

# Outcome of Beveled versus Vertical Incision Technique after Reconstructive or Aesthetic Facial Surgery

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**Background:** We suggest that the degree of scar improvement with a beveled incision technique with an angle of about 20 degrees to the skin can be translated for various reconstructions on the face and can be verified by a validated clinical assessment scale and histology.

**Methods:** A total of 5 patients (2 men and 3 women) with a mean age of 68 years (range 54–84 years) undergoing elective surgeries on the face for tumor excision or cosmetic procedures were included. The beveled incision technique was compared with the conventional vertical incision (control group). Outcome measures were major and minor complications, pain and scar quality using the Patient and Observer Scar Assessment Scale, and histomorphologic scar assessment.

**Results:** After a mean follow-up of 7.6 months (range 6–13 months), all patients healed uneventfully without pain, hypertrophic scars, or infection. We found a better overall Patient and Observer Scar Assessment Scale score in the beveled incision technique group ( $15 \pm 3.4$ ) compared with the conventional vertical incision group ( $18.4 \pm 7.8$ ,  $P = 0.7$ ). Histomorphologic analyses showed after 6 months less scar zone, less inflammatory reaction, fewer macrophages, less foreign body reaction, and more hair follicles in the beveled incision technique group compared with the vertical incision group.

**Conclusion:** We showed that the beveled incision technique using a 20-degree angle in elective surgeries on the face yields a cosmetic pleasant result for both the patient and the surgeon, which also goes in line with our histomorphologic analyses. (*Plast Reconstr Surg Glob Open* 2019;7:e2286; doi: 10.1097/GOX.0000000000002286; Published online 23 May 2019.)

## INTRODUCTION

Poorly placed incisions are easily seen.<sup>1</sup> We recently developed a surgical technique which has a finer scar and preserves hair growth, even in high-risk patients.<sup>2</sup> Hereby, we applied a technique with the 45-degree beveled skin incision. However, the scar often remained visible with insuffi-

cient regrowth of the brow hairs. We further refined this technique and flattened the incision angle to about 20 degrees. The regrowth of brow hairs through the scars was much better, and the resulting scars developed much finer.<sup>2</sup>

We suggest that the degree of scar improvement with a beveled incision technique can be translated for various reconstructions on the face and can be verified by a validated clinical assessment scale [Patient and Observer Scar Assessment Scale (POSAS)]<sup>3</sup> and correlates with histologic results.<sup>2</sup>

## METHODS

The local ethical committee approved the study in accordance with the ethical standards of the Declaration of Helsinki (Ref Nr: 2016-01146). Patients with written informed consent and undergoing elective surgeries on the face for defect reconstruction after tumor excision and cosmetic procedures (eg, direct browlift and face-lift) including in hair-bearing areas were included. The exclusion criteria were as follows: smokers (>5 cigarettes

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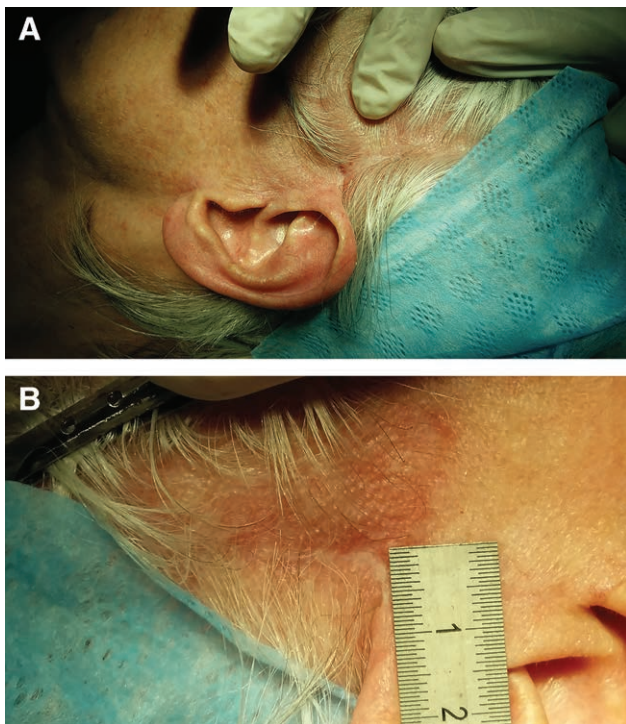
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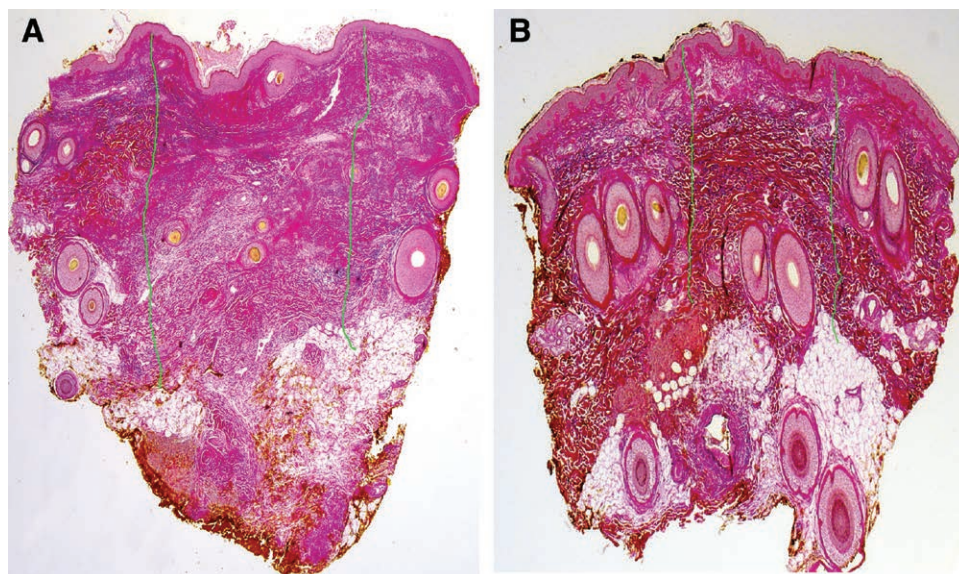


