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Treating Tear Trough Deformity: Transconjunctival Blepharoplasty with Fat Pad Repositioning and Fixation in the Intranasal Mucosa—18 Years' Experience

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Abstract

Introduction With aging, progressive changes occur in the eyelid region. The novel technique for repositioning of the fat pads described herein addresses Hester classification type II, lower eyelid aging with minimal decrease in the eyelid/cheek juncture.

Materials and Methods In this retrospective study of patients undergoing surgery at our clinic between 2000 and 2018, 92 were classified as Hester II and a transconjunctival surgical procedure was performed with repositioning of the fat pads and intranasal fixation assisted by the Casagrande needle.

Results Erasure of the nasojugal fold was observed in all patients, offering a greater uniformity in the convexity of the middle third and resulting in better rejuvenation of the target area while eliminating visible scarring from a suture through the skin.

Discussion The repositioning of fat pads using intranasal fixation offers the necessary anchoring qualities without worrying about unsightly scars or the need to remove stitches early, which can decrease the proper scarring and adhesion of the pads in their new pockets.

Conclusion The quality and longevity of the results of this retrospective study allow us to offer this novel fat pad fixation method in transconjunctival blepharoplasty.

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Keywords Eyelid · Blepharoplasty · Tear trough · Nasojugal sulcus · Fat pad

Introduction

Changes in the lower eyelid have long been a topic of medical discourse, due to their close relation with the aging midface. In 1961, Loeb coined the term nasojugal groove to define the change manifesting as a depression between the lower eyelid and the medial portion of the malar region. The term "tear trough" was created by Flowers in 1969 to describe the same anatomical feature [1, 2].

The anatomical cause of the tear trough has always been a subject of disagreement [1–3]. With Mendelson's anatomical work in 2012, the tear trough ligament was discovered and described. It is the cause of the nasojugal sulcus and, with aging, it becomes evident along with the palpebromalar sulcus [4].

The lower eyelid makes up part of the midface, which the upper border is delimited by the outer corner of the eye and the lower border, by the border of the lip.

With aging, progressive changes occur in these structures by altering the balance between them through modifications in volume, shape, consistency, and position. At the bone level, there is a reduction in the volume. In regard

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to soft tissue, there is progressive atrophy and descent according to progression of chronological age [5].

The different levels of aging on the middle third were systematized by Hester in 2000. His classification Type II, lower eyelid aging with a minimal decrease in the eyelid/cheek junction (aging of the upper portion of the middle face) is the classification indicated for the technique described here. Other indications may exist, such as in patients with Hester III or IV with contraindications for more invasive procedures [6].

Many surgical options for the eyelid have emerged over time. In 1995, Hamra presented the need for preservation of the fat pats for treatment of localized aging of the eye, offering an alternative to the resection technique that caused a hollowed out, sunken eye (senile enophthalmos) [7, 8]. Causes of enophthalmos are broad; however, they can be categorized into two groups: increase in the bony orbital capacity or decrease in volume of the orbital contents [9].

Treatment of the lower lid is complex, with the clinical evaluation of the eye for the best choice of the technique being essential [10]. A nonsurgical choice may be to use alloplastic or autologous filling [11, 12]. When treated surgically, the incision may be either transcutaneous [10, 13–17] or transconjunctival [10, 18–22].

Goldberg presented a surgical technique where not only were the fat pads preserved but they were also repositioned subperiosteally in an attempt to reduce the nasojugal sulcus, yielding a smooth orbit-malar transition. Kawamoto presented a technique where the fat is repositioned with continuous fixation in the subperiosteal plane [18, 19].

Tonnard hypothesizes that periorbital aging is more due to deflation than to sagging; hence, periorbital rejuvenation should logically incorporate refilling of the deflated areas. They began using fat grafts to address periorbital aging, gradually incorporating the correction of volume loss into standard periorbital rejuvenation procedures [23, 24].

