



Review

Direct Brow Lift an Update of Current Literature

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Introduction

Ptosis of the eyebrows is the earliest manifestation of the aging face [1]. It gives the face a tired look and accentuates upper eyelid deformities. There are numerous surgical procedures to lift the brow; the earliest were published in the early 1900s [2-4]. Since the introduction of the direct brow lift technique, there have been minor refinements to this procedure, as well as some major developments in surgical techniques. Mid-forehead and coronal incisions were later replaced by the endoscopic techniques for brow lifting [5,6]. Yet, with the armory of brow lifting techniques that currently exist, there still is a major role for the direct brow lift, herein described in detail.

Anatomy

The eyebrow is comprised of the skin (with its hair follicles) and soft tissues that cover the superior orbital rim. Under the brow hairs and skin lies the muscle. Laterally, the frontalis muscle intertwines with the orbicularis oculi muscle and medially, the corrugate or supercilii and the procerus, insert into the soft tissues of the brow and lower forehead [7].

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The muscle overlies the brow fat pad-the Retro-Orbicularis Oculi Fat pad (ROOF). The ROOF is strongly attached to the superior orbital rimperiosteum.

This ROOF should be distinguished from the pre-aponeurotic fat, which is located posterior to the septum.

The supraorbital bundle (nerve and blood vessels) ride above and medial to the midpoint of the superior orbital rim to enter the forehead inside the frontalis muscle.

The Ideal Brow Position

The ideal position of the brow has been debated among cosmetic and oculoplastic surgeons [7-9].

The brow is normally located above the superior orbital rim in females and at the level of the rim in males. There is a more prominent fat pad and less curvature in men compared to women [9-11].

Westmore et al. [8] described the boundaries of the ideal brow. Medially - the ideal brow begins in the same vertical line as the nasal ala and medial can thus and laterally in ends in an oblique line from the nasal ala to the lateral limbus.

Both medial and lateral ends of the brow should lie in the same horizontal line and the brow's apex should ideally lie above the lateral limbus.

McKinney et al. [10] measured the minimal distance between the center of the pupil and the apex of the brow and found that in the normal brow this distance should be 2.5 cm on average, if this distance is shorter than the patient has brow ptosis.

Brow ptosis

Brow ptosis is part of the aging process [1,2,12] and can also occur due to facial nerve paresis. Clinically, brow ptosis is present if the brow (all or part of it) lies below the superior orbital rim. Ptosis of the lateral part of the brow is more common than of the medial part as the latter has deeper and stronger attachments. When brow ptosis occurs, the redundancy of skin in the upper eyelid increases. In particular, ptosis of the lateral brows can cause mechanical eyelid ptosis, as a result of the hooding of the upper eyelid skin. For this reason, it is important to assess the position of the brow in patients who are candidates for upper blepharoplasty, and the amount of eyelid skin to be excised should be determined only after careful consideration of the interplay between the brow position and the upper eyelid skin.

Brow lift surgical options

There are numerous surgical procedures to elevate the ptotic brow, including: Trans-blepharoplasty browpexy, mid-forehead lift, coronal brow lift, pretrichial brow lift, endoscopic brow lift, and the direct brow lift [12]. Any of these options includes releasing the brow, elevating and shaping it and finally fixating it to the desired location.

Pre-operatively the patients should be assessed for skin type, the position, shape and symmetry of the brows, the amount of browptosis, the position of the anterior hairline, and the presence of forehead rhytides [13,14].

We will briefly go over the main techniques available today and elaborate extensively on the direct brow lift technique (Table 1).

Trans blepharoplasty browpexy: This approach is more appropriate for small degrees of brow ptosis that affect mainly the lateral brow. It is commonly done in conjunction with upper eyelid blepharoplasty through the same incision [15]. This procedure is simple, and has the advantage of placing the wound within the natural skin crease. However, it has only limited efficacy and a higher risk of recurrence.

Mid-forehead lift: The incisions in this technique are placed in a forehead crease, and thus it is suitable for men with deeper forehead creases and retreating hairlines [16,17]. The potential complications of this procedure are visible scarring and altered forehead sensation.

Coronal brow lift: This approach involves a long incision behind the hairline from ear to ear. It allows the surgeon to also treat forehead and glabellar wrinkles while lifting the brow [18]. It is not suitable for patients that have high hairline or hair that is thinning, as this approach will lengthen the forehead and a potential complication of this technique is alopecia.

Pretrichial brow lift: The pretrichial incision is created just anterior to the hairline, often in a saw-toothed manner to aid in scar camouflage. This technique is most appropriate for patients with a high forehead it will lower the hairline. Forehead and glabellar wrinkles can be treated concurrently. Visible scarring is a potential complication of this surgery and it is best hidden in patients who wear their hair with bangs.

Endoscopic brow lift: This approach utilizes small incisions and has become popular for facial rejuvenation. It has a similar success rate as the coronal brow lift, with a significantly lower rate of complications (numbness, itching, hair loss, tissue swelling) and a faster recovery time [5,6,19-21]. However, this technique has disadvantages that include: A steep learning curve, the additional expense of specialized equipment, and additional surgical time.

Direct brow lift: The direct brow approach can be used for any pattern and amount of brow ptosis. This approach gives the greatest amount of brow lift per millimeter of tissue being excised. It also has a higher predictability rate and gives the surgeon more control on the final brow position and shape. The main disadvantage of this technique is the postoperative scar. The direct brow lift is often reserved for patients with pre-existing deep forehead rhytids, which can help camouflage the scar, or for patients with full and “bushy” brow hairs which can hide the scar from view.

