

Trans-blepharoplasty lateral volumizing brow lift in the management of lateral upper eyelid dermatochalasis

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Abstract. *Purpose:* To investigate the efficacy of simultaneous upper eyelid blepharoplasty (UEB), internal browpexy (IB), and brow fat pad suspension suture (BFPSS) for periorbital rejuvenation. *Methods:* a prospective study of 96 eyelids of 48 patients who underwent simultaneous UEB, IB, and BFPSS was conducted. All patients underwent a periorbital evaluation and patient satisfaction was evaluated at baseline, 1 week, 3 months, and 6 months after the surgery. *Results:* The mean baseline BOE increased significantly from 37.5 ± 2.9 points to 81.5 ± 4.6 points at the 12-month follow-up. The mean baseline eyelid eyebrow distance (LBD) increased significantly from 19.1 ± 0.6 to 21.5 ± 1 mm at the 12-month follow-up. The mean baseline pretarsal space increased significantly from 2.6 ± 0.58 to 4.5 ± 0.31 mm at the 12-month follow-up. Baseline lateral dermatochalasis classification was graded into grades 1, 2, and 3 in 28 (29.16%), 50 (52.09%), and 18 (18.75%) eyelids, respectively. At the 12-month follow-up, grade 0 was recorded in 87 (90.6%) eyelids, and grade 1 was recorded in 9 (9.4%) eyelids. *Conclusions:* Our cohort highlights how concurrent BFPSS and QIB are minimally invasive adjuncts to UEB in the treatment of lateral dermatochalasis of the upper eyelid.

Key words: dermatochalasis, brow ptosis, blepharoplasty, browpexy, BFPSS, periorbital

Introduction

A youthful periorbital appearance has ideal upper eyelids and eyebrow shapes, characterized by a convex upper eyelid crease, with a well-defined pretarsal space (PTS) and a distinctive volume distribution, that blends smoothly with the lateral eyebrow fat. The eyebrow lies at the superior orbital rim. In women, it is arched and peaked laterally at the level of the lateral limbus, while the male eyebrow is flatter and straighter¹⁻³.

Dermatochalasis is characterized by excessive redundant skin folds due to involutional changes in the periocular soft tissue⁴.

Eyebrow ptosis is the drooping of the eyebrow below the superior orbital rim, which is more pronounced laterally due to involutional changes in the bone and fat pad (static part) and the unopposed action of the

brow depressors (dynamic part). The orbicularis oculi muscle (OOM) is the only depressor of the lateral eyebrow, and there is no muscle elevator of the eyebrow beyond the temporal line of the forehead⁵⁻⁶.

The Orbicularis retaining ligament (ORL) forms the lateral brow thickening (LBT) above the supraorbital rim and the lateral orbital thickening (LOT) in the lateral canthal region⁷.

Retro-orbicularis oculi fat (ROOF) lies in the supraorbital area deep to the OOM and superficial to the frontal bone periosteum, and is enveloped in the galeal fascia. The brow fat pad is an important component of the appearance of the lateral brow volume. Hereditary and involutional factors can cause a descent of the eyebrow fat⁸⁻¹⁰.

Dermatochalasis, lateral eyebrow ptosis, and descent of eyebrow fat are the main causes of lateral hooding that contribute to a tired periorbital appearance,

superolateral visual field restriction, narrow pretarsal space, and temporal eyebrow fullness^{4,11,12}.

Upper eyelid blepharoplasty (UEB) is an effective technique in the treatment of dermatochalasis. Stand-alone upper blepharoplasty is commonly associated with postoperative eyebrow descent. Besides, it cannot address concurrent lateral hooding without extended incisions^{3,13,14}.

Brow lifting techniques include internal brow lift and external brow lift, such as a direct, mid-forehead, or endoscopic approach. None of the brow lift approaches led to the patients' full satisfaction. Trans-blepharoplasty brow lift is a minimally invasive technique providing stabilization and a modest lateral brow lift in conjunction with UEB. The trans-blepharoplasty brow lift has become an essential adjunct to UEB, enhancing postoperative outcomes of functional and cosmetic eyebrow ptosis¹⁵⁻¹⁷.

Internal browpexy (IB) is a trans-blepharoplasty method for anchoring the sub-brow tissue to the frontal bone. Brow fat pad suspension suture (BFPSS) plicates OOM to the superior lateral arcus marginalis, and it suspends the brow fat pad superiorly to create a volume-enhancing effect. BFPSS achieves the fullness of the lateral eyebrow rather than its elevation^{1,18-20}.

