




Dermal Steal Technique: A Single-Surgeon Retrospective Evaluation of Aesthetic Outcomes of Beveled versus Conventional Perpendicular Skin Incisions

Manoj Khanna¹ Sourabh Shankar Chakraborty²

¹ Enhance Clinics, Kolkata, West Bengal, India

² Department of Burns and Plastic Surgery, All India Institute of Medical Sciences, Kalyani, West Bengal, India

Indian J Plast Surg

Address for correspondence Dr. Sourabh Shankar Chakraborty, MBBS, DNB (ENT), MCh (Plastic), MNAMS, Assistant Professor, Department of Burns and Plastic Surgery, All India Institute of Medical Sciences, Kalyani 741245, West Bengal, India (e-mail: sourabh.chakraborty86@gmail.com).

Abstract

Background Beveled skin incision was proposed 30 years back to improve scar outcome. But we could not find any existing literature that studied the outcomes of beveled excision in a non-hair-bearing skin objectively.

Methods Twenty-eight patients undergoing skin excision during various aesthetic procedures were divided equally into two groups. In group I patients, both the apposing edges of skin had beveled incisions, while in group II conventional 90-degree incisions were given. The scar outcomes were measured using Patient and Observer Scar Assessment Scale v 2.0/EN (POSAS 2.0).

Results The means of the total score of the patient scale of POSAS had a statistically significant difference ($p = 0.012$) between the two groups, so had the means of the observer scale ($p = 0.048$). The difference in scores between overall patient opinion in the two groups was statistically significant ($p = 0.0119$); however, it was not significant in the overall observer opinion ($p = 0.405$).

Conclusion The beveled incision group had a better scar outcome than the perpendicular incision group.

Keywords

- ▶ dermal steal
- ▶ dermal show
- ▶ beveled incision
- ▶ perpendicular incision
- ▶ scar
- ▶ POSAS 2.0

Introduction

Scars are the telltale signs of a human body's surgical history. They are the inevitable result of all surgeries, howsoever fine or microscopic. Their existence, however, has always been undesirable, especially in aesthetic plastic surgery. Various methods have been devised over time to achieve the same, namely, minimally invasive techniques, suturing techniques, incision placement, closure methods, and so on, to achieve aesthetically pleasing scars. One of them is the use of a

beveled angle incision. Rather than incising at a 90-degree angle, perpendicular to the skin surface, the scalpel has a more acute angle in relation to the surface of the skin, that is, less than 90 degrees.

The first mention of beveled incision was made in 1983 by J.R. Lewis¹ in his discussion of the brow lift technique. Rather than the conventionally used 90-degree angle, he described a horizontal incision over the brow as being more aesthetically effective. Since then, multiple theories have been proposed regarding the benefit of a beveled angle incision, including

DOI <https://doi.org/10.1055/s-0044-1787566>.
ISSN 0970-0358.

© 2024. Association of Plastic Surgeons of India. All rights reserved. This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)
Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

but not limited to better edge apposition, improved wound healing, reduced scar width, and increased scar strength.² However, studies investigating these claims are scarce.

In their systematic review, Brown et al² reported that the use of a beveled angle incision improved aesthetic outcomes, with ideal angle ranging from 10 to 45 degrees. However, their discussion was limited to using a beveled angle on hair-containing skin only.

The standard incisions given in most of the surgeries are perpendicular to the skin. The epidermis and dermis are cut at the same vertical line, perpendicular to the skin. In case of surgeries involving resection of excess skin and tissue, the same incision is given on both sides of the excised skin. In order to get a finer linear scar, the dermis from either side of the wound margin needs to be firmly approximated and to decrease tension on the epidermis. This requires deep bites in the dermis below the wound margin, which is not adequate at times.

After extensive literature review, we could not find any study in which beveled incision had been given while excision of the skin and the aesthetic outcome evaluation of the scar had been done. We therefore developed a novel skin excision technique in which beveling is done toward the center of the wound, on either side of the wound margin. The incision is given angulated toward the center of the excised tissue, so that the dermis underneath the excised skin is deficient. The excision of skin is carried out in such a way that the epidermis and the dermis are cut at different angles and an “excess” of dermis is present on both the remaining skin margins (–Fig. 1). This “excess” dermis is excised in a perpendicular incision and discarded. We preferred to call this technique the “dermal steal technique” as we are robbing the dermis from the excised skin to provide increased strength to the closure of the approximated margins.

