pocket, while Nassif used a preseptal dissection and the subperiosteal pocket. Each technique may offer advantages and disadvantages.

Our main reason for choosing preseptal dissection was familiarity with this technique. The plane is normally used for open reduction of orbital and zygomatic bone fractures; moreover, approach to the medial side of the orbit is easier. Even so, we are aware that risk of complication is minimized when the orbital septum is left intact, suggesting the preseptal route with more dissection may more likely lead to complications. However, our results clearly indicate that a preseptal dissection does not necessarily cause lower eyelid retraction, and that the transposition of pedicled fat without dissection of the external ocular musculature causes no disturbance to ocular movement. The possibility of bleeding and the time needed to complete dissection may be less for the postseptal procedure than for a preseptal route, although we have had no such experience. For surgeons familiar with preseptal dissection, such as open reduction of a bone fracture, the technical intimacy may well offset those drawbacks.

In terms of the destination of the repositioned fat, although subperiosteal dissection may appear easier to accomplish, with less bleeding, we used supraperiosteal dissection for several reasons. First, subperiosteal fixation requires sutures to be passed through the skin because there is no secure purchase and to be removed after 3 to 5 days to avoid suture marks; we also anticipate the risk of relapsing of the repositioned fat. Second, we consider it preferable to cut the orbicularis-retaining ligament to eradicate tear trough deformity because the ligament binds the malar bone and the orbicularis oculi muscle. This consideration is based on the report of Kane, which stated that injectable substances used in fat grafts or alloplastic implants should be placed between the muscle and the skin, indicating that an injection into a deep region is not effective. Additionally, the injection method involves delicate and difficult techniques, and the injected substances sometimes visible through the skin or the skin surface may become lumpy.

The removal of orbital fat may accentuate tear trough deformity. A male patient in our study had a history

Figure 4. A, C. Preoperative views of a 28-year-old woman with tear trough deformity. B, D. Postoperative views 1 year following transconjunctival orbital fat repositioning. Note: A and B were taken using the ring flashlight; C and D were taken under room ceiling light without the ring flashlight.
of transconjunctival orbital fat removal on the right side 4 years before consulting our department. His tear trough deformity had deepened after that operation, seemingly an example of tear trough deformity accentuated by orbital fat removal (Figure 5).

Eyelid concerns not only arise from tear trough deformity or baggy eyelid, but also from cutaneous hyperpigmentation or dermal microvasculature. These conditions often present in combination, requiring the employment of several therapeutic modalities to achieve the best result. For example, the patient in Figure 6 had first undergone treatment for periorbital hyperpigmentation using laser irradiation and bleaching ointments. Although good clearance of pigmentation was observed after the treatment, tear trough deformity persisted. Our present operative technique produced a more satisfactory overall result. In patients with complex morbidity that causes darkness around the eyes, a combination of treatment modalities may be necessary to achieve comprehensive improvement.

Of the complications involved in a lower blepharoplasty, lower ectropion must be avoided as much as possible. In our technique, both the orbital septum and pedicled fat are anchored with firm downward tension. This technique had previously been thought to induce retraction or ectropion complications. However, in the present study, as well as our clinical experiences, we have experienced neither lower lid ectropion nor even slight scleral show. The crucial aspects of our technique are that the skin and orbicularis oculi muscle are kept intact to avoid complications of ectropion or scleral show. Moreover, we have experienced no cases of diplopia after our operation. Further, even when the orbital fat flap was appraised as movable, the inferior oblique muscle was minimally exposed.

In terms of postoperative edema, which generally occurs 2 to 3 days after surgery, most of our female patients could apply makeup and resume ordinary life 5 to 7 days after surgery. A few patients experienced edema of conjunctiva 1 week postsurgery; however, this disappeared within 2 weeks in all instances.

CONCLUSION

Based on our study, in which aesthetic outcomes were satisfactory and there were no major complications, we consider our operative technique to compare favorably
with other established procedures. Transconjunctival orbital fat repositioning (incorporating preseptal dissection and supraperiosteal pockets) is a safe and effective method for relatively young Asians complaining of peri-orbital tear trough deformity.

DISCLOSURES

The authors have no financial interest in and receive no compensation from the manufacturers of products mentioned in this article.

REFERENCES


Table 2. Reported dissection planes and sites of transconjunctival orbital fat reposition

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Dissection plane</th>
<th>Site of fat reposition</th>
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<tbody>
<tr>
<td>Momosawa et al (present study)</td>
<td>Preseptal route</td>
<td>Supraperiosteal pocket</td>
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Figure 6. A, C, Pretreatment views of a 29-year-old woman with periorbital skin hyperpigmentation. B, D, Posttreatment views 3 months following treatment for periorbital hyperpigmentation with laser irradiation and bleaching ointments. Although results were good, the patient wanted greater improvement for tear trough deformity. E, F, Postoperative views 6 months following successful transconjunctival orbital fat repositioning. Note: A, B, and E were taken using the ring flashlight; C, D, and F were taken under room ceiling light without the ring flashlight.