This cohort aims to investigate the efficacy of adding BFPSS to trans-blepharoplasty IB in the management of lateral dermatochalasis and hooding of the upper eyelid.

Patients and Methods

Patient selection: This prospective study included patients who underwent trans-blepharoplasty combined IB and BFPSS surgery in the management of upper eyelid dermatochalasis and lateral hooding.

- **Inclusion criteria:** At least 18 years of age patients with lateral dermatochalasis of the upper eyelids (\geq grade 1) and lateral eyebrow ptosis.
- **Exclusion criteria:** Eyelid ptosis, lacrimal gland prolapse, botulinum toxin injection within 6 months, thyroid eye disease, myasthenia, and facial paralysis.

Patient evaluation: A full ophthalmic examination, visual field test, and periorbital evaluation were performed at baseline, 3 months, and 12 months after the surgery.

- *The periorbital evaluation* includes an assessment of the globe position, palpebral fissure size and shape, upper eyelid (position and symmetry, Margin reflex distance 1, levator function, eyelid crease), periorbital fat pads (preseptal, preaponeurotic, and ROOF), eyebrow (height, position and symmetry), Bell's phenomenon, and, facial nerve function.
- *Lateral eyebrow ptosis* is defined as a descent of the temporal eyebrow below the orbital rim.
- *Eyelid-eyebrow distance* (LBD) is defined as the distance from the upper lid margin to the lower edge of the eyebrow measured at the lateral limbus.
- *Pretarsal space* is defined as the distance from eyelid crease to eyelid margin when the eyes are open.
- *Pretarsal show grades:* no pretarsal show, partial pretarsal show, or complete pretarsal show.
- *Lateral dermatochalasis of the upper eyelids' classification (LDC):* Grade 0: absence of dermatochalasis in the lateral region of the orbit; Grade 1: lower edge of dermatochalasis (LED) is located above the intersection of the lacrimal caruncle with the edge of the upper eyelid; Grade 2: between the intersection of the lacrimal caruncle with the edge of the upper eyelid and the lower edge of the iris at the pupillary midpoint; Grade 3: LED below the lower edge of the iris^{1,4,8,21}.
- *The duration of surgery* from the time of the incision to the closure of the wound is measured by a stopwatch in minutes.
- *Patient satisfaction evaluation*²²:
 1. Global aesthetic improvement scale (GAIS).
 2. Blepharoplasty Outcomes Evaluation (BOE): Scoring six items on a 0–4 scale, (a score of 0 is rated for the most negative response, and a score of 4 is rated for the most positive response. Dividing the score sum by 24 and multiplying by 100 gives the total score. This range is 0–100, with 0 representing the least

patient satisfaction and 100 representing the most patient satisfaction.

- *Photography*: close-up midface photographs were taken under standard positioning in primary, up, and down gazes. Photographs were

standardized to a corneal diameter of 11.5 using Adobe Photoshop (Adobe Systems, Inc., San Jose, Calif.) 23. Photographs were rated by two observers blinded to the study (Figure 1).



Figure 1. Case 1: A baseline photograph grade 2 LDC, B 12 months postoperative photograph grade 0. Case 2: C baseline photograph grade 2 LDC, D 12 months postoperative photograph grade 0. Case 3: E baseline photograph grade 1 LDC, F 12 months postoperative photograph grade 0. Case 4: G baseline photograph grade 3 LDC, H 12 months postoperative photograph grade 0. Case 5: I baseline photograph grade 3 LDC, J 12 months postoperative photograph grade 0.

Surgery

Preoperative markings are performed with the patient in the upright primary position after manual correction of the eyebrow position.

- The position of the eyebrow peak is marked at the level of the lateral limbus.
- The marking of the upper lid crease extends from the medial canthus to the lateral canthus at the lowest point of the lateral hooding. The pinch test is performed and the upper marking is done at least 10 mm from the lower edge of the eyebrow. The marking is checked again with the patient in supine position after surgical preparation and draping.

Surgical Procedure:

- All procedures are performed under local and conscious sedation. The skin was infiltrated subcutaneously with 2-5 ml of lidocaine 1% with 1:100,000 epinephrine after surgical preparation and draping.