The objective of this article is to present a simple, low-risk subperiosteal fixation technique for the fat pats using a Casagrande needle (modification of the Reverdin needle) for Hester type II patients, which reduces the chance of esthetic scarring complications, such as seen with captonated sutures. The subperiosteal placement avoids superficial nodulation [25].

Materials and Methods

Materials

A search of this clinic's Mirror image system database was performed using the term "lower blepharoplasty," limiting the search to the period between 2000 and 2018, resulting in 373 total patients. Charts of those patients were reviewed to identify those who had had lower blepharoplasty with fat transposition and intranasal fixation. One hundred and nine patients were eliminated for various reasons including loss of follow-up, incomplete data and associated transcutaneous procedure. Of the remaining patients, 92 were classified as Hester II, undergoing transconjunctival treatment by transposition of the fat pads, and in cases of skin laxity, the use of the CO_2 Laser.

Technique Description

In our described procedure, the patient classified as Hester II needs replacement of the fat pad to improve tear trough and resurfacing with a CO_2 laser to treat dermatochalasis.

Preoperative marking of the nasojugal groove with a pen is performed, followed by rigorous intranasal asepsis with chlorhexidine to help avoid local infections. Local infiltration with epinephrine 1:120,000 is administered in the palpebral region along the path of the Casagrande needle from the eyelid to the intranasal region. A transconjunctival incision is made below the tarsal plate. With a blunt dissection, the structures are separated, with care being taken in the release of the central and medial pouches to the presence of the inferior oblique muscle between them (Fig. 1). Microwave cautery with a fine tip is used to perform hemostasis, cautiously not to injure the vascular pedicle. The *arcus marginalis* is identified and released in its medial portion. A subperiosteal plane is created for placement of the central and medial fat pads (Fig. 2). The fixation stitches (catgut 4.0 simple) are passed in the distal region of the fat pockets with independent sutures for each pad (Fig. 3). The Casagrande needle is used to pass the thread in a subperiosteal plane of the lower palpebral region up to the lateral portion of the mucosa nasal. Traction is made with the non-dominant hand inside of the target nostril using the piriform aperture and the medial limit of the maxilla bone as a guide to fixation of the stitches, passing through the pre-delimited region of the

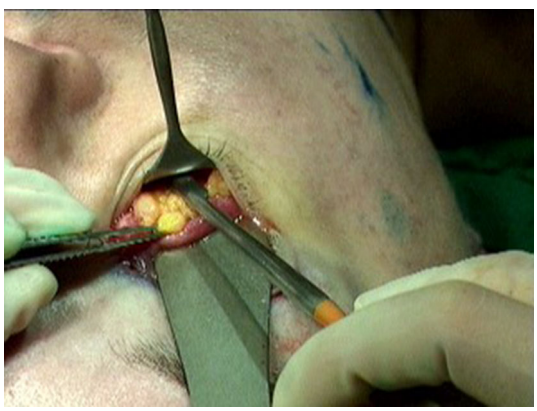

Fig. 1 Creation of the subperiosteal plane

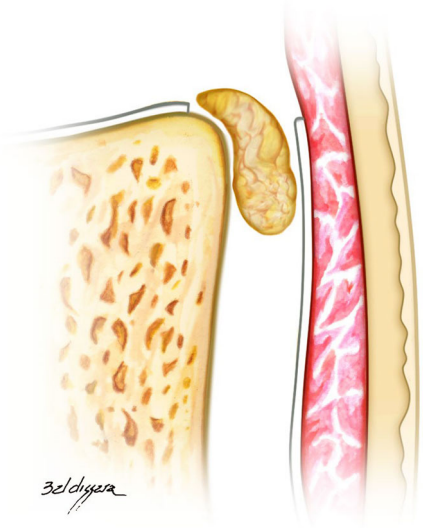

Fig. 2 Release of the arcus marginalis, transpositioning of the fat in the subperiosteal plane

