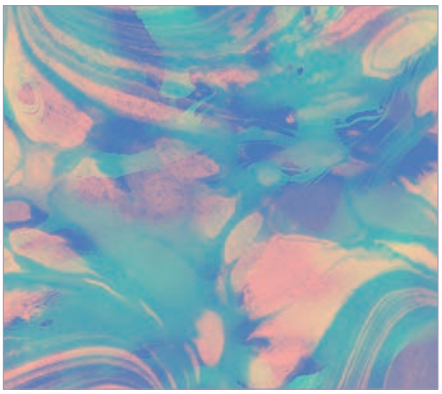

A Combination Approach to Treating Acne Scars in All Skin Types:

Carbolic Chemical Reconstruction of Skin Scars, Blunt Bi-level Cannula Subcision, and Microneedling—A Case Series

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J Clin Aesthet Dermatol. 2020;13(5):19–23

ABSTRACT

BACKGROUND: Acne is a common condition that often results in scarring. Current treatment options, such as chemical peels, laser therapy, radiofrequency, subcision, and microneedling, all have some efficacy in the treatment of acne scars. Results can vary based on the type of scarring and the treatment modality used. **OBJECTIVE:** We propose a novel treatment of acne scarring using a multimodal approach comprising chemical reconstruction of skin scars, subcision, and microneedling. **METHODS:** A retrospective chart review was conducted from January 2017 to December 2018 of all patients with acne scars treated with a triple combination approach in an outpatient cosmetic dermatology practice. Patients presenting with acne scarring who were 18 years of age or older and treated with the triple combination technique were eligible for inclusion. Each patient was treated with a combination of three procedures: 1) chemical reconstruction of skin scars (CROSS), mainly with carbolic acid; 2) blunt bi-level cannula subcision; and 3) microneedling. **RESULTS:** A total of 139 patients were treated, of whom 89 (64%) had Fitzpatrick Skin Types IV to VI. Shadow-lit before and after photos and patient feedback on side effects and satisfaction level were used to assess changes. On average, patients received a total of two treatments each (range: 1–4 treatments). This triple approach to treating acne scars resulted in consistently high satisfaction among patients and photographic evidence of improvements. **CONCLUSION:** The triple combination of CROSS (to stimulate neocollagenesis), subcision (to release dermal connective tissue tethering), and microneedling (to stimulate neocollagenesis) appears to be effective for the treatment of acne scars. Randomized, controlled clinical trials with larger patient numbers are needed to support these observations.

KEY WORDS: Acne scars, chemical reconstruction of skin scars, CROSS, subcision, microneedling, combination treatment, cosmetic treatment, chemical peel

Acne is a common multifactorial condition estimated to affect up to 80 percent of adolescent girls and 90 percent of adolescent boys. Unfortunately, many of those with acne are left with scarring that causes cosmetic concerns, with 30 percent of those affected by scarring considering it a major problem and burden.[1] Several medical and surgical treatments have been proposed for the management of scarring, including laser resurfacing, chemical peeling, radiofrequency, subcision, and microneedling.[2–10]

The treatment of acne scarring is dependent on Fitzpatrick Skin Type and the type of scarring. Fitzpatrick Skin Types IV to VI are at higher risk of postinflammatory hyperpigmentation (PIH), especially from treatment modalities characterized by significant heat deposition onto the surface of the skin, such as ablative lasers. The type of facial scarring (e.g., icepick, rolling, boxcar) also guides the choice of therapy. Icepick scars are typically less than 2mm on the surface and taper as they extend to the deep dermis. Rolling scars are wider and have sloped or shallow borders. When the skin around the rolling scars is stretched, this type of scarring tends to fade or flatten out. Boxcar scars differ from icepick scars in that they have sharply demarcated vertical borders and can be shallow or deep.[11]

For icepick scars, punch excision and chemical reconstruction of skin scars (CROSS) are excellent treatments options.[12–14] Punch excision with a 2mm or smaller punch enables immediate removal of the acne scar. If sutured, the resulting injury can heal with a minimal linear scar, which is often preferred by patients relative to a tethered depression. Similarly, focal application of chemical peel products, such as carbolic acid or trichloroacetic acid using the CROSS technique, can stimulate collagen remodeling to release tethered icepick or depressed scars.[15]