**Fig. 1.** Representative image of a 71-year-old female patient 7 months after a facelift using a vertical incision technique (A) and beveled incision technique (B).

per day); age <18 and >90 years; pregnant/lactating women; inability to follow the procedures of the study, due to language problems, psychological disorders, and dementia; Fitzpatrick types IV–VI; Asian; and denial of scar massage/sun protection after the surgery.

A total of 5 white and otherwise healthy patients (2 male patients and 3 female patients) with a mean age of 68 years (range 54–84 years) were included (facelift 3 and tumor excision 2). The surgical site involving only one side of the face (tumor excision) was divided into the following 2 parts: the incision beveled 20 degrees as previously described<sup>4</sup> and the conventional vertical one. In patients undergoing a facelift procedure, one technique was used on each side of the face. Randomization was performed by sequentially numbered, sealed, opaque envelopes. Wound closure was carried out using single subcuticular 5/0 absorbable monofilament (Biosyn, US Surgical) and single cuticular nonabsorbable (Prolene; Ethicon Inc., Menio Park, Calif., USA) sutures.

Outcome measures were major and minor complications, pain and scar quality using POSAS, and histomorphologic scar assessment by elastin staining and hematoxylin and eosin staining, as evaluated by one instructed and independent assessor. The POSAS consists of the following 2 numeric scales: the Observer Scar Assessment Scale (OSAS) and Patient Scar Assessment Scale (PSAS). The OSAS score ranges from 6 (normal skin) to 60 (worst scar imaginable), whereas the PSAS score ranges from 6 (normal skin) to 60 (very different to normal skin).<sup>3</sup> The scars were evaluated at final follow-up. Six months after surgery, a biopsy of the scar was taken on both operated sides in the hair-bearing area. The biopsy of the scars was evaluated and compared with the normal skin using a standardized histological score (0–10), including collagen fiber alignment, maturity and density of the papillar and reticular dermis, alpha-SMA (smooth muscle actin) expression in fibroblastic cells of connective tissue, and elastic fibers and collagen fibers of the dermis. One point was assigned for each category in the presence



**Fig. 2.** Representative histology of a 54-year-old female patient six months after facelift using a vertical incision on the left side (A) and beveled incision technique on the right side (B). Notice the epidermal inversion and wide dermal scarring in the vertical incision compared to the beveled incision technique, showing a reduced scar zone, less inflammatory reaction, fewer macrophages, less foreign body reaction and more hair follicles.





**Fig. 3.** Representative image of a 66-year-old male patient six months after tumor excision on the left temporal region using the beveled incision technique anteriorly (white asterisk) and the vertical incision posteriorly (double white asterisk), showing a better cosmetic outcome using the beveled incision technique.

of a normal finding, whereas an abnormal finding was assigned a score of 0.<sup>5</sup>

#### Statistical Analysis

The values are shown as the mean and SD/standard error of mean or median and range where appropriate. Patient responses to the POSAS and histology analyses were compared between the control group and the study group using the unpaired two-tailed Student's *t*-test. Statistical significance was determined by a value of  $P \leq 0.05$ . Analyses were performed using GraphPad Prism version 5.00 for Windows (GraphPad Software; GraphPad, San Diego, Calif., USA).

