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Improving the Appearance of Surgical Facial Scars With IncobotulinumtoxinA and Microneedling

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ABSTRACT

Background: The appearance of post-surgical scars on the face is a major concern for surgeons and a source of anxiety for patients after Mohs surgery due to nonmelanoma skin cancer (NMSC). The objective of this retrospective study was to assess the effectiveness of combining incobotulinumtoxinA and microneedling to improve the appearance of post-operative facial scars. Enrolled subjects underwent surgical removal of facial NMSCs followed by flap reconstruction by the same surgeon during 2014 (n=35) and 2015 (n=35). Sutures were removed 7 days after the procedure. Subjects treated during 2014 received no additional treatment and served as a control group. Subjects treated during 2015 also received micro-doses of incobotulinumtoxinA along the scar border and microneedling of the surgical area. Microneedling was repeated after 15 days. Scar severity was determined by the surgeon and an independent dermatologist using the modified Vancouver Scar Scale (VSS) scores on day 7 and day 30 following suture removal. Patient Satisfaction Scale scores were also determined using a 5-point scale on day 30. Mean (SD) VSS scores were 10.4 (1.14) on day 7 among treated subjects vs. 9.5 (1.88) among control subjects ($P<0.05$). On day 30, mean VSS scores had decreased to 1.1 (0.89) for treated subjects vs. 7.6 (1.72) for control subjects ($P<0.05$). Patient Satisfaction Scores were significantly higher among treated patients vs control subjects (4.45 vs 3.14; $P<0.001$). The use of incobotulinumtoxinA is a promising therapeutic option for improving scar appearance. Combined with microneedling, it significantly reduced VSS scores and improved overall satisfaction of treated subjects following surgery for NMSCs.

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INTRODUCTION

More than 80% of nonmelanoma skin cancers (NMSC) occur on the face[1] where the appearance of post-surgical scars is a major concern for surgeons and a source of anxiety for patients as they have a potential for a negative functional and social impact. While surgeon adherence with technical aspects of the procedure directly affect the final scar quality, local and genetic factors can also play a role in scar development.[2] Recognizing these mechanisms allows one to identify therapeutic opportunities to optimize appearance and functionality of the surgical area. Thus, various treatments and techniques have been proposed to improve the appearance of scars.[3] The objective of this study was to assess the combined effect of incobotulinumtoxinA and microneedling in improving post-operative facial scars.

MATERIALS AND METHODS

Study Subjects

This retrospective study enrolled otherwise healthy subjects who underwent surgical removal of facial NMSCs followed by flap reconstruction performed by the same surgeon during 2014 and 2015.

Treatment Protocol

During 2014, subjects who were treated with Mohs surgery for NMSC received no specific treatment after the procedure and served as a control group. During 2015, subjects were treated with Mohs surgery for NMSC and received a combined treatment of incobotulinumtoxinA (Xeomin®; Merz North America, Raleigh, NC) and microneedling (Dermapen®; FD Holdings LLC, Loveland, CO).

The excised NMSC lesions were primarily located on the forehead, nose and cheek and ranged from 2.0 to 4.0 cm in diameter. All subjects underwent facial skin flap reconstruction (ie, advancement, rotation, or transposition). Subsequently, subjects returned for suture removal on day 7. The 2014 subjects were instructed to wear sunscreen after suture removal but received no additional treatment. The 2015 subjects received 0.3 U incobotulinumtoxinA injected every 5 mm along both sides of the scar border. Scar length ranged from 2 to 12 cm, depending on the reconstruction. On post-surgery day 7, all subjects were treated with 20 passes of microneedling over the scars and their borders (2 mm, speed 70) with an endpoint of mild bleeding. Mi-

TABLE 1.

Modified Vancouver Scar Scale			
Pliability	**Height**	**Vascularity**	**Pigmentation**
0: normal	0: normal	0: normal	0: normal
1: supple	1: 1-2 mm	1: pink	1: hypopigmented
2: yielding	2: 3-4 mm	2: red	2: mixed
3: firm	3: 5-6 mm	3: purple	3: hyperpigmented
4: adherent	4: >6 mm	--	--

croneedling was repeated after 15 days. The 2015 subjects were also instructed to wear sunscreen after suture removal.