In contrast with icepick scars, rolling and boxcar scars tend to respond better to fillers, radiofrequency, laser skin resurfacing, and microneedling.[13] Fillers temporarily revolumize depressions caused by acne scarring and one filler is already approved by the United States Food and Drug Administration specifically for filling acne scars.[16] A multitude of studies have also demonstrated the efficacy of radiofrequency (i.e., monopolar, bipolar, and fractionated bipolar) in producing 50- to 75-percent improvement in the appearance of boxcar and rolling scars after several sessions.[17-19] Histologic studies conducted after

FUNDING: No funding was provided for this study.
DISCLOSURES: The authors have no conflicts of interest relevant to the content of this article.
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FIGURE 1. Triple therapy tool tray; carbolic chemical reconstruction of skin scars, cannula subcision, and microneedling system

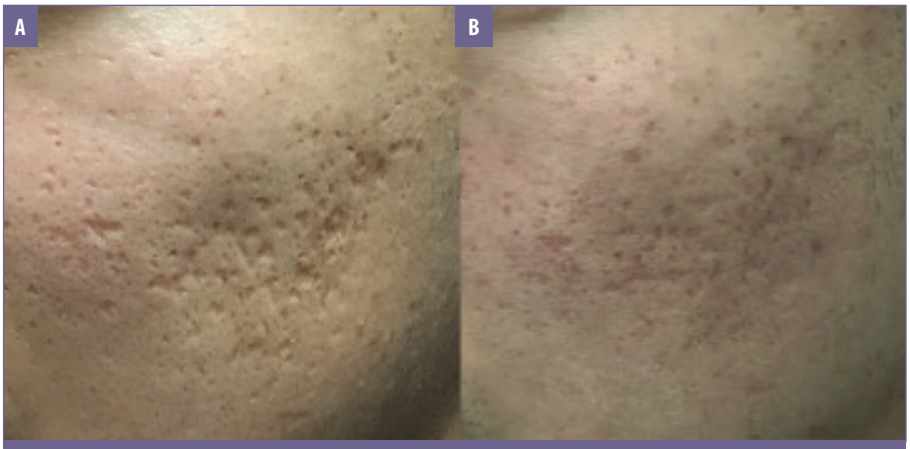

FIGURE 2. A) Before, and B) after three sessions of triple therapy treatment— Before: Skin Type IV with conversationally visible, nondistensible acne scarring; icepick and box scars treated with carbolic chemical reconstruction of skin scars (CROSS), rolling scars treated with cannula subcision, and microneedling applied for all scar types; no postinflammatory hyperpigmentation was reported; After: Less visible, distensible scars; note the filling in of all scar types, smoother contour of the skin, and softer shoulders on icepick and box scars

the treatment of acne scars with radiofrequency have shown an increase in elastic fibers and Types I and III collagen.[20] Of all the radiofrequency modalities, fractionated bipolar treatments appear to provide the best results.[21]

Laser skin resurfacing with ablative and nonablative fractionated modalities is a highly effective treatment for acne scars, with improvements ranging from 25 percent to more than 75 percent based on the number of treatments and modality used. High fluences can result in increased risk of PIH.[22–25] In one split-face study of 10 patients treated with fractionated CO_2 laser, high-fluence, low-density settings produced improved results in scar appearance when compared with low-fluence, high-density settings.[26]

Cachafeiro et al[22] compared nonablative fractionated erbium-doped yttrium aluminium garnet laser resurfacing to microneedling for the treatment of acne scars. A total of 46 patients received three treatments of either laser or microneedling. Blinded reviewers evaluated before and after photographs and found that both modalities showed comparable improvement. However, the microneedling group experienced less down time, found the procedure to be more tolerable, and experienced fewer side effects overall. Several other studies have also reported the efficacy of microneedling for the treatment of acne scars, especially in darker skin types.[27–29]

Although multiple monotherapies can be helpful, combination treatments might be more effective.[10] In this report, we propose a novel treatment of acne scarring using a multimodal approach.

METHODS

A retrospective chart review was conducted of all patients with acne scars treated with combination therapy from January 2017 to December 2018. Photoconsent was obtained from each patient. Each patient was treated with a combination of three procedures: CROSS, mainly with 88% carbolic acid, blunt bi-level cannula subcision, and microneedling (Figure 1).

