

Flat Incision Technique for Reconstructive Brow Surgery: A Wound Healing Model and Clinical Evaluation

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Background: Skin incision is considered to be placed at 90° in reference to the skin to get perfect wound edge adaptation. The incision on hair-bearing tissues, as the scalp, is considered to be bevelled at 45° to promote hair growth through the scar. There is no consensus about the preferred incision angle on the brow. The aim of this article was to demonstrate the feasibility of the “flat incision technique” for brow repositioning, where brow deformation results after forehead reconstruction. A wound-healing model for the bevelled incision is presented.

Methods: Brow incisions are bevelled with an angle of 20°. The lower incision is placed inside the brow so that the upper 2 rows of hair are included; the dermis is completely transected and dissection is continued into the subdermal plane. The procedure is presented in a patient who underwent resection of the forehead due to melanoma.

Results: The bevelled incision increases the surface area of dermal layer by a factor of 2 compared with the standard vertical skin incision at 90°. Loss of the dermal tissue integrity and continuity due to trauma hinders the recovery of cell migration and function, resulting in a more prominent scar formation. It appears reasonable that with the increased surface area of the dermal layers in the wound edges, the scar quality improves. The case study demonstrates the feasibility of the procedure.

Conclusion: The bevelled 20° incision for brow repositioning and reshaping showed to be a viable and predictable procedure. (*Plast Reconstr Surg Glob Open* 2018;6:e1684; doi: 10.1097/GOX.0000000000001684; Published online 26 February 2018.)

INTRODUCTION

Patients requiring reconstructive facial plastic surgery desire a pleasant aesthetic outcome with invisible scars. A 90° skin incision, also called vertical incision, is considered to be the goal to get a perfect wound edge adaptation. The incision on hair-bearing tissues, as the scalp, is considered to be bevelled at 45° to promote hair

growth through the scar.¹ There is no consensus about the preferred incision angle on the brow. The brow is often chosen to camouflage incisions necessary to approach the facial skeleton in facial trauma or for reconstructive procedures of the forehead. Alopecia, scarring, and brow asymmetry are often produced. The first author introduced in 2012 the “flat incision technique” (FIT) for brow aesthetic enhancement by defining brow shape, brow symmetry, and brow suspension through a so-called direct-brow incision at 20°. ^{2,3} The proposed bevelled brow incision enhances the dermal layers of the wound by a factor of 2, in contrast to the vertical incision, providing a markedly improved scarring.³

The forehead is a challenging regional aesthetic unit.⁴ The skin is almost fixed to the frontal muscle, the skin expansibility in relation to the relaxed skin tension lines⁵ is limited; consequently, an undesired brow lifting is commonly seen after a side-to-side advancement after an extended fusiform excision. An alternative is a vertical line incision against the relaxed skin tension lines. Independent of the approach, the brow symmetry is often compromised.

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In the present article, we propose the FIT for brow repositioning in reconstructive surgery, providing insight into the versatility of an established aesthetic procedure. It is the first time in the literature that this technique is presented in reconstructive surgery.

METHODS

Surgical Steps Toward the FIT

The surgery is planned with the patient in a sitting position. To achieve brow symmetry and for better orientation, a horizontal line through the highest point of the untreated brow is drawn (Fig. 1B), and the new position of the opposite brow is marked with an additional 2-mm margin, as the lifted brow skin tends to relapse over time. The operation is performed with loupe magnification. The incisions are bevelled with an angle of about 20 degrees in relation to the skin (Fig. 2). The lower incision is placed inside the brow so that the upper 2 rows of hair are included. This is important and ensures that brow hair can regrow through the scar. The upper incision lies on the supraorbital skin and is also bevelled at 20° with reference to the skin surface (Fig. 3).