Treatment Evaluation

The modified Vancouver Scar Scale[4] (VSS) was used to evaluate treatment response. For each subject, scar scores could range from 0 (normal) to 14 (purple, hyperpigmented, adherent, >6 mm; Table 1). VSS scores in both groups were assessed on day 7 and day 30 after suture removal by the Mohs surgeon and an independent dermatologist. A Patient Satisfaction Scale was used to assess overall satisfaction with treatment outcomes on a scale of 1 (Very Unsatisfied) to 5 (Very Satisfied) on day 30.

Statistical Analysis

Pearson's chi-square test or Fisher's exact test was used to compare the categorical variables between the groups in the presence of expected values less than 5. To compare numerical variables between the groups, the Mann-Whitney test was used due to the absence of normal data distribution. The Wilcoxon test was used for related samples to compare the scores between the two evaluations in each group. To compare the numerical variables between groups and evaluations simultaneously, ANOVA for repeated measurements was used followed by the Tukey post hoc test for between-group comparisons, and the contrast profile test for comparison between the variables transformed into ranks due to the absence of normal distribution. For each test, $P<0.05$ was considered significant. Calculations were made with the SAS System for Windows, v. 9.2 (SAS Institute Inc., Cary, NC).

RESULTS

Each group included 35 subjects, all of whom complied with all study requirements and were evaluated on their scheduled days. On day 7 after treatment, mean (SD) VSS scores were 10.4 (1.14) among treated subjects vs 9.5 (1.88) among control subjects ($P<0.05$); however, on day 30, mean VSS scores had decreased to 1.1 (0.89) for treated subjects vs 7.6 (1.72) for control subjects ($P<0.05$). Changes in individual VSS variables are shown in Figure 1. The Patient Satisfaction Score was significantly higher among treated patients vs. control subjects (4.45 vs 3.14; $P<0.001$; Figure 2). Images of subjects immediately after surgery and 30 days post-treatment are shown in Figures 3 to 6.

FIGURES 1A-B. Changes in the components of the modified Vancouver Scar Scale on day 7 (A) and day 30 (B) following surgery. On day 30, the overall mean (SD) VSS scores had decreased to 1.1 (0.89) for treated subjects vs. 7.6 (1.72) for control subjects ($P<0.05$).

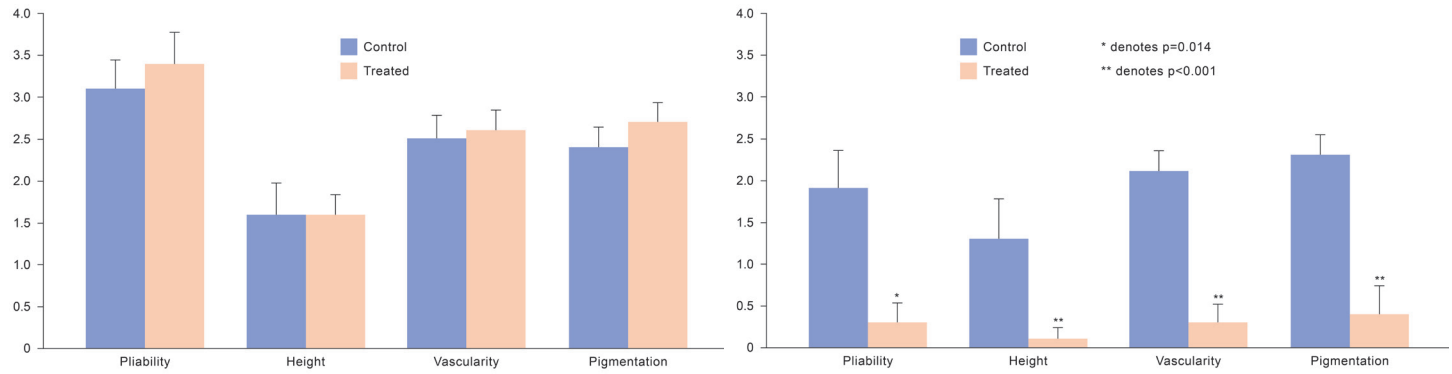


FIGURE 2. Comparison of Patient Satisfaction Scores for control subjects (left) and treated subjects (right). Patient Satisfaction Score was significantly higher among treated patients vs. control subjects (4.45 vs. 3.14; *P*<0.001)