Step 1: Carbolic CROSS. 88% carbolic acid was used to treat icepick and box scars in a similar method to trichloroacetic acid (TCA) CROSS, but with two main differences: TCA CROSS is typically performed using 60% to 90% TCA applied with a toothpick into the middle of the scars, avoiding spillage onto the scar's shoulders. Instead, carbolic CROSS was performed with a very fine paintbrush instead of a toothpick, because, compared to a toothpick, it is technically easier to fill the inside of these scars using this kind of brush. In addition, the carbolic acid was allowed to spill slightly out onto the shoulder of the scar to soften the scar's shoulder and improve blending with unscarred skin. This was applied after degreasing with acetone and before administering local tumescent anesthesia for the subcision procedure.

Step 2: Subcision. The initial subset of patients underwent the more established subcision procedure, performed with a Nokor 18-gauge needle (Becton Dickinson and Co., Franklin Lakes, New Jersey). Overhead shadow lighting was used to emphasize the rolling and atrophic scars of the patient to determine the area needing to be subcised. After marking, the area was tumesced with 1% lidocaine mixed with sodium bicarbonate in a 2:1 ratio, using a 3- or 5-cc syringe and a one-inch, 25- or 30-gauge needle. Approximately 18 to 24cc of this diluted lidocaine mixture was used per cheek. For subcision, the Nokor 18-gauge needle was used to create multiple puncture sites.

Alternately, a second subset of patients was treated with multilevel subcision using a 70-mm, 18-gauge cannula, which only required one puncture site. This bi-level subcision was performed parallel to the skin, either aiming directly under the skin and breaking up the scar tissue or aiming more towards the dermal fat junction, breaking scar tissue and adhesions and producing audible cracking sounds. A slow piston movement was adopted, moving the cannula back and forth and in a fanning pattern. During tumescence, the indents produced by the acne scar tethers were clearly visible. The endpoint was to achieve very little resistance in the subcised area.

Step 3: Microneedling. Microneedling was performed with a collagen percutaneous induction therapeutic device immediately after subcision. This device uses a disposable tip with 36 needles and boasts a speed of 1,200 cycles per minute. The device was used with a

stamping technique, holding the tip on the skin for approximately 2 to 3 seconds, effectively producing 400 to 600 needle punctures, before moving on to adjacent skin. The endpoint was punctate bleeding and, as such, the appropriate depth of the needling was varied according to both the facial region (e.g., temples are thinner) and the individual patient's skin thickness. The needle depth was calibrated from 1.5 to 2.5mm deep in the cheeks and 0.5mm on the temples and forehead. Aftercare included Aquaphor (Beiersdorf AG, Hamburg, Germany) and/or hyaluronic acid gel.

RESULTS

A total of 139 patients were treated, including 89 (64%) with Fitzpatrick Skin Types IV to VI. Shadow-lit before and after photos and patient feedback on side effects and satisfaction level were used to assess changes. Patients received a mean of two treatments each (range: 1–4 treatments). This triple approach to treating acne scars resulted in consistent high satisfaction among patients and photographic evidence of improvement (Figure 2). Typical side effects of these procedures included bruising and hematomas from subcision, tiny scabs and peeling from CROSS and microneedling, and swelling from anesthesia and subcision. PIH was rare.

Clinically, cannula subcision produced much less bleeding and subsequent hematoma formation than Nokor subcision. In addition, cannula subcision could be performed safely in the temples and marionette region. The Nokor needle was not used in the temples or the marionette region due to the risk of injuring blood vessels and, therefore, was only applied in the cheeks. Patients who underwent both Nokor and cannula subcision consistently reported experiencing less severe side effects after the latter. Specifically, patients who underwent both types of subcision tended to develop hematomas after Nokor subcision but not after cannula subcision.

FIGURE 3. A) Before and B) after one session of triple therapy treatment; Before: Skin Type V with icepick, rolling, and boxcar scars; After: Seven months after one triple therapy treatment session, marked improvement in the gradation of scars on side lighting were noted.

