Brow Lift for the Correction of Visual Field Impairment

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**Background:** Eyebrow ptosis and hooding gives the eye a sad, heavy look that often disturbs the visual field. Ptosis of the eyebrow is considered a characteristic feature of the aging face. The youthful eyebrow is one in which the lateral two-thirds of the eyebrow is elevated and arched; descent or flattening of the eyebrow is one of the first signs of facial aging, occurring as early as the third decade of life. Further descent of the lateral eyebrow and the appearance of skin redundancy may cause lateral hooing, which gives the eyes a heavy, tired, and sad look, and enhances aesthetic deformities of the upper eyelid. Blepharoptosis caused by brow ptosis is compensated partially by the activity of the frontalis muscle, which, over time, can create deep horizontal rhytids across the forehead. Patients with significant brow ptosis and lateral hooing may experience functional visual field impairment.

Gravity and senescence are the main causes of aging of the entire periorbital region and brow. In the lateral brow area, the elevator and depressor muscles are not well balanced because the only brow elevator, the frontalis muscle, is deficient laterally. As a result, the lateral brow, which has fewer fascial attachments, is subject to a more forceful mechanism that promotes a more marked descent compared to the medial brow.

Many brow lift surgical procedures have been described over the last 100 years, varying in the position of the incisions and the plane of dissection and associated with differing complications, advantages, and disadvantages. A nonsurgical option for brow lift using botulinum toxin A injections has been described that causes temporary paralysis of the brow depressors.

The earliest published surgical techniques for brow lift involved an excision of excess skin in various locations in the upper face. Direct brow lift using an excision of redundant skin has also been applied to the area immediately above the brow. In 1964, Castanares was the first to describe a direct method in which a resection of an ellipse of skin above the brow...
with a lateral extension outward over the areas of the “crow’s feet” is performed. The incision facilitated the approach to the corrugators and procerus muscles (Figure 1, A). Vinas et al.\textsuperscript{12} have introduced, on the basis of Castanares’s work, a technique in which direct excision of supra brow skin is performed in a shape of a “butterfly wing” for the improvement of low, drooping, and oblique eyebrows in patients who have high foreheads.

Another method of direct brow elevation involves direct excision of skin and subcutaneous fat in the mid-forehead, which disguises the resultant scar in a preexisting transverse forehead wrinkle.\textsuperscript{8,13} Mogelvang\textsuperscript{14} reported a concept for the direct brow lift using a flap transposition technique.

Other brow lift procedures using various approaches sought to reduce conspicuous scars, as was advocated in the above direct techniques, and included concepts such as hair line incisions, the transblepharoplasty approach,\textsuperscript{15,16} and the endoscopic technique described by Vasconez.\textsuperscript{17}

Recently, Har-Shai and Hirshowitz\textsuperscript{18} published the scalpel-shaped blepharoplasty excision for the correction of lateral brow ptosis and hooding. In this paper, we review our experience with the direct extended scalpel-shaped incision technique and evaluate the clinical results in light of the ongoing concerns regarding the scar appearance. In addition, the indications and patient selection criteria for this surgical method will be elaborated.

**METHODS**

**Patient Selection**

Patients with severe brow ptosis (the brow located inferior to the superior orbital rim) and upper lid skin excess together with lateral hooding, which imposed mostly upon the upper and lateral visual field (demonstrated through a vision field test), were selected for surgery. Other possible conditions for lateral brow or upper lid fullness, such as prominent supraorbital rims, prominent or prolapsed lacrimal gland, or subcutaneous fat deposits (retro-orbicularis oculi fat), in addition to underlying systemic conditions, were ruled out.

The patients described, in layman’s terms, their need to contract the frontalis muscle to facilitate vision or daily tasks such as writing or reading. A feeling of heaviness and a fatigued appearance of the upper eyelids and eyebrows were other major complaints. All patients requested a simple surgical procedure that could correct their visual field problem and provide an aesthetically pleasing result. In many instances, patients rejected the option of a foreheadplasty procedure.

**Preoperative Planning**

Preoperative planning depends on an understanding of the relevant anatomy.