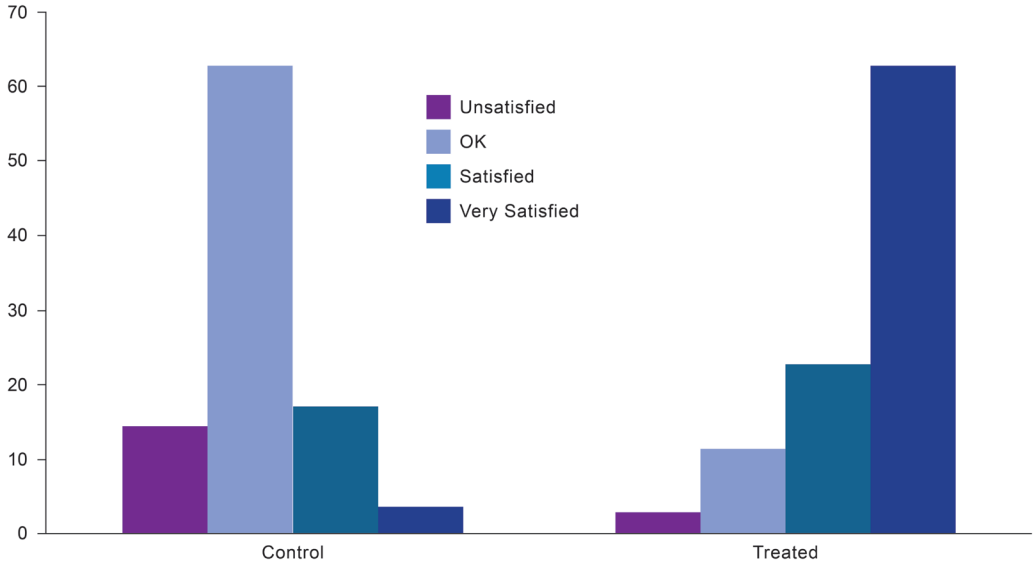


FIGURE 3A-D. Treated subject on day 7 (A and B) and day 30 (C and D) following surgery.

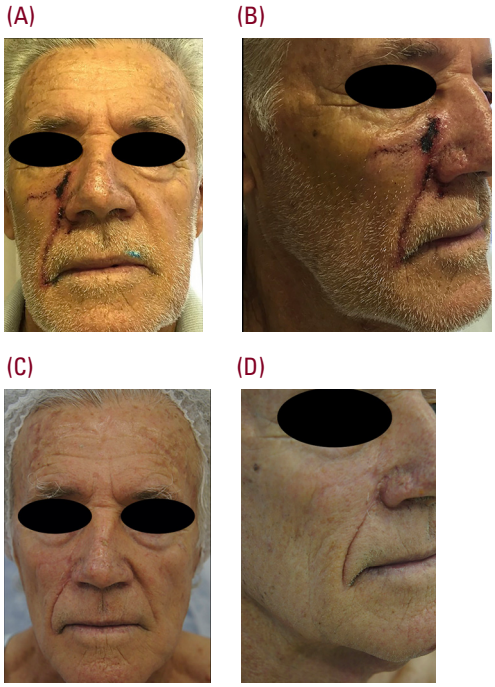


FIGURE 4A-D. Treated subject on day 7 (A and B) and day 30 (C and D) following surgery.