### RESULTS

After a mean follow-up of 7 months (range 6–13 months), all patients healed uneventfully without pain, hypertrophic scars, or infection. The mean surgery time (average amount of time of the entire case) was 100 minutes (range 20–150 minutes). We found a better overall

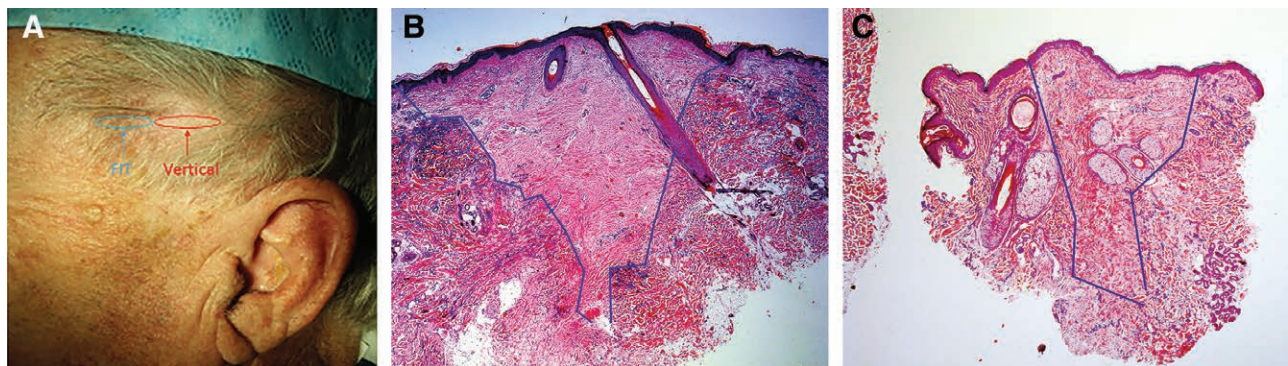
POSAS score in the beveled incision technique group ( $15 \pm 3.4$ ) compared with the conventional vertical incision group ( $18.4 \pm 7.8$ ,  $P = 0.7$ ). Both the OSAS and PSAS were better in the beveled incision technique group compared with the vertical incision group ( $7.4 \pm 2.3$  and  $8.8 \pm 3.3$ ,  $P = 0.52$ ;  $7.6 \pm 1.5$  and  $9.6 \pm 4.8$ ,  $P = 0.76$ ) (Figs. 1–3). These results go in line with our histomorphologic findings (Fig. 2 & 4), showing epidermal inversion and wide dermal scarring in the vertical incision technique whereas less loss of elastic lamellas and scar zone, less inflammatory reaction, fewer macrophages, less foreign body reaction, and more hair follicles in the beveled incision technique. The mean score was 7.2 (range 6–10) in the beveled incision technique group compared with 6.2 (range 6–7) in the vertical incision group ( $P = 0.22$ ) (Table 1).

### DISCUSSION

The negative impact of scarring (eg, pain and tenderness) can be a source of considerable distress, loss of self-esteem, and stigmatization.<sup>6</sup> The final appearance and function of the healed skin are dependent on patient and wound factors, which are usually outside the control of a surgeon. Another important part for the final scar appearance is the technique, which is within the control of the surgeon and includes technique of skin apposition and closure material.<sup>6</sup> Consequently, it is most important to improve the technical factors to achieve the most acceptable and pleasant scar for the patient.

To the best of our knowledge, the scar improvement in beveled incision technique using a beveled incision of 20° compared with the standard vertical incision technique was not studied and quantified yet. We showed that a remarkable scar improvement is verified by a clinical assessment scale and a histomorphological scar score using established and validated assessment tools.<sup>7–9</sup>

Our results go in line with a recently published systematic review.<sup>10</sup> All studies concluded that the use of a beveled angle incision improved the cosmetic outcome, with the ideal angle ranging from 10 to 45 degrees.<sup>10</sup> Possible explanations for the better and denser regrowth of hair using a beveled incision with 20 degrees are as follows: re-



**Fig. 4.** 84-year-old male patient six months after tumor excision on the left temporal region using the beveled incision technique anteriorly and the vertical incision posteriorly (A). The corresponding histology showed a wide dermal scarring in the vertical incision (B) compared to the beveled incision technique (C).

TABLE 1. Patient Demographics and Outcome

Patient (Sex/ Age)	Surgery Time (Minutes)	Follow-up (Months)	Compli- cations	Surgery	OSAS		PSAS		POSAS		Histology	
					FIT	Vertical	FIT	Vertical	FIT	Vertical	FIT	Vertical
F/66	150	13	None	Facelift	9	8	9	9	18	17	6	6
F/71	150	7	None	Facelift	8	6	6	7	14	13	10	6
F/54	150	6	None	Facelift	10	14	9	18	19	32	7	6
M/66	20	6	None	Tumor	5	10	6	6	11	16	7	7
M/84	30	6	None	Tumor excision excision	5	6	8	8	13	14	6	6

F, female; FIT, flat incision technique; M, male.

duced distance for the regrowing hair to reach the skin surface; with the flattening of the incision, more hair follicles are saved; and the dermal overlay area is increased by a factor of more than 2 compared with the standard vertical skin incision (90 degrees),<sup>11</sup> stimulating the formation of myofibroblasts in the wound.<sup>12,13</sup>

Our study has different limitations, such as limited sample size with a relatively short follow-up period and a lack of homogeneity. Therefore, more observational and large-scale studies should be conducted and evaluated by 2 independent assessors with a long-term follow-up of at least 12 months to confirm our findings.

## CONCLUSIONS

The beveled incision technique with a beveled angle of 20 degrees in elective surgeries on the face yields a cosmetic pleasant result for both the patient and the surgeon, which also goes in line with our histomorphologic analyses.

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