**Anatomy.** The frontal belly of the frontalis muscle has no bony attachments. Its medial fibers are continuous with those of the procerus muscle, while its intermediate fibers blend with the corrugator and orbicularis oculi muscles. Its lateral fibers are blended with the orbicularis oculi and over the zygomatic process of the frontal bone and are attached to the temporalis fascia. The fibers are directed upward and join the galea aponeurotica below the coronal suture.\textsuperscript{18,19} The galea aponeurotica itself has several attachments to the periosteum at the orbital rim. Because the frontalis muscle has
no bony attachments, ptosis of the eyebrow (mainly its lateral portion) is possible as the aging process abets forehead skin laxity, which enables the brow to glide inferiorly above the orbital rim towards the orbit.

At the same time, the key to success of the forehead lift operation is the complete mobilization of the forehead flap by release of the attachments between the galea and the periosteum at the orbital rim. These attachments, which are not released during the direct extended brow lift, prevent the elevation of the brows to an undesirable height.

In addition, the prominent superciliary arches, which are located in the lower portions of the frontal bones and are superior to the supraorbital margins, differ among individuals and genders (these arches are larger in men than in women). The degree of prominence depends to some extent on the size of frontal air sinuses. Given the anatomic variations of the superciliary arches, and the lack of bony attachments to the frontalis muscle, the insertion point of the frontalis muscle to the galea might also differ. Consequently, the distance from the upper borders of the brow to the most inferior horizontal rhytid of the forehead may differ among patients. The lower the forehead horizontal rhytids, the better is the camouflage of the scar abutting the eyebrow, because it will more closely resemble another low transverse forehead wrinkle.

**Patient marking.** Preoperative marking was performed with the patient in a sitting position with the eyes closed. The lower margin of the incision, along the superior border of the brow abutting the hair follicles, was outlined from medial to lateral. At the lateral edge of the brow, the skin marking was extended laterally and downward in a curved concave fashion, often within a natural skin crease or crow’s feet, to reach approximately 1 cm medially to the anterior temple hairline (Figure 1, A). The upper border of the skin incision was marked following manual elevation of the ptotic brow. The location was usually 8 to 10 mm above the existing location of the brow and would not interfere with closure of the eyes. The brow was allowed to drop back to its ptotic position. Thereafter, the upper border of the incision joined the two extremities of the skin outline of the lower incision in a gentle convex curve. The general outline of the incision resembles the shape of a No. 20 scalpel blade, in which the maximal width (up to 15 mm) is

![Figure 3. A, C, E, Preoperative views of a 68-year-old female. B, D, F, Postoperative views 12 months after direct extended scalpel-shaped incision for the correction of lateral brow ptosis. The lateral hooding was overcome, and the suture line is barely visible.](image_url)
located laterally at the temple crow’s feet area (Figures 1 and 2). The expected location of the supratrochlear and supraorbital nerves were also identified and marked.

**OPERATIVE TECHNIQUE**

The patient was placed in a supine position. The face and brows were cleansed with antiseptic solutions and draped. Under intravenous sedation, local anesthesia along the incision lines was administered, and an incision was made, keeping the scalpel at a right angle to prevent damage to the brow hair follicles. The skin was excised in a subcutaneous plane in order to prevent damage to the supratrochlear and supraorbital nerves. Some of the frontalis muscle fibers might be seen.

Following meticulous hemostasis and prevention of excessive cauterization at the nerve locations, the surgical wound was sutured using an intradermal approach in a one-layered continuous 4/0 Monocryl suture (Ethicon; Johnson & Johnson, Somerville, NJ) from medial to lateral. The wound margins were approximated in a precise way while the suture was passed through the dermis with no excessive tension to prevent any insult to the blood supply of the hair follicles. No fixation sutures to the periosteum were placed.

The final suture line was in the form of an oblique flattened lazy S. Three fine Steri-Strip tapes (3M Health Care, St. Paul, MN) were applied horizontally, one onto the suture line and the other two above and below the suture line to prevent any tension to the sutured skin. The Steri-Strips were removed after 5 days.

**RESULTS**

Fourteen patients, including 8 males (48–74 yrs of age) and 6 females (67–71 yrs of age) underwent the direct extended scalpel-shaped brow lift to correct lateral brow ptosis and hooding. No wound dehiscence occurred at the lateral suture zone where the maximal amount of skin was excised and where tension was greatest. The surgical scar became scarcely noticeable over time (6–9 mos), and often fell within or parallel to a preexisting crease of the crow’s feet. Elimination of some of the crow’s feet occurred in all patients (Figures 3–5).
Subjective and objective functional relief with respect to the vision field and the feeling of heaviness and satisfaction with the aesthetic result were reported by all patients, along with a significant improvement in their quality of life. A more pleasing postoperative look with a more wide-open appearance of the eyes was usually obtained, which persisted during a follow-up period of 1 year or more. No hypertrophy of the extended lateral scar occurred. Neither brow hair loss nor scar widening was demonstrated.