- Incision and excision of the marked upper eyelid skin were done. A blunt dissection of nasal OOM and orbital septum, followed by an excision of the nasal fat pad was performed.
- The lateral OOM was divided, and a dissection was performed in a preseptal plane to expose and incise the superior arcus marginalis. Dissection was continued superiorly in the preperiosteal plane, releasing ORL and exposing 15-20 mm of frontal periosteum, ascertaining full mobility of the eyebrow. The sub-brow tissue deep to the dermis at the level of the peak of the eyebrow, 12-15 mm from the upper edge of the blepharoplasty incision, was sutured to the frontal periosteum about 12-15 mm superior to the arcus marginalis with two or three 5/0 Prolene interrupted sutures.
- The arcus marginalis lateral to the lateral limbus was sutured to the inferior and superior edges of OOM, respectively, with 1 mattress 5/0 Vicryl suture.
- The blepharoplasty skin incision is undermined and then closed with a running 6-0 Vicryl suture (Figure 2).

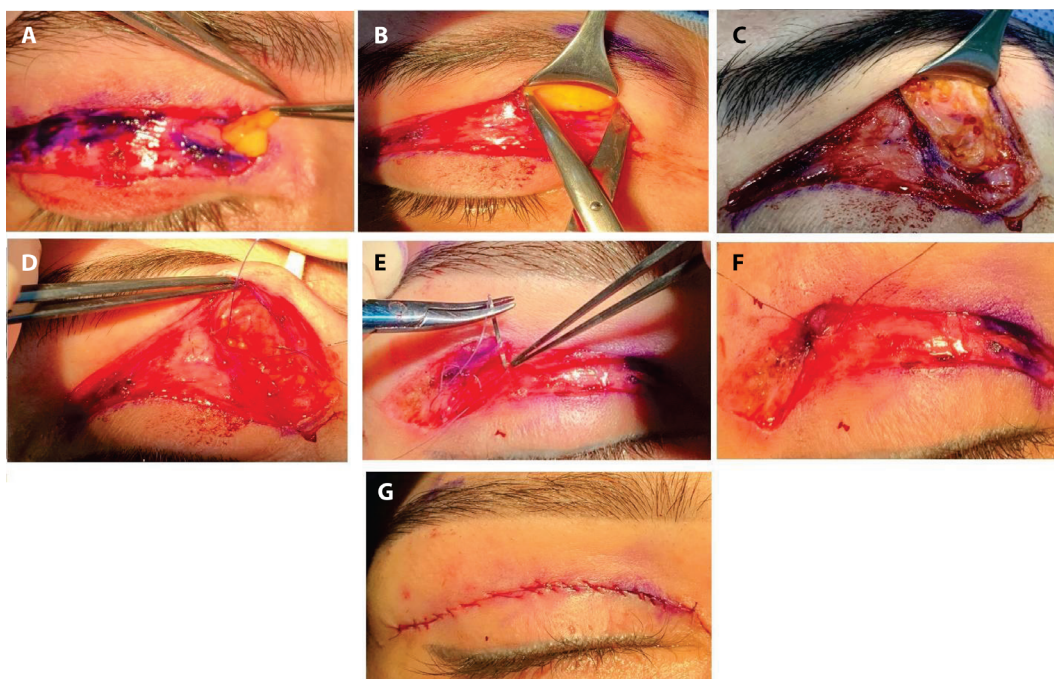


Figure 2. Surgical technique: (A) Nasal fat pad excision (B, C) Preperiosteal dissection (D) IB suture (E, F) BFPSS (G) Wound closure.

Postoperative treatment: It includes the application of topical antibiotics and steroid ophthalmic ointment twice daily on the incisions, cold compresses at 30-minute intervals for the first 3 days, and head elevation during sleep. The skin sutures were removed after 1 week.

Primary Outcome Measures included the evaluation of LDC, LBD, and patient satisfaction at 12-month follow-up compared to baseline.

Statistical analysis

Variables were expressed as a percentage or mean \pm standard deviation. SPSS Windows version 16.0 (SPSS, Chicago, USA) was used to complete the statistical analysis. Paired Student's t-test was used for the statistical analysis. A P value < 0.05 was statistically significant.