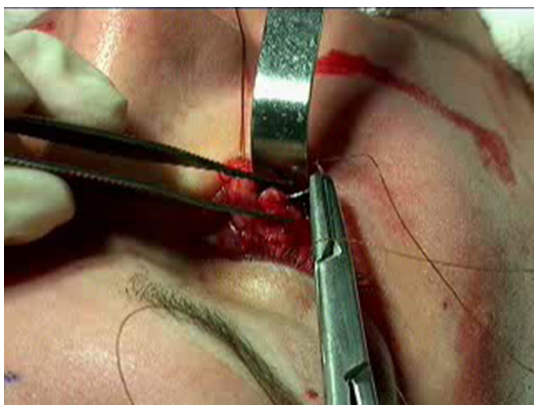

Fig. 3 Passing the suture through the fat pad

Fig. 4 Passing the Casagrande needle through the nasal region

tear trough, although depositing the bags in the target region (Fig. 4). Care must be taken not to injure cartilaginous nasal structures. When the surgery is completed,

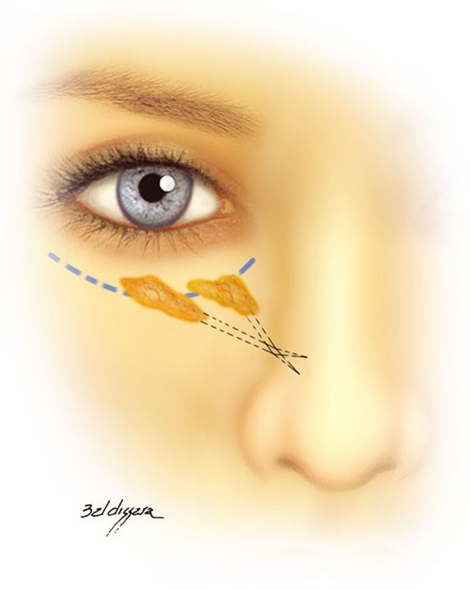

Fig. 5 Plane of passage for the Casagrande needle for intranasal fixation

there are no stitches on the skin surface; the absorbable stitches fixing the fat bags are in the lateral mucosa of the nostril (Fig. 5). For the treatment of skin flaccidity from dermatochalasis, the CO_2 laser is performed in each anatomical unit of the lower eyelid. During the period from 2000 to 2012, an ablative procedure was performed using the Coherent CO_2 UltraPulse® laser using 300 mJ of energy with a maximum of two passes in the palpebral region in a lateral orientation using a density of 5 or 6, corresponding to an overlap of 30–35%. After the invention of the fractional CO_2 laser, procedures were performed starting in 2012 with the Alma® brand Pixel device with a skin resurfacing setting of 60 mJ/pixel, 0 mm of spacing and a "Medium" power setting. Four to six passes (both horizontal and vertical orientation) according to the clinical evaluation were made. Care must be taken to avoid damage to the palpebral noble structures.

Preoperative evaluation of the need for canthopexy/canthoplasty is made and if either is needed, it is performed.

Results

Between 2000 and 2018, transconjunctival lower blepharoplasty with fat pad repositioning was performed by intranasal fixation in 92 patients (184 eyelids), 84 women and 8 men, with an average age of 50.8 (35–78). Associated procedures included upper blepharoplasty, 72%; endoscopic

forehead lift, 65%; autologous or alloplastic filling (not in the palpebral region), 41%; others (liposuction, abdominoplasty, scar revision, rhinoplasty), 32% and facelift 24%. Average surgical time for the described lower lid procedure was 10 min per side. Pre- and postoperative photographs are included (Fig. 6, 7, 8, 9, 10, 11, 12 and 13).

Elimination of the nasojugal fold (eyelid–cheek transition) was observed in all patients, offering a greater uniformity in the convexity of the middle third face, resulting in a better rejuvenation of the target area.

Complications included one case of hematoma and three cases of local infection. The hematoma was treated with intranasal drainage and local compression. The infections were treated with oral antibiotics (amoxicillin plus clavulanate), warm compresses and removal of the intranasal stitches, those being considered a possible port of entry for the infection.