In one female patient, parasthesia of the left supraorbital nerve was documented, which subsided spontaneously after 3 months. It was thought that nearby cauterization might have caused the nerve injury.

**DISCUSSION**

The eyelid–eyebrow region is the central focus for facial expression. Even a minor change in brow position can alter the expression of an individual’s face. With the correction of lateral drooping of the brow, the facial expressions of sadness and fatigue caused by brow ptosis can be improved to achieve a more tranquil facial aesthetic.\textsuperscript{20}

Drooping of the eyebrows may be compensated for by chronic spastic contraction of the frontalis muscle, which lifts the eyebrows frequently, if not all the time. Such contractions are substantiated by the presence of prominent transverse forehead wrinkles.\textsuperscript{20}

Botulinum toxin A injections can serve as a temporary alternative to surgical brow lift in younger patients; however, the average brow elevation achieved by such injections is 4.83 mm,\textsuperscript{6} which might not suffice to correct low-lying eyebrows, particularly when they are associated with lateral brow drooping.

Direct brow lifting has typically been reserved for patients with no desire for a coronal brow lift, or in whom the scars of a coronal lift would be unacceptable; for instance, in patients with male pattern baldness or a high hairline. Direct brow lift is also advocated when the patient’s medical condition will not permit more aggressive and distant brow elevation techniques.

\textbf{Figure 5.} \textit{A, C, E,} Preoperative views of a 48-year-old male. \textit{B, D, F,} Postoperative views 12 months after direct extended scalpel-shaped incision for the correction of lateral brow ptosis. The postoperative views demonstrate scarcely noticeable suture lines. Although this patient was relatively young, the postoperative scars are barely visible because of his dense eyebrows and low transverse forehead wrinkles. Given his male pattern baldness, a coronal brow lift might have caused unacceptable scarring.
The scalpel-shaped incision described herewith is based on a further extension of the incision laterally and downwards. This permits concealment of the lateral scar within or parallel to a crown’s feet crease and elimination of some of the crown’s feet rhytids. Because the maximal amount of skin is excised laterally, the scalpel-shape incision allows a favorable elevation of the lateral portion of the eyebrow with respect to the medial part.

Evaluation of operative results over time suggests that the scalpel-shaped technique is mainly suitable for patients with thick, “bushy” eyebrows because the postoperative scar in such patients is less visible than in patients with comparatively thin, wispy brows. Short and sparse eyebrows caused by excessive trimming, plucking, or alopecia, which are encountered most frequently in female patients, conceal the scar line poorly.

In addition, a superior postoperative aesthetic result is more likely to be achieved in patients with forehead skin laxity, which allows approximation of the surgical incision margins with low tension, which in turn allows better healing and scarring. This benefit enables older patients to be candidates for the direct extended brow lift.

In addition, this technique enables the surgeon to perform ancillary procedures via the medial surgical cut, such as procerus and corrugator supercilii muscle transection or excision and reversed superiosteal forehead lift, which have been described through a transpalpebral approach.

Booth et al reviewed their experience with the direct brow lift to establish its efficacy, complication rate, and degree of patient satisfaction. They noted that with careful wound closure, postoperative scars were rarely considered cosmetically unacceptable by patients. The direct brow lift operation was found to provide high levels of patient satisfaction in both males and females.

CONCLUSIONS

The direct extended brow lift is a simple, quick, and effective procedure requiring no specialized endoscopic equipment. It is easy to perform, has minimal morbidity, and allows the surgeon good control of both the degree of brow elevation and the postoperative shape of the brow. This technique is unique among the other proposed methods because of the 1:1 ratio of tissue removal to brow elevation when determining the amount of skin to be excised, especially at the lateral brow area. In addition, preoperative asymmetries of the eyebrow position can also be corrected.

The candidates who will benefit most from the direct extended scalpel-shaped brow lift are patients who are older than 50 years of age, have eyebrow ptosis in which the brow is located inferior to the superior or orbital rim accompanied with lateral hooding, well developed crow’s feet, forehead skin laxity that allows low tension approximation, long and dense eyebrows, and low transverse forehead wrinkles.

DISCLOSURES

The authors have no disclosures with respect to manufacturers of products mentioned in this article.

REFERENCES


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