Results

Study population

This is a prospective study of 96 eyelids of 48 patients who underwent surgical treatment of the lateral upper eyelid dermatochalasis and lateral eyebrow ptosis from January 2021 to March 2024. The mean follow-up was 14 ± 2.1 months (range: 12-17 months). The mean age of patients was $50.5.1 \pm 10.2$ years (range: 35 - 64) with 39 females (81.25%) and 9 males (18.75%). Primary and secondary surgery was done in 88 (91.7%) and 8 (8.3%) eyelids, respectively.

Clinical results

The mean operative time was 97.6 ± 4.3 minutes per patient. GAIS showed degrees 1, 2, and 3 in 15 (31.25%), 30 (62.5%), and 3 (6.25%) patients at the 12-month follow-up, respectively. The mean baseline BOE increased significantly from 37.5 ± 2.9 points to 81.5 ± 4.6 points at the 12-month follow-up (P value < 0.0001). The BOE scale was 70 - 80%, 80 - 90%, and more than 90% in 2 (4.2%), 29 (60.4%), and 17 (35.4%) patients at the 12-month follow-up, respectively. The mean baseline LBD increased significantly from 19.1 ± 0.6 to 21.5 ± 1.0 mm at the 12-month

follow-up (P value = 0.0009). The mean elevation of the temporal eyebrow is 2.2 ± 0.26 mm. The mean baseline PTS increased significantly from 2.6 ± 0.58 to 4.5 ± 0.31 mm (P value = 0.0009) at the 12-month follow-up. The mean increase of the PTS is 1.8 ± 0.6 mm. Baseline LDC was graded into grades 1, 2, and 3 in 28 (29.16%), 50 (52.09%), and 18 (18.75%) eyelids, respectively. At the 12-month follow-up, grade 0 was recorded in 87 (90.6%) eyelids, and grade 1 was recorded in 9 (9.4%) eyelids.

Safety

There were no recorded major intraoperative or postoperative adverse effects throughout the study. Minimal postoperative eyelid edema and ecchymosis were observed in all cases. None of the patients reported wound incision scars. Postoperative mild eyebrow asymmetry was recorded in one patient without any further revision.

Discussion

Optimal periorbital rejuvenation requires understanding the patients' desires, applying the brow-lid continuum concept, and selecting suitable surgical modalities^{24,25}.

Treatment of lateral hooding is challenging, and we think to achieve acceptable aesthetic and functional outcomes, it requires a customized treatment plan based on addressing dermatochalasis, lateral brow ptosis, volume changes of the brow fat pad, and achieving the proper eyebrow shape. In this cohort, we performed a combination of the release of deep orbital attachments, IB, BFPSS during simultaneous UEB for the management of lateral dermatochalasis.

The standard UEB involves removing redundant skin, preserving the preaponeurotic fat pad, and the conservative removal of the nasal fat pad²².

To address dermatochalasis, we performed standard UEB with a minor modification, which is the lateral extension of the UEB incision involving the lateral hooding within a skin tension line.

The original IB described by McCord and Doxanas, and the subsequent modifications, included an extended preperiosteal dissection, the release of

deep retaining ligaments of the eyebrow, extirpation of lateral OOM, Tuck and Rise IB, quantitated IB, preplanned arch suturing and Endotine browplasty. All these procedures have shown good results with few complications^{8,26,27}.

Previous studies showed the ability of IB to correct mild to moderate lateral brow ptosis and reported a brow lift elevation ranging from 1.2 to 3.19 mm. These reports highlighted the benefits of simplicity and efficiency of IB, the absence of an external incision, and the same recovery time of standalone UEB. Other reports showed that the IB can't attain actual brow lifting without pleating and reported forehead tenderness, dimpling, and restricted brow movement as the main adverse effects^{10,13,18,20,28}.

In the literature, severe brow ptosis is better corrected with a formal external brow lift, but these procedures are invasive with longer recovery time and carry risks of motor and sensory complications. External browpexy showed good results with minimal complications, but is best suited for men with thicker brow cilia. Chemical brow lifting is an effective, minimally invasive approach, but temporary^{8,29-32}.

Our approach to brow lifting is quantitated IB. We reported a mean elevation of the lateral eyebrow of 2.2 ± 0.26 mm without serious ocular side effects during the follow-up interval. Postoperative dimpling is a bothersome adverse effect. A proper sub-brow tissue and skin dissection, and ascertaining free mobility of the fat pad decreases the incidence of postoperative dimpling. Scarring of the sub-brow tissue could be minimized through a meticulous subgaleal dissection. Many studies show that IB provides short-term success and that its durability is questionable, which can be attributed to an improper procedure or lack of long-term follow-up studies. Our cohort showed intermediate-term success over 1 year. Further long-term follow-ups would then allow to evaluate its longevity^{1,12,19,25,33-35}.