Discussion

The evolution of plastic surgery has included an endless pursuit of smaller scars and improvement in the art of camouflaging incisions in natural folds and/or non-visible locations.

Nonsurgical treatments such as hyaluronic fillers have been used for patients who want to avoid surgery, but this should be reserved for patients that have limited volume loss and for younger patients who want to pursue a non-operative option [17]. Most of Hester type II patients need a surgical procedure for a better outcome. With the technique described (replacement of the fat and resurfacing with a CO_2 laser), it is possible to achieve a great result in the early postoperative time, making the recovery time shorter compared to an anterior lamella incision technique. (Fig. 6, 7, 8, 9, 10, 11, 12 and 13).

Fig. 6 **a** Preoperative 55-year-old female patient, **b** postoperative 1 year

Fig. 7 **a** Preoperative 48-year-old female patient, **b** postoperative 3 months

Fig. 8 **a** Preoperative 57-year-old male patient, **b** postoperative 9 months

Fig. 9 **a** Preoperative 56-year-old female patient, **b** postoperative 6 months

Fig. 10 **a** Preoperative 48-year-old female patient, **b** postoperative 2 months

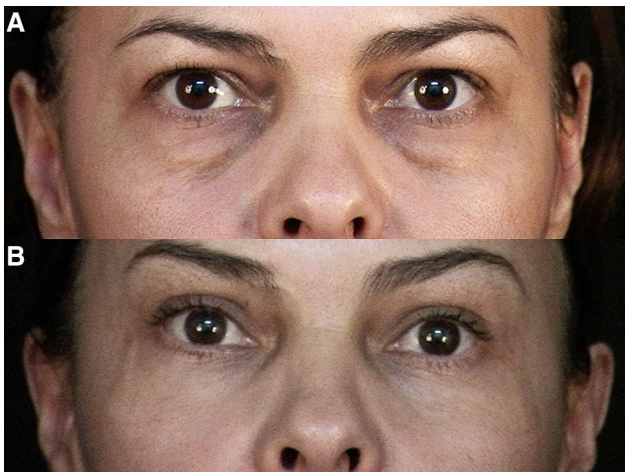

Fig. 11 **a** Preoperative 49-year-old female patient, **b** postoperative 4 months

Fig. 12 **a** Preoperative 48-year-old female patient, **b** postoperative 8 months

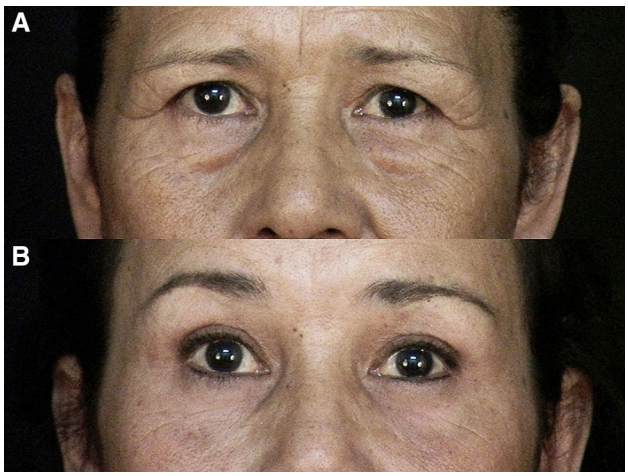

Fig. 13 **a** Preoperative 56-year-old female patient, **b** postoperative 4 months

Despite their records and popularity, hyaluronic acid fillers are not absent of undesirable consequences. Filler persistence, blue–gray dyschromia, filler migration, skin expansion from overfilling, contour abnormalities, and persistent edema are notable short- and long- term filler-related issues for patients in the periocular area [26].

The fat grafting in the eyelid area is a good approach to enhance the volume of the palpebral area, but it is difficult to make focal improvements according to the need in the nasojugal fold. There is no consensus on fat graft reabsorption rates in the area and fat grafts with no fixation easily change their position in the subcutaneous or subperiosteal plane.