Operative Technique

1. Mark the skin-marking the brow is a crucial step in the operation; it is done while the patient is awake. First mark the superior border of the brow and measure the amount of elevation required by pulling the brow up to its desired postoperative position. Some additional elevation is recommended to compensate for post-operative brow relaxation. Generally, for every 1.5 cm of tissue excised, 1 cm of elevation can be expected. Use the marker pen to outline the superior edge of the incision and join this line to the line marked just above the brow hairs to form an ellipse. It is important to avoid excess skin excision, as it can cause lagophthalmos.
2. Identify the position of the supraorbital bundle at the medial aspect of the brow.
3. Incision-cut the skin along the marked ellipse. Stay within the ROOF at the medial 1/3rd of the outlined ellipse to protect the supraorbital bundle and deepen the dissection to below the fat layer in the lateral end of the ellipse, to expose the frontalis muscle. Pay close attention to avoid damaging the supraorbital bundle when excising the ellipse of tissue.
4. Closing the wound-careful closure performed in two layers (deep and superficial skin sutures) is the preferred technique as it leads to the most satisfactory cosmetic result. Often, interrupted 4-0 absorbable sutures are used to close the deep layers in a buried fashion. In patients with facial palsy these sutures may also be fixated to the periosteum. Closing the skin is often carried out with 5-0 non-absorbable sutures, taking care to evert the skin edges to allow for a flat, rather than depressed scar [22]. Steri-strip dressings may also be placed along the wound. The skin sutures should be removed after 5-7 days.

Efficacy and Complications

This technique has the advantage of being able to elevate and at the same time to completely reshape the brow arch with a high degree of precision and without an extensive dissection (figures 1 and 2). The key points in the surgical procedure must always be respected, including adequate release and tension-free fixation while keeping in mind the expected postoperative tissue relapse [23]. Although there are no prospective, controlled clinical trials evaluating the efficacy of the direct brow lift surgery, this procedure has been found to give a reliable and predictable outcome, with high patient satisfaction [24].

Technique	Concept	Pros	Cons
Trans-blepharoplasty browpexy	Commonly done together with upper blepharoplasty through the same incision.	Simple, and has the advantage of placing the wounds within the natural skin crease	Only limited efficacy and a higher risk of recurrence.
Mid-forehead lift	Incisions in this technique are preformed in the forehead crease	Suitable for men with deeper forehead creases and retreating hairlines.	Visible scarring and altered forehead sensation.
Coronal brow lift	Involves a long post-trichial incision from ear to ear.	Allows the surgeon to remove excess forehead skin, fat and tissue while lifting the brow.	Not suitable for patients that have high hairline or hair that is thinning, as it may cause alopecia.
Pretrichial brow lift	Incision is created just anterior to the hairline	Most appropriate for patients with a high forehead. forehead wrinkles can be treated concurrently.	Visible scarring
Endoscopic brow lift	Utilizes small incisions to lift the brow endoscopically	Similar success rates as the coronal brow lift, with a significantly lower rate of complications.	A long learning curve for surgeon, additional expense of the specialized equipment
Direct brow lifting	Incisions are made in the superior border of the brow	The greatest amount of brow lift per millimeter of tissue being excised higher predictability rate (the surgeon has more control on the final brow position and shape)	Postoperative scar

Table 1: The different techniques for brow lifting and their appropriate pros and cons.



Figure 1: (A) 59 years old patient with a history of involuntional bilateral brow ptosis (before) and (B) (1 year after) bilateral direct brow lift.



Figure 2: (A) 67 years old patient with History of chronic right Bell's palsy resulting in brow ptosis (before) and (B) (1 year after) right direct brow lift.

Many authors report low complication rates following direct brow lift, however there is no exact quantification [25-27]. Supraorbital nerve trauma and complete loss of sensation in the forehead is one of the reported side effects, however it should be avoidable when careful dissection is employed. Temporary patches of reduced forehead sensation from cutting smaller branches of the nerve can occur and will normally recover in a few months. One report [24] found that 74% of patients had altered sensation over the forehead, but only 7% of those were unhappy about it. Another report [28] found a 27.5% rate of postoperative paresthesia but did not mention if it was transient or permanent.

The postoperative scar in this approach is a major concern to both patients and surgeons. Ueda et al. [28] reported that 77% of patients were satisfied with the cosmesis of the postoperative scar and none of their patients was 'completely dissatisfied'. Booth et al. found similar high levels of satisfaction, with 81% of their patients reporting being either happy or very happy with the surgical outcome [24]. Unsatisfactory aesthetic outcome is another common patient's complaint

[29-31]. Freund and Nolan reported that both the standard open brow lift and the endoscopic approach result in disappointing eyebrow height and contour.

Discussion

Brow lift surgery has evolved tremendously over the years [30]. New techniques to solve forehead related cosmetic concerns were introduced in the modern era; all have their own potential advantages and disadvantages.

The direct brow lift operation, discussed thoroughly here, remains relevant due to its simplicity. This is a quick procedure, with no need for special equipment or extensive training and it provides reliable and predictable postoperative outcome, with high rates of patient satisfaction. Postoperative complications can be minimized by careful dissection and layered closure.

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