At the bottom, the dermis is completely transected, and then dissection is continued 1–2 cm into the subdermal plane toward the forehead cranially and the brow

caudally. This maneuver releases the brow and surrounding tissues and ensures an inconspicuous scar during the healing process and reduces the risk of brow ptosis relapse. Meticulous hemostasis and rinsing with saline 0.9% is performed. Two deep resorbable sutures (Maxon, 5-0) grasp the periosteum to ensure tension-free margins, allowing collagen production during the healing process. This ultimately leads to a nearly invisible scar.⁶⁻⁸

Skin repair is performed with a nonresorbable 7-0 continuous suture (Prolene 7-0, Ethicon, Hamburg, Germany), ensuring an exact adaptation of the epidermal layers without any irregularity. The wound is cleaned with an antiseptic solution and then dried. The wound is covered with 12-mm tape strips (Steri-Strips; 3M, Minn.). On top of the Steri-Strips, a cotton wool dressing is applied to absorb any wound fluids during the following 12 hours. The outer dressing is removed the next day and the skin suture on the third day. New Steri-Strips are applied for a further week.

Clinical Study

A 62-year-old man presented with a lentigo maligna melanoma at his left forehead (Fig. 1A). A fusiform excision was performed with a safety margin of 0.5 cm. The defect was repaired by side-to-side subcutaneous advancement flaps and a small full-thickness skin graft (FTSG). As

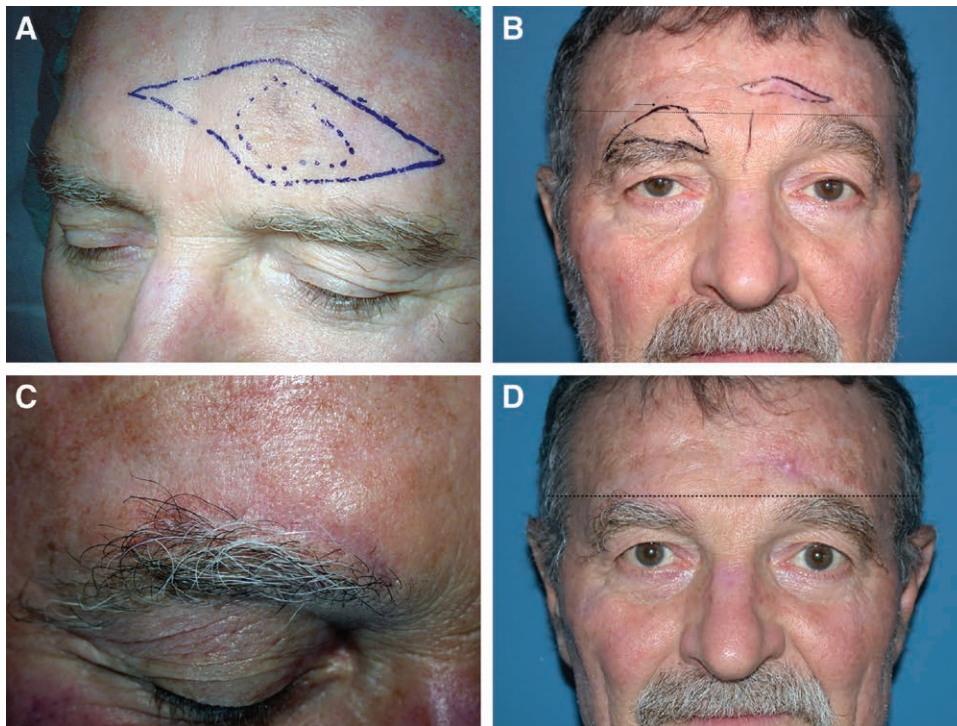


Fig. 1. A, A 62-year-old male with a lentigo maligna melanoma at his left forehead. Planning of the excision with a safety margin of 0.5 cm. B, Six months after the surgery with a remarkable brow asymmetry and unpleasant cosmetic result with FTSG. Planning of the brow lift at the right side with the resection of the FTSG. For better orientation, an imaginary horizontal line is drawn through the apex of the left brow, and the brow lift at the right side is planned with an overcorrection of about 2 mm. C, Five months after surgery: The scar is nearly inconspicuous and good regrowth of the brow hair through the scar is observed. D, After a final follow-up of 12 months: As the horizontal line shows, exact brow symmetry without a visible scar was achieved.

a result of the extended skin dissection into the direction of the supraorbital region on the left side brow cranialization was observed and was still visible 6 months after surgery (Fig. 1B). To overcome this, an FIT was performed on the healthy sagged right brow for repositioning in reference to the lifted side. The FTSG was excised and the primary closure was uneventful. One year after surgery, the patient presented with excellent brow symmetry and a nearly invisible scar (Fig. 1C, D).