The idea of repositioning (rather than removal) prolapsed fat pads is well established among surgeons [6, 7, 15–20]. The transconjunctival approach allows for an imperceptible scar and a lower risk of complications related to violation of the septum in a high anatomical position, such as ectropion.

When performing the fixation of fat pads with a vascular pedicle, the techniques established in the literature present some possibilities of complications. Even with the repositioning of fat pads presenting a vascular pedicle, as described by Goldberg, there is a degree of fat resorption [18]. Performing periosteal fixation sutures can lead to greater reabsorption of the fatty tissue due to the constricting action of the sutures on the fat; the need for more stitches for fixation raises the risk of steatonecrosis. The technique of anchoring the fat pads with stitches captonated in the skin present questions as to the time of suture removal, simultaneously trying to avoid a visible scar on the skin and allowing enough time to fix the pad in its new subperiosteal pocket without it reverting to its more superficial position [19].

The author believes that the anterior lamella is better corrected with the CO_2 laser, with no necessity of anterior incision approach; choosing a transconjunctival approach to correct the fat pads and tear trough deformity. Taking it into consideration, it is essential to remember that reposition and fixation are more difficult since we have a small work area view in the transconjunctival technique.

The repositioning of fat pads using intranasal fixation is easy to reproduce and low cost, requiring only that the surgeon adds the Casagrande needle or similar to instruments already used. This method offers the necessary anchoring qualities without concerns on unsightly scars or the need to remove stitches early, which decreases the proper adhesion of the fat pads in their new pockets.

Because the fixation point is far from the area of the repositioned tissue, any increases in volume from edema or bruising in the treated areas do not interfere with or alter the fixation and final healing. The subperiosteal position allows for better distribution of the fat pads and leaves no visible nodulations in the face, a complication found in the supraperiosteal transconjunctival approach. In addition, because there is no cutaneous alteration in the peripalpebral region, this technique facilitates the performance of ancillary procedures with a CO_2 laser, TCA peeling and/or fat grafting [7, 11].

After first encountering the complication of infections, a more rigorous preventive technique for intranasal hygiene was employed preoperatively, using non-alcoholic chlorhexidine. Similarly, to reduce the incidence and severity of local bleeding and bruising, infiltration with adrenaline solution through the path of the Casagrande needle (inferior eyelid to the intranasal region) became part of the protocol. No more infections or bleedings were reported after this protocol.

Conclusion

The transconjunctival approach for the management of prolapsed fat pads using intranasal fixation offers an excellent option for the rejuvenation of Hester II patients. It is also well accepted by patients due to the lack of transcutaneous incision and the quality and longevity of results.

Our result allows us to present this new fixation technique of the fat pads with all the qualities of the anchoring procedure without the risk of visible scar for patients that need repositioning of the fat pad.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest to disclose.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

