Blunt Blade Subcision: An Evolution in the Treatment of Atrophic Acne Scars

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BACKGROUND  Subcision is the mainstay of atrophic acne scar treatment but the efficacy and safety of the procedure is controversial.

OBJECTIVE  To improve the efficacy of the subcision procedure, a blunt subcision blade was designed and evaluated.

METHODS  Eighteen patients with bilateral atrophic acne scars considered eligible for subcision were enrolled. Before subcision, a tumescent solution was injected subdermally to anesthetize the treatment area and aid the dissection of the dermal-subcutaneous tissue. Patients underwent treatment using the blunt subcision blade, a long metal blade with gradually narrowing edges, and a rounded blunt tip. Early post-operative complications, overall aesthetic improvement and persistent discoloration, or lumpiness were assessed 7 days after subcision and at a 6-month follow-up visit.

RESULTS  Moderate to marked improvement of atrophic scars was observed in 15 cases (83.3%). Mild to moderate tenderness, periorbital ecchymoses, and swelling were reported by some patients, but resolved completely within 1 week after the procedure. No cases of persistent discoloration or lumpiness were observed at the final visit.

CONCLUSION  The blunt blade subcision procedure is suggested as an effective method for the treatment of atrophic acne scars.

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Acne vulgaris is one of the most prevalent diseases worldwide and a serious cause for concern as it can create significant levels of psychological distress in patients.1 Despite the advancement of laser and surgical resurfacing procedures, atrophic acne scars remain the Achilles’ heel of dermatologic surgery.2 The atrophic rolling scar results from surface skin tethering to the deep dermis through compact fibrous strands and the loss of underlying dermal connective tissue. According to the theory of Orentreich,3 releasing these fibrous strands can stimulate formation of new connective tissue during wound healing, resulting in smoother skin. This theory forms the basis of “subcutaneous incisionless surgery” or the “subcision” procedure.

Several methods have since been proposed to enhance the procedure’s clinical efficacy and to reduce complications and discomfort. Various instruments (such as Nokor and conventional needles, cataract blades, and wires) and techniques have been advocated but their effectiveness is in dispute.4–7 Moreover, subcision has lost overall popularity given the high risk of needlesticks for surgeons, moderate patient satisfaction, and the possibility of neurovascular injuries and also complications such as permanent discoloration.
The authors hypothesized that a blunt blade with a narrow rim can effectively replace the sharp instruments normally used in cutting anchoring fibers. The authors surmised that the use of a blunt blade to repair atrophic scars would have numerous advantages, such as reduced trauma to the facial neurovasculature and a reduced risk of needlesticks for surgeons. To the best of our knowledge, this is the first study to introduce a blunt instrument for the subcision of atrophic scars, and the technique is named “blunt blade subcision.”

Methods

Patients

From September 2012 to March 2013, 18 patients with atrophic facial acne scars referred to the Cosmetic Clinic of Shohada-e Tajrish Hospital were recruited to the study. Patients with moderate to severe bilateral atrophic facial (malar) acne scars, primarily of the rolling type according to the qualitative global acne scarring grading system,8 were enrolled. There were 11 female and 7 male patients, with a mean age of 25 years, ranging from 18 to 45 years.

Exclusion criteria included active nodulocystic acne, greater than 6 papules and pustules on each side of the face, active facial skin infection (herpes simplex infection, impetigo), hematologic or coagulopathy disorders, immunosuppression, dermatologic diseases that could interfere with the procedure, a history of keloid formation, taking medications that prolong bleeding time (especially aspirin, warfarin, or vitamin E), having undergone resurfacing procedures within 6 months before the study, pregnancy, and breastfeeding. A 12-month washout period was implemented after oral isotretinoin therapy.

All patients were fully informed about the project and signed an informed consent. The protocol was approved by the Institutional Review Board on Human Research of Laser Application in the Medical Sciences Research Center (Shahid Beheshti University of Medical Sciences) and conformed to the guidelines of the 1975 Declaration of Helsinki.