Our primary objective was to determine the aesthetic outcome of scar in follow-up, following primary closure of the excised skin margins, in cases of either beveled or perpendicular skin incisions made at the apposing edges of the excised skin. Our secondary objective was to compare the outcomes of both groups of skin incisions. We hypothesized

that there will not be any statistically significant difference between the aesthetic outcomes of the two groups.

Methods

Study Design and Participants

We conducted a retrospective, single-surgeon study on 28 patients treated with reduction mammoplasty, abdominoplasty, etc., from 2017 to 2021. Any patient younger than 18 years or older than 50 years, having comorbid conditions such as connective tissue disease and malnutrition, those undergoing anticoagulant therapy, or those refusing to participate in the study were all excluded. Data were collected from all the records of all these patients, including name, age, sex, diagnosis, date and name of surgery performed, type of incision, number of days of hospital stay, any comorbidities, number of days after which the patient achieved routine activities, and any complications in the postoperative period. They were divided into two groups of patients. Group I comprised 14 patients, in whom beveled incisions were given along both the excised margins of the skin, while in group II, comprising 14 patients, perpendicular incisions were given in parallel.

Prior Intervention

Beveled incisions were made using a no. 15 scalpel blade at an angle of 10 to 30 degrees, beveling toward the center of the skin that has to be excised. This edge is devoid of epidermis and therefore creates a 1- to 2-mm show of dermis beyond the incised skin margin. These dermal flaps were approximated (–Fig. 2; –Supplementary Videos 1 and 2). Standard perpendicular incisions were made by keeping the no. 15 blade at 90 degrees to the skin surface. Minimum use of bipolar cautery to achieve hemostasis was done along the incised margins. In all the cases, closure was done in three layers, intermittent subdermal followed by continuous subcuticular sutures (using absorbable sutures) and finally intermittent simple sutures (using nonabsorbable sutures). The same protocol for scar massage, silicone gel sheet application, and avoiding direct sunlight was followed by

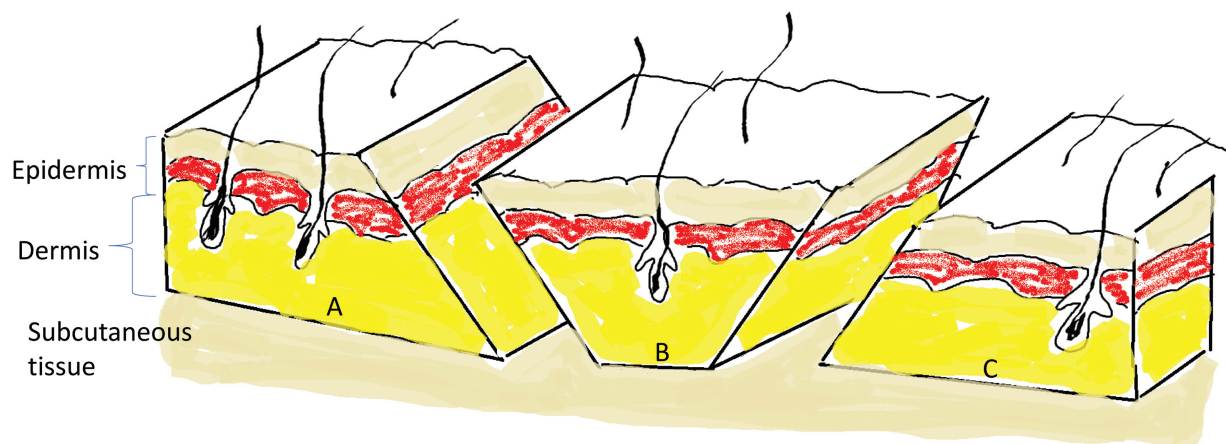


Fig. 1 Schematic diagram showing the dermal steal technique. Segment B will be excised, while segments A and C have extra dermal show, and will be approximated together.



Fig. 2 Dermal steal technique. (A) Beveled skin incision in abdominoplasty where dermal show is seen along the edge of the lower skin and stealing dermis from the skin to be excised. (B) Beveled incision in breast reduction with the dermal show along the margin of the right-side skin.