DISCUSSION

Brow scarring, loss of brow fullness and brow distortion markedly deteriorate facial appearance. Furthermore, scar symptoms such as pain, tenderness, and itching have

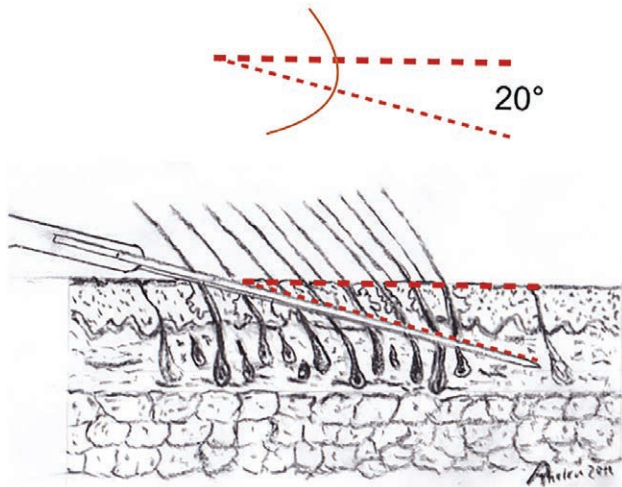


Fig. 2. Anatomical perspective of the skin with dermis and hair follicles. Flat incision with an angle 20° to the skin surface, cutting the hair shafts and preserving the hair follicles.

a negative impact on overall quality of life.⁹ The proposed 20° bevelled skin incision, camouflaged into the brow, showed to be a valuable maneuver in terms of scar quality and also showed to be a viable option for brow repositioning in reconstructive surgery.

There are many factors that must be taken into consideration to analyze the reason for an unpleasant hypertrophic scar in the face. Skin type and racial differences influence the pattern of wound healing. The dark skin is more predisposed to produce a hypertrophic scar. Wound healing is delayed in smokers among other systemic factors. Nevertheless, the surgical technique is the most striking prerequisite for a successful wound healing.^{7,8,10,11} The use of proper surgical techniques, which ensure minimal tension and inflammation, can lead to better cosmetic result.¹¹ Furthermore, the larger excisional wounds may stimulate the formation of myofibroblasts in the wound, resulting in scar formation.¹¹⁻¹³ Camirand and Doucet¹ introduced in 1997 a 45° bevelled incision technique for the hair-bearing skin in face-lift procedures. This approach achieved a better hair regrowth through the scar. For several years, the first author used this technique for direct brow aesthetic surgery. However, the scar often remained visible with insufficient regrowth of brow hair. To improve the brow scar quality, a flat skin incision up to 20° was adopted. The rationale was to shorten the distance of hair to grow throughout a thin bevelled wound edge. Moreover, it was observed that not only was the regrowth of brow hair much better but also the quality of the resulting scar markedly improved, even in high-risk patients. The author's clinical experience is that 20° beveling of the incision is the minimum angle that can be performed to avoid skin necrosis. So far, it is the maximum increase of the dermal surface in the wound edges compared with the standard vertical skin incision. An angle larger than 20° would re-