Preoperative Preparation

The cheek scarring area was determined by a dermatologist, in consultation with the patient, and outlined using a nontoxic surgical marker. The needle entrance point was marked 1 cm anterior/2 cm superior to the tragus.

Povidone–iodine was used for local disinfection and sterilization procedures were strictly observed. Patients were in a semisitting position to provide the dermatologist with the best view of the rolling scars.

A tumescent solution consisting of 50-mL 1% plain lidocaine, 1-mL 0.1% epinephrine, and 10-mL 8.4% sodium bicarbonate solution in 1-L normal saline was used for local anesthesia.9 The solution was injected subdermally with a 23-gauge needle. A total of 50 to 100 mL of the tumescent solution was injected at 4 to 7 sites on each side of the face. The image in Figure 1 was obtained immediately after tumescent solution injection. After the injections, subcision was delayed for 15 minutes to achieve maximum vasoconstriction and anesthetic effect.

Subcision Instrument

A “blunt subcision blade” was used for the subcision of atrophic acne scars. The instrument is a stainless steel blade in 2 different sizes (6-cm or 13-cm length, 1.5-mm width) (Figure 2). The blunt edges gradually taper to form 2 flat surfaces; however, the tool remains blunt and noncutting at the tip. The edges are constructed as narrowly as possible to enable the release of

Figure 1. Immediately after tumescent solution injection.
fibrous strands using only light sheering force. The instrument was designed to be blunt to prevent vessel laceration and nerve trauma during the subdermal maneuver.

The blade length allows distant scars in the area to be reached through 1 penetration site. The blade handle has a thumb depression on 1 side to ensure the blade is held correctly, with the flat surfaces being horizontal and the blunt edges lateral.

Subcision procedures were performed by a skilled dermatologist using an identical technique for each patient. An 18-gauge needle was used to puncture the prespecified entrance site of the blade (Figure 3). Previous injection of tumescent solution tightens the epidermis, so there was no need to pinch or stretch the skin. The blade was inserted approximately parallel to the skin, with the flat surface of the blade pointing upward and the tip lifting up the skin, as demonstrated in Figure 4. Up to three-fourths of the blade length could enter the skin and 1 entrance site was sufficient to access the farthest scars in the specified subcision area (Figure 5).

The blade was moved back and forth subdermally, with a horizontal fan-like motion, to release the fibrous strands within the entire scar area (Figure 6). The authors attempted to cut most of the fibrotic tissue in front of the blade. The blade was moved slowly with light sheering force to avoid neurovascular damage or perforation of the overlaying skin. Given that lateral motion and releasing force were not applied, some lateral resistance remained. The photograph in Figure 7 was taken immediately after subcision.

**Postoperative Care**

Petrolatum gauze with topical gentamycin was applied over the perforation site with light pressure and used to
simply dress the wound. Oral antibiotics or antivirals were used as individually indicated. Patients were informed about the possibility of substantial swelling within 48 hours of the procedure and slight tenderness within 2 weeks. To reduce facial edema, patients were recommended to sleep in a partial semisitting position for 2 nights. Although mild bleeding and transient bruising were expected, hematoma formation was not anticipated as major vascular injuries would be avoided using the blunt blade subcision procedure.

**Measurement of Outcomes**

Photographic documentation using an EOS 600D Canon camera (Canon Inc., Tokyo, Japan) was obtained at baseline and at the 1-week and 6-month follow-up visits after subcision. In each session, 3 photographs were taken of each patient and filed in a database.