Supplementary Video 1

Video showing the beveled incision technique during abdominoplasty with distinct dermal show of the lower skin. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/>.

Supplementary Video 2

Video showing the dermal steal technique during breast reduction, and dermal show is present along the incised margins. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/>.

all the patients. All these steps ensured that any bias due to various confounding factors of primary wound healing is ruled out.

Outcome Assessment

At follow-up all, these patients were called upon and interviewed and their scars were examined. The parameter used was the Patient and Observer Scar Assessment Scale v 2.0/ EN (POSAS 2.0) (► **Supplementary Fig. 1**, available in the online version). Neither the patients nor the observer knew how incisions were given along the parallel skin margins to ensure a rigorous double-blinding. Informed consent was obtained from all the patients to enroll in this study. The study was approved by Institutional Ethical Committee (IEC no. IEC/AIIMS/Kalyani/Meeting/2023/109). All the data were recorded in Microsoft Excel sheet.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 23. Nominal data were described using frequencies and percentages. Continuous data were described using mean and standard deviation and compared between the two groups using paired *t*-test. A *p*-value of less than 0.05 was considered significant.

Result

Fourteen patients were enrolled in each group (beveled and perpendicular incision group). Both the groups had 13 females and 1 male patient. The mean age of the patients in groups I and II was 36.1 and 36.7 years, respectively. In total, four patients gave a history of addiction to alcohol or smoking (2 in each group). Two patients had diabetes, while three had hypothyroidism in group I. In group II, two patients were hypertensive, while only one was diabetic. The most common procedure performed in each group was breast reduction: six (43%) and nine (64%) in groups I and II, respectively. The mean duration of follow-up in group I was 31.4 ± 20.4 months, while in group II it was 64.2 ± 6.9 months ($p = 0.0003$). The mean duration of stay in the hospital in the two groups was 2.07 ± 0.62 and 2.07 ± 0.73 days, respectively ($p = 1.000$). The mean time to return to normal work following surgery was 4.14 ± 2.93 weeks in group I and 4.43 ± 3.37 weeks in group II ($p = 0.785$). None of the patients reported any post-operative significant complications necessitating hospital admission or reoperation. The means of the total score of the patient scale of POSAS 2.0 in groups I and II were 10.1 ± 5.7 and 15.8 ± 4.9 , respectively ($p = 0.012$), while those of the observer scale of POSAS 2.0 were 10.4 ± 6.1 and 14.8 ± 4.8 , respectively ($p = 0.048$). The means of the overall patient opinion of POSAS 2.0 in groups I and II were 1.64 ± 0.93 and 3 ± 1.18 , respectively ($p = 0.0119$), while the means of the overall observer opinion were 123.29 ± 1.68 and 2.79 ± 1.19 , respectively ($p = 0.405$).



Fig. 3 Follow-up results of the beveled skin incision technique. (A) Preoperative picture of breasts. (B) Follow-up picture of breast following reduction. Vertical scar of (C) right and (D) left breasts.

Discussion

It is well established that wound healing requires fibroblasts and growth factors, which are in greater concentration in the dermis of the skin compared to the epidermis. The more the fibroblasts in the wound bed, the more rapid and effective the wound healing, hence the greater the scar strength, with decreased scar widening and improved cosmetic outcomes.³ Since, scars develop mainly in the collagen-rich dermal layer, increasing the surface area of the dermal layers available during closure should theoretically recruit more fibroblasts and growth factors in the wound bed, leading to a finer scar than that achieved with other methods.⁴ This can be achieved by giving beveled incisions on both sides of the skin to be excised, ensuring that the amount of dermis removed is less than the epidermis on either side.⁴

In a double-blinded study, Camirand and Doucet⁵ statistically proved that a 30- to 45-degree beveled incision (incising perpendicular to the hair shaft) was aesthetically superior than incisions made parallel to the hair follicles. The scar obtained following beveled incision for frontal and face lifts was better in terms of invisibility, hair growth through scar, and absence of hypopigmentation.

Shook et al⁶ proposed harvesting of full-thickness skin grafts using the 45-degree beveled edge technique. However, donor site cosmesis was not evaluated after primary closure.