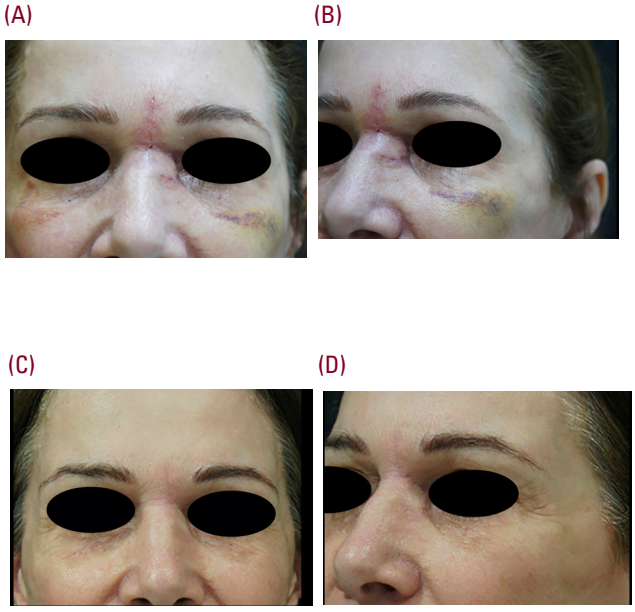


FIGURE 5A-B. Treated subject on day 7 (A) and day 30 (B) following surgery.

(A) (B)

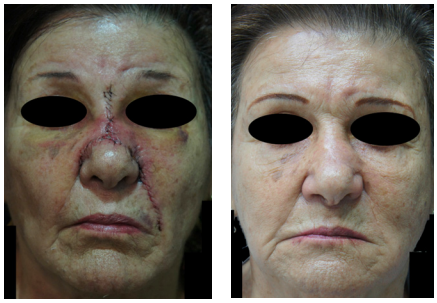


FIGURE 6A-B. Treated subject on day 7 (A) and day 30 (B) following surgery.

(A) (B)

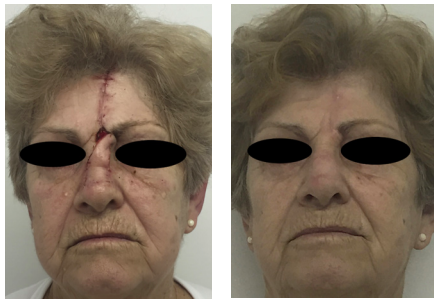
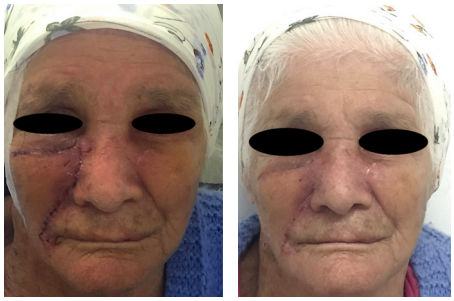


FIGURE 7A-B. Non-treated subject on day 7 (A) and day 30 (B) following surgery.

(A) (B)



DISCUSSION

Since the face is the location for the majority of NMSCs,[1] the appearance of postsurgical scars are a significant concern when Mohs surgeons plan their interventions. This applies not only to aesthetic appearance, but also to potential functional impact. We showed the use of incobotulinumtoxinA 7 days post-surgically with microneedling significantly improved the appearance of facial scars.

Previous studies have demonstrated the ability of postoperative incobotulinumtoxinA monotherapy to reduce scar severity in animal models[5] and clinically when used pre-surgically,[6] and post-surgically immediately following wound closure.[7,8]

In some anatomic areas, incobotulinumtoxinA aids wound healing by reducing the tensile force of muscles on wound borders.[7,9] The beneficial effects of incobotulinumtoxinA on scar formation also appear to be the result of its ability to inhibit fibroblast proliferation,[10,11] transform growth factor expression[10] and decrease collagen deposition.[12]

Microneedling has previously been shown to improve the appearance of atrophic acne scars[13,14] and stabilized burn scars.[15-18] Based on VSS and Visual Analogue Scale scores, treated subjects rated mean improvement in burn scar appearance by a mean of ≥80%.[16] Examination of treated tissue revealed these improvements are associated with substantial scar tissue modeling.[16,18] Microneedling has also been shown to decrease burn scar erythema by 55%.[19]

To our knowledge, this is the only published experience with combined treatment of incobotulinumtoxinA and microneedling for treating post-surgical scars, although a weakness of the study is its retrospective nature. Additional studies are needed to determine the relative contribution of each intervention on scar appearance.

CONCLUSION

The use of incobotulinumtoxinA is a promising therapeutic option for improving the appearance of postsurgical facial scars. Combining incobotulinumtoxinA with microneedling significantly improved the appearance of postsurgical facial scars and increased overall subject satisfaction.

DISCLOSURES

The authors have no conflicts of interest to disclose.

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