Patients were evaluated 7 days after subcision to assess “early postoperative complications.” These were categorized as local pain/tenderness, swelling, and bruising and graded as mild, moderate, or severe. Using a physician visual analog scoring system, 2 independent dermatologists rated the patient’s “overall aesthetic improvement” based on a comparison between the baseline and 6-month follow-up visit photographs. The dermatologists evaluated the average change in the depth of atrophic acne scars using the following arbitrary scale: no change, mild improvement (1%–25%), moderate improvement (25%–75%), and marked improvement (>75%). At the last visit, any persistent discoloration or lumpiness were assessed as “late postoperative complications” and graded as limited, moderate, or extensive. Finally, a dermatologist (other than the surgeon) rated the patient’s overall satisfaction through a telephone conversation, which was recorded anonymously.

**Results**

Seven days after subcision, 7 patients (38.9%) complained of tenderness, but constant pain was not noted. Mild to moderate swelling was reported by 5 patients (27.8%); this figure was mainly reduced during the subsequent week. In addition, periorbital ecchymoses was observed in 3 patients (16.7%), primarily in cases with high levels of atrophic acne scar-ring in the malar region. Patients with early postoperative complications were evaluated 3 weeks later, and the ecchymoses or swelling was completely resolved (Table 1).

The investigators agreed on the marked improvement of atrophic acne scars in 9 cases (50%) and moderate improvement in 6 cases (33.3%) (Figures 8 and 9). However, 3 patients (16.7%) experienced only mild improvement within 6 months of the subcision procedure. No instances of persistent discoloration or lumpiness were observed at the final visit.

Twelve patients (66.7%) expressed high satisfaction with the results and 5 patients (27.8%) were
moderately satisfied whereas 1 subject (5.5%) noted no change after treatment.

Discussion

After acne vulgaris, formation of dense fibrous strands between the surface skin and the deep dermis and also the loss of dermal connective tissue results in atrophic rolling scar formation. Subcision, which severs these fibrotic strands and stimulates connective tissue formation, is the method of choice for the treatment of atrophic rolling scars.\(^{10,11}\)

Although different methods have been introduced for scar subcision, the results have been variable. In a study by Alam and colleagues,\(^4\) an average of 50% to 60% improvement in the appearance of the treated scar area was noted. Balighi and colleagues\(^{12}\) reported mild and moderate improvements in 70% and 30% of patients, respectively, whereas Vaishnani\(^{13}\) achieved an approximate 15% to 30% improvement after 1 treatment session.

Because scar redepression is a contributing factor to scar recurrence, Aalami Harandi and colleagues\(^{14}\) introduced repeated suctioning to increase hematoma formation as a complementary treatment after subcision, and a 43% to 74% improvement was noted depending on the suctioning protocol used. It was hypothesized that hematoma formation would prevent redepression of the treated scar by providing a suitable environment for enhanced connective tissue formation and correction of the defect. However, the subcision-suction method is significantly limited by serious complications such as hypertrophic scar formation due to hemorrhagic papules and pustules.

Various needles, cataract blades, and wires have been introduced with modifications in needle shape (e.g., 1 or 2 right angle folding) and device handling to enhance fibrous band release, improve device handling, and reduce side effects.\(^4,7,15-17\)

The tribeveled hypodermic needle (Nokor; Becton Dickinson, Franklin Lakes, NJ) is the most common device used to repair atrophic scars. The back-and-forth motion of the sharp triangular head releases fibrous strands; however, some complications have

<table>
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<th>No.</th>
<th>Symptom</th>
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<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
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<td>11</td>
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<td>2 (11.1%)</td>
<td>—</td>
<td>7 (38.9%)</td>
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<tr>
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<td>Swelling</td>
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<td>2 (11.1%)</td>
<td>—</td>
<td>5 (27.8%)</td>
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<tr>
<td>15</td>
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<td>1 (5.6%)</td>
<td>2 (11.1%)</td>
<td>—</td>
<td>3 (16.7%)</td>
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Table 1. Early Postoperative Complications in Patients After the Blunt Blade Subcision Procedure

Figure 8. A 26-year-old woman with atrophic acne scars treated with blunt blade subcision. Before treatment (A) and moderate improvement 6 months after the procedure (B).
been noted. The short Nokor needle makes it difficult to control horizontal movements. In addition, accidental vertical movements and the extremely sharp needle tip can damage deep neurovascular structures, particularly if the procedure is performed by a less experienced surgeon. Moreover, multiple needle entry sites for the 18-gauge needle are needed to cover the entire scar area (such as the malar region), potentially resulting in iatrogenic scars at needle puncture sites.