In 2012, Feinendegen proposed that “flat” incisions with a 20-degree angle to the skin surface enhance the surface of the dermal layers by more than a factor of 2 compared with the standard 90-degree incision perpendicular to the skin surface. He obtained better cosmesis with this beveled incision in cases of brow lift in his two subsequent studies, producing imperceptible scar.

In their series of brow lifts using a 10- to 20-degree beveled incision perpendicular to hair follicles, Niamtu⁷

reported that no patient complained of problematic scar or a need to change their hairstyle.

However, in all these previous studies, beveled incisions were given only in hair-bearing skin. Moreover, no excision of the skin was performed, so the excess dermis for closure was available on the edge of the wound only.

Beroukhim et al⁸ advocated reverse beveling of the skin margins to improve wound edge apposition and achieve closure in an everted position. They suggested decreasing the contractile forces on the skin edges by beveling away from the center of the wound. Following buried dermal suture approximation, the superior wound edges would naturally fall in the everted position. They did not assess the outcome of the closure technique, which in our opinion would have resulted in increased tension in the dermal layer, which may or may not be sufficient to withstand dehiscence secondary to tissue giveaway.

To our knowledge, this is the first study in which beveled incision is given such that excess dermis is available during closure of apposing skin margins. This is the only study in which aesthetic outcomes of the scar following dermal steal technique and perpendicular incisions had been evaluated objectively. It is evident from our results that the beveled incision group of patients had statistically significant (3 out of 4 parameters in POSAS 2.0 scale) better scar outcomes than the perpendicular incision group (– Fig. 3). Morbidity in terms of the number of days of hospital stay and return to normal work was similar in the two groups, which is reflective of standardized surgical techniques used in both groups.

Even after our sincere efforts this study have certain limitations. Since the study was retrospective in nature, proper randomization could not be achieved. However, the surgeon did not report any bias regarding the selection of the patient for the type of incision. Recall bias could not be eliminated. A small group of patients had been allotted and evaluated in each group. Proper matching of cases and

control was not achieved. Confounding factors, namely, age of patients, type of the primary surgery, and addictions might have affected the follow-up scar scoring, which could not be accounted for. The follow-up duration was variable.

Conclusion

Our study has objectively demonstrated that during excision, beveling the margins of a surgical incision gives better cosmetic outcome than the standard perpendicular incision advocated in classic surgical teachings. This is applicable in all procedures where excision is done, including but not limited to breast reduction, abdominoplasty, scar revision, excision of lesions, facelift surgery, and umbilicoplasty.

Note

The poster presentation of this technique by the primary author won the silver medal in ISAPS Olympiad, 2023.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Patients' Consent

All participants have given their informed consent in writing prior to inclusion in the study. Identifying details

(names, dates of birth, identity numbers, and other information) of the participants have not been revealed in the article.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Lewis JR Jr. A method of direct eyebrow lift. *Ann Plast Surg* 1983; 10(02):115–119
- 2 Brown S, Mirmanesh M, Song P, Coombs D, Rengifo D, Pu LLQ. Beveled incisions: what is the evidence? *Aesthetic Plast Surg* 2018;42(03):743–747
- 3 Lamme EN, Van Leeuwen RT, Brandsma K, Van Marle J, Middelkoop E. Higher numbers of autologous fibroblasts in an artificial dermal substitute improve tissue regeneration and modulate scar tissue formation. *J Pathol* 2000;190(05):595–603
- 4 Feinendegen DL. The direct brow-lift using the flat incision technique. *Aesthetic Plast Surg* 2012;36(02):468–471
- 5 Camirand A, Doucet J. A comparison between parallel hairline incisions and perpendicular incisions when performing a face lift. *Plast Reconstr Surg* 1997;99(01):10–15
- 6 Shook BA, Peterson J, Wells MJ, Butler DF. The beveled edge technique for harvesting of full-thickness skin grafts. *Dermatol Surg* 2005;31(9, Pt 1):1128–1130
- 7 Niamtu J III. The subcutaneous brow- and forehead-lift: a face-lift for the forehead and brow. *Dermatol Surg* 2008;34(10):1350–1361, discussion 1362
- 8 Beroukhim K, Sklar LR, Eisen DB. Reverse beveling to improve wound edge apposition. *J Am Acad Dermatol* 2019;81(03):e63–e64