DISCUSSION

We present a combination technique of carbolic CROSS, subcision, and microneedling for the treatment of acne scars. All patients experienced improvement in their acne scarring and were satisfied with the results.

Patients in this case series often had Fitzpatrick Skin Types IV to VI and were predominantly self-selecting. They either previously experienced complications with PIH from prior fractional ablative CO_2 resurfacing, experienced no improvement from prior laser treatments, or preferred not to risk the side effects of PIH on their skin tone. This treatment is optimal for darker skin types due to the low risks of PIH with subcision, microneedling, and CROSS.[14,15,27,28,30–32] If present, PIH is usually transient.[30] The lack of thermal damage with these modalities likely contributes to the low risk of PIH in darker skin types. Our case series suggests this triple procedure is characterized by higher patient satisfaction, fewer side effects, and faster healing time. In addition, the specific combination of procedures can be adjusted to each patient by the length of recovery time needed or best fit for their individual skin tone and scarring patterns.[28]

For the first step of this combination procedure, carbolic acid was chosen over TCA for CROSS, as TCA is a cutting agent and can cause widened scars. In contrast, carbolic acid is a vesicant, creating edema and then a very shallow vesiculation of the skin lining the acne scar. A study by Dalpizzol et al[33] comparing the results of carbolic acid to those of TCA found that both chemicals had similar efficacy, although carbolic acid resulted in a smaller risk of widening acne scars. The carbolic formula used for CROSS produces a superficial injury as opposed to the medium-to-deep peel potentially produced by TCA.[34,35] Boasting weaker concentration than TCA, it has not been found to cause any notable hypopigmentation in our experience. On occasion, we have observed temporary hypopigmentation; however, this self-resolves within a few weeks. No lasting hypopigmentation has been observed.

For the second step of this combination procedure, subcision with a Nokor needle or cannula was used specifically to release the papillary scars from the dermis and deeper tissue. This controlled destruction of the fibrous scar tissue produces trauma and regeneration of collagen in the area.[36,37] Multiple passes might be necessary to fully release tethered icepick-type scars.

For the third step of this combination procedure, microneedling was adopted. Prior clinical and histological studies have demonstrated the efficacy of microneedling specifically for treating boxcar and rolling scars.[38] Histology shows increase in epidermal thickness, Types I, III, and VII collagen, elastin, and tropoelastin after the microneedling of acne scars.[38] However, icepick or deep atrophic scars with tethered scarring below the skin have not responded as well as boxcar and rolling scars, likely due to the inability of microneedling to release these fibrous connections. Therefore, the addition of subcision in our triple combination treatment addresses this limitation of microneedling by first releasing the fibrous connective tissue tethering icepick scars down.

The order of the procedures was chosen to minimize any patient discomfort and PIH while maximizing efficacy. CROSS was performed first, followed by subcision and microneedling. This facilitates the greatest level of precision for the physician and convenience for the patient. CROSS is relatively painless and should be done without tumescence so the shape of the scars can be seen clearly without distortion. Since tumescence essential to reduce pain and bleeding while performing subcision, this should be performed after CROSS. One side of the face should be tumesced and subcised and then the other should be addressed to maintain the full strength of the anesthesia. Following subcision, the face is still numb, which creates an easy opportunity to add microneedling or laser. Skin Types II to III can choose CO_2 or erbium fractional laser; however, microneedling will always be the best option for Skin Types IV to VI. Microneedling or fractionated ablative laser treatments should not be done before subcision, as the effects would hinder visibility. Once scars change and become shallower from CROSS/subcision, erbium/CO_2 can then be used effectively for boxcar and icepick scars. As soon as clinical improvement in icepick and boxcar scars are noted, microneedling can be replaced with low-fluence, short pulse fractionated Er:Yag for scars on the cheeks and temples.

Limitations. Limitations to this study include the lack of a control group and that all procedures were completed at a single center and performed by a single physician. The skill of the physician in each of the three steps can invariably affect the final treatment results.

CONCLUSION

The combination of CROSS using 88% carbolic acid, blunt bi-level cannula subcision, and microneedling appears to be an effective treatment of acne scarring in all skin types; the combination treatment could potentially demonstrate greater efficacy and less severe side effects than previous methods. Further studies are recommended to confirm our findings.

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