1. Loeb R (1981) Fat pad sliding and fat grafting for leveling lid depressions. Clin Plast Surg 8:757–776
2. Flowers RF (1993) Tear trough implants for correction of tear trough deformity. Clin Plast Surg 20:403–415
3. Haddock NT, Saadeh PB, Boutros S, Thorne CH (2009) The tear trough and lid/cheek junction: anatomy and implications for surgical correction. Plast Reconstr Surg 123:1332–1340 **(Discussion 1341–1342)**
4. Wong CH, Hsieh MKH, Mendelson B (2012) The tear trough ligament: anatomical basis for the tear trough deformity. Plast Reconstr Surg 129:1392–1402
5. Cardim VLN (2003) Evolução da face senil. In: Badin AZ, Casagrande C, Saltz R (eds) Rejuvenescimento fácil-cirurgia videoendoscópica e procedimentos ancilares. Revintes, Rio de Janeiro, pp 19–24
6. Herster TR Jr, Codner MA, McCord CD, Nahai F, Giannopoulus A (2000) Evolution of technique of the direct transblepharoplasty approach for the correction of lower lid and midfacial aging: maximizing results and minimizing complications in a 5-year experience. Plast Reconstr Surg 105(1):393–406
7. Hamra S (1995) Arcus marginalis release and orbital fat preservation in midface rejuvenation. Plast Reconstr Surg 96(354–362):5
8. Hamra ST (1996) The role of orbital fat preservation in facial aesthetic surgery: a new concept. Clin Plast Surg 23:17–28
9. Guyuron B, Harvey D (2016) Periorbital and orbital aging: senile enophthalmos as a cause of upper eyelid ptosis. Plast Reconstr Surg 138(1):31e–37e
10. Stutman RL, Codner MA (2012) Tear trough deformity: review of anatomy and treatment options. Aesthet Surg 32:426–440
11. Hirmand H (2010) Anatomy and nonsurgical correction of the tear trough deformity. Plast Reconstr Surg 125(4):699–708
12. Tonnard P, Verpaele A, Peeters G, Hamdi M, Cornelissen M, Declercq H (2013) Nanofat grafting: basic research and clinical applications. Plast Reconstr Surg 32(4):1017–1026
13. McCord CD Jr, Codner MA, Hester TR (1998) Redraping the inferior orbicularis arc. Plast Reconstr Surg 102:2471–2479
14. Atiyeh BS, Hayek SN (2004) Combined arcus marginalis release, preseptal orbicularis muscle sling, and SOOF plication for midfacial rejuvenation. Aesthetic Plast Surg 28(4):197–202
15. Collar RM, Lyford-Pike S, Byrne P (2013) Algorithmic approach to lower lid blepharoplasty. Facial Plast Surg 29(1):32–39
16. Kikkawa DO, Lemke BN, Dortzbach RK (1996) Relations of the superficial musculoaponeurotic system to the orbit and characterization of the orbitomalar ligament. Ophthalmic Plast Reconstr Surg 12(2):77–88
17. Miranda SG, Codner MA (2017) Micro free orbital fat grafts to the tear trough deformity during lower blepharoplasty. Plast Reconstr Surg 139(6):1335–1343
18. Goldberg RA (2000) Transconjunctival orbital fat repositioning: transposition of orbital fat pedicles into the subperiosteal pocket. Plast Reconstr Surg 105:743–748 **(Discussion 749–751)**
19. Kawamoto HK, Bradley JP (2003) The tear "TROUF" procedure: transconjunctival repositioning of orbital unipedicled fat. Plast Reconstr Surg 112(7):1903–1907

20. Barton FE Jr, Ha R, Awada M (2004) Fat extrusion and septal reset in patients with the tear trough triad: a critical appraisal. Plast Reconstr Surg 113(7):2115–2121
21. Hidalgo DA (2011) An integrated approach to lower blepharoplasty. Plast Reconstr Surg 127(1):386–395
22. Pezeshk RA, Sieber DA, Rohrich RJ (2017) The six-step lower blepharoplasty: using fractionated fat to enhance blending of the lid-cheek junction. Plast Reconstr Sur 139(6):1381–1383
23. Tonnard PL, Verpaele AM, Zeltzer AA (2013) Augmentation blepharoplasty: a review of 500 consecutive patients. Aesthet Surg J 33(3):341–352
24. Rohrich RJ, Mahedia M, Shah N, Afrooz P, Vishvanath L, Gupta RK (2018) Role of fractionated fat in blending the lid-cheek junction. Plast Reconstr Surg 142(1):56–65
25. Casagrande C, Saltz R, Chem R, Pinto R, Collares M (2000) Direct needle fixation in endoscopic facial rejuvenation. Aesthet Surg 20:361–367
26. Zoumalan CI (2018) Managing periocular filler-related syndrome prior to lower blepharoplasty. Aesthetic Plast Surg. 8 Oct 2018. (Epub ahead of print)