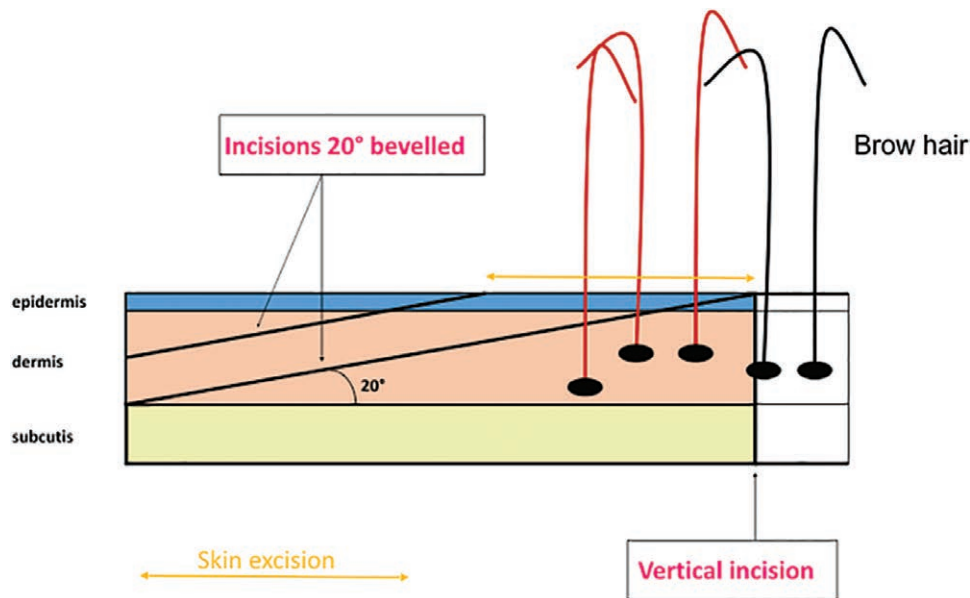


Fig. 3. The “flat incision” with a 20° angle to the skin surface enhances the surface area of the dermal layer by more than a factor of 2 compared with the standard vertical incision. More hair follicles are preserved for the later regrowth.

duce the possible size of the dermal wound layers. A first clinical study with 38 patients for direct brow lifts for aesthetic reasons showed a fine and nearly invisible scar.² Those results were confirmed in a second clinical study with 18 patients after brow reduction and repositioning in aesthetic surgery.³

Herein, we present now the first patient using the FIT in reconstructive surgery.

Hypothesis for Better Scarring by Using a 20° Bevelled Incision

The scar mainly develops in the collagen-rich dermal layer, the most important substrate of wound healing. By beveling the skin incision about 20° in relation to the skin, the surface area of dermal layer is increased by a factor of 2 compared with the standard vertical skin incision at 90° (Fig. 3). In the dermal layer, the fibroblasts and extracellular matrix play an important role in the wound healing process.^{14–20} The degree of dermal loss determines the natural process of wound healing. Experimentally, it could be demonstrated that scar development is strongly related to the number of fibroblasts in the dermal layer. The higher the number of fibroblasts, the lesser was the scar formation.¹⁵ In this context, the amount of dermis in a wound seems to correlate with the scar formation. The higher the amount of dermis, the lesser was the scar formation.^{16,17,21}

The 3-dimensional structure of the dermis defines the behavior of reparative cells.^{21,22} The dermal tissue's integrity and continuity is a prerequisite for skin repair. Loss of the dermal tissue integrity and continuity due to trauma hinders the recovery of cell migration and function, resulting in a more prominent scar formation.²¹ In recent studies, the special characteristics of the microfibrils of the extracellular matrix were examined, and both structural and regulatory properties to load-bearing connective tissues were reported.^{20,23} Thus, it appears reasonable that with the increased surface area of the dermal layers in the wound edges, the wound heals faster and also has the ability to resist more tension.

Compared with other skin areas in the body, the vascularization of the facial skin is stronger; this is especially true for the forehead, which is vascularized through branches of the ophthalmic artery (internal carotid) and temporal artery (external carotid). Furthermore, in reference to the brow, the dense intra- and subdermal arterial plexus^{24–26} allows a thin dermal preparation without the risk of necrosis.

CONCLUSIONS

The bevelled incision at 20° for brow repositioning and reshaping is a viable and predictable procedure in aesthetic surgery as reported previously. Herein, the procedure is also proposed for brow repositioning in reconstructive surgery.

Because brow deformation is not an uncommon result after reconstructive surgery of the forehead, the proposed technique resolves undesired results and provides the versatility of brow repositioning while the produced scars are

almost imperceptible. Enhancement of the dermal layer through the bevelled incision potentially promotes wound healing.

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