There is reluctance among surgeons and dermatologists to use this method given the high risk of needlestick because of the sharp needle tip and the necessity of manually pinching or stretching the skin in front of the needle.

Conventional hypodermic needles with gauges ranging from 18 to 27 are frequently used for superficial and deep dermal undermining. The difficulty of maintaining the needle in the transverse plane has prompted some surgeons to make use of a needle handle or to angulate the needle at 90 degrees; however, this is also associated with a considerable risk of needlestick for the surgeon.

To the best of the authors’ knowledge, this is the first study to report the use of a blunt blade to undermine atrophic acne scars. Moderate to marked improvement was observed in up to 83% of patients, which is comparable to previous studies using Nokor or conventional needles. It is noteworthy that other types of atrophic acne scars, such as deep boxcar and pitted scars, displayed partial leveling with this technique.

The side effects of blunt blade subcision were mild, transient, and well-tolerated. Facial edema was observed in most cases. This side effect was partially due to local tumescent injection and frequently resolved within 1 week. In some cases, local tenderness to the touch was noted, which could be the result of vigorous manipulation of the underlying connective tissues. However, the absence of constant pain or paresthesia is indicative of intact nerve fibers. In contrast, a few patients experienced mild ecchymoses, mainly in the periorbital area. Great caution should be exercised when undermining the upper part of the malar region. Nonetheless, because the surface skin remains intact and the risk of adverse effects is minimal, patient downtime is reduced resulting in a high patient satisfaction rate.

Although hematoma formation is the preferred subcision method of some surgeons, the risk of persistent discoloration, hemorrhagic papules, and hypertrophic scars limits its use. Moreover, the organization of the hematoma can result in an uneven surface, with numerous reports of persistent firm bumps appearing after the procedure. Therefore, the authors conclude that hematoma development, filler applications (e.g., naturally sourced porcine collagen) and subdermal implants (e.g., absorbable plain catgut suture) have a high-risk benefit ratio, without significant improvements in aesthetic results.

Injecting a high volume of tumescent solution before subcision can promote fibrous strand release in a process termed “hydrodissection,” a phenomenon.

Figure 9. A 28-year-old man with atrophic acne scars treated with blunt blade subcision. Before (A) and marked improvement 6 months after treatment (B).
previously used during mechanical liposuction for the correction of fat tissue deformities. The resulting mild dermal-subcutaneous separation allows for easier blade control during the horizontal blade maneuver and prevents deeper penetration, thereby reducing the risk of neurovascular injuries. In addition, tumescent solution injection results in widespread anesthesia, thus allowing patient pain and discomfort during the procedure to be controlled with a reduced amount of lidocaine.

The main advantage of blunt blade subcision is the reduced risk of needlestick during the rapid repetitive motion, which is of particular interest to surgeons. Moreover, this subcision technique is potentially less time consuming because the entire malar and mandibular regions accessible through 1 blade entry site.

Although the results seem promising, this pilot study is limited by low participant numbers and a lack of objective methods for outcome evaluation. Clinical trials with larger sample sizes and standardized methods of improvement evaluation would be helpful, to compare the efficacy of blunt blade subcision with other commonly used approaches.

In conclusion, this novel technique of subcutaneous undermining using a blunt subcision blade seems to be a safe and effective method for atrophic acne scar treatment. The technique is associated with a short recovery time and a low rate of serious complications. In addition, the technique’s simplicity and low cost could make it a suitable first step in the treatment of most cases of atrophic acne scars.

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References

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