Achieving ideal eyebrow volume is an important surgical concept in brow lifting surgery. Proper eyebrow volume enhances the contour, eyebrow-eyelid transition, and fullness of the eyebrow. Techniques of brow volume-enhancing include BFPSS, brow fat pad debulking, or brow fat pad support using fat graft or subbrow fat mobilization. Browplasty mostly suits patients with heavy ROOF, but care is taken to avoid

excessive brow fat resection and sub-brow tissue adhesion. Patients with volume-depleted eyebrows may benefit from brow fat pad support^{20,32,36,37}.

BFPSS was first reported by Zarem et al. as a lateral orbicularis muscle fixation, then Robert Goldberg coined the name the brassiere suture for this technique. Subsequent variations included lateral excision or bisection of OOM and fixation of both edges, or only the upper edge of OOM, and isolated BFP suspension^{11,18,19,21,23}.

Our approach to BFPSS has involved the bisection of OOM and fixation of both edges of OOM to the arcus marginalis. We have reported good qualitative aesthetic results and improved lateral eyebrow contour and fullness. We do not do either browplasty or fat augmentation in our cohort.

A combination of IB with the brassiere suture in the treatment of brow ptosis was reported. Armstrong et al. advocate excision of the lateral OOM and securing the cuff of the remaining OOM to the frontal periosteum. Silva et al. combined internal pexia in the periosteum and the removal of the lateral part of the OOM with posterior fixation to the arcus marginalis. The elevation of the lateral brow was 2.42 and 3.33 mm in Armstrong et al. and Silva et al, respectively^{19,23,38,39}.

None of our cases required lacrimal gland suspension or glabellar myoblast, but we think these adjuncts to UBS are ideal approaches for the management of lacrimal gland prolapse and medial canthal rhytids, if indicated^{4,18,12}.

Our approach is not unique or innovative. However, we incorporated effective previously tested treatment modalities to achieve the best results with minimal complications. We think minimal invasive adjunct techniques should be implemented as a routine in periorbital rejuvenation.

This study did not apply quantitative analysis for volumetric changes in the eyebrow, which is a drawback. The main area of strength in this study is the intermediate follow-up time.

Conclusion

Our cohort highlights how concurrent BFPSS and QIB are minimally invasive adjuncts to UEB in the

treatment of upper eyelid lateral dermatochalasis, providing excellent and aesthetic periorbital rejuvenation.

Declaration

- Ethical Approval: The local ethics committee of Seha Emirates hospital; Abu Dhabi; UAE approves this study. The study followed the tenets of the Declaration of Helsinki. *ClinicalTrials.gov ID: NCT04861454*.
- Patient Consent: All patients signed an informed consent.
- Conflict of Interest: Declared none.
- Funding: Declared none.
- Data sharing statement: All data used to support the findings of this study are available from the corresponding author upon request.

Abbreviations: Pretarsal space (PTS), Orbicularis oculi muscle (OOM), Orbicularis retaining ligament (ORL), Lateral brow thickening (LBT), Lateral orbital thickening (LOT), Retro-orbicularis oculi fat (ROOF), Upper eyelid blepharoplasty (UEB), Internal browpexy (IB), Brow fat pad suspension suture (BFPSS), Eyelid-eyebrow distance (LBD), Lateral dermatochalasis of the upper eyelids classification (LDC), Global aesthetic improvement scale (GAIS), Blepharoplasty Outcomes Evaluation (BOE).

Study Approval: The local ethics committee of Seha Emirates Hospital; Abu Dhabi; UAE approves this study. The study followed the tenets of the Declaration of Helsinki. *ClinicalTrials.gov ID: NCT04861454*.

Informed Consent: All patients signed an informed consent.

Acknowledgment: No substantial contribution was provided for this submission.

Declaration of Interest Statement: The author declares no conflict of interest. No financial support was received for this submission.

Data Sharing Statement: All data used to support the findings of this study are available from the corresponding author upon request. *ClinicalTrials.gov ID: NCT04861454*

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Received: 22 May 2024

Accepted: 25 July 2024

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