Treatment of Atrophic Acne Scars

a report by

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Acne affects 29% of women and 34% of men between the ages of 15 and 44 in the US.[1] This common problem affects patients psychosocially and has the potential to leave lasting scars. Acne scars are a challenge for the physician, as few treatment modalities are effective. Acne scars can be improved by using substances to fill the atrophic dermis or by using exogenous agents such as lasers or chemical peels to stimulate collagen growth.

Fillers and Chemical Peels for Atrophic Acne Scarring

Collagen fillers and hyaluronic acid can be used to inject scars, just as these substances are used to inject rhytides. Newer hyaluronic acid fillers are more extensively cross-linked and may hold more water. These fillers will soon be an option for injecting atrophic scars. As with treatment of rhytides, hyaluronic acid and collagen fillers are a temporary solution, usually lasting three to six months.

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Medium-depth chemical peels can cause regeneration of the epidermis and dermis, resulting in an increase in collagen, elastin and glycosaminoglycans.[2,3] Dermal collagen remodelling continues to occur for several months.[2,3] High-concentration TCA (95–100%) applied focally to atrophic acne scars by subcision has been histologically shown to increase collagen fibres in the dermis and to result in decreased depth of acne scars.[4] Also called the 'chemical reconstruction of skin scars' (CROSS method), high-concentration TCA application has been shown to induce epidermal and dermal rejuvenation by stimulating deposition of collagen.[3] The CROSS method uses a sharp wooden applicator to apply TCA to the entire depressed area.[3–5] Adverse effects include hypertrophic tissue reaction to the TCA and pigmentary changes.

Non-ablative Lasers for Atrophic Acne Scarring

Non-ablative lasers have become popular for the treatment of atrophic acne scars. The target chromophores for these lasers reside in the dermis. Treatment with these lasers stimulates neocollagenesis and collagen remodeling. Advantages of non-ablative lasers include minimal downtime, on-going (albeit gradual) results and reduced side effects[6] compared with ablative lasers (carbon dioxide and the Er:YAG laser), which can result in scarring and hyper- or hypo-pigmentation.[7]

The 585nm pulsed-dye laser has been found to reduce the depth of acne scarring by 47.8% in 10 patients over a four-month follow-up period.[8] The use of the 585nm pulse-dye laser has been shown to increase the production of transforming growth factor β-1 (TGF-β) by five-fold to 15-fold after 24-hours.[9] TGF-β is a potent stimulator of collagen production.

A series of five treatments with the 1,064nm Q-switched Nd:YAG laser treatment for mild to moderate atrophic acne scars resulted in significant quantitative improvements in skin topography as evaluated by a three-dimensional optical profiling system. Improvements were noted to be increasing at one, three and six-month follow-up visits, indicating on-going collagen remodelling.[10,11]

The 1,320nm Nd:YAG has also been shown to improve atrophic acne scarring.[6,12–15] Lee and colleagues treated 29 patients with the 1,320nm Nd:YAG laser with six treatments. Patients obtained an improvement of 2.8 on a four-point scale by objective physician assessment. The patients reported a subjective improvement of 5.4 on a 10-point scale at the three-month follow-up visit.[15] Alam and colleagues found similar results in subjective improvement. Follow-up ranged from three to 12 months.[6] Dual treatment of atrophic acne scars with subcision and the 1,320nm Nd:YAG has been reported to result in a greater improvement of acne scars than subcision alone.[16] The 1,320nm Nd:YAG laser has been shown to be safe and effective in Asian skin.[17]

The 1,450nm diode laser is a non-ablative laser that has been shown to decrease acne by targeting sebaceous glands.[18,19] It has also been shown to improve acne scars by causing collagen remodelling.[18,19] Jih and colleagues treated 20 patients with three treatments of the 1,450nm

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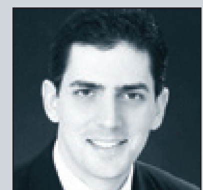

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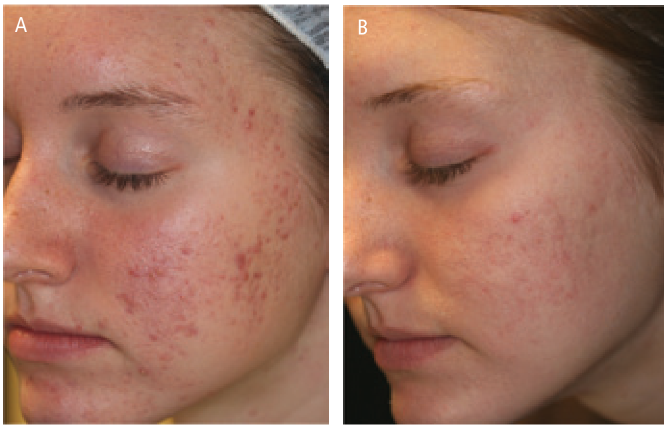
Figure 1: Patient at Baseline (A) and Four Months After Four Treatments with Fractional Photothermolysis (B)



The patient also received four treatments with the 595nm pulsed-dye laser in combination with the 1,450nm diode laser prior to fractional photothermolysis. Note the dramatic improvement in acne vulgaris, atrophic acne scarring, and post-inflammatory erythema.

diode laser and noted both objective and subjective improvements in acne scarring and sebum production, maintained over a 12-month follow-up period. The level of improvement increased over time and was noted to be 25–50% at the six-month follow-up. Subjective improvement in acne scars was noted to be 79.4% at the three-month follow-up, 93.3% at the six-month follow-up and 85.9% at the 12-month follow-up.[19] The 1,450nm diode laser has been shown to be effective without adverse effects in the treatment of dark-pigmented individuals, including skin types four and five.[19,20]

Fractional Photothermolysis for the Treatment of Atrophic Acne Scarring

Fractional photothermolysis is a unique technology that utilises micro-thermal treatment zones (MTZs). Micro-thermal treatment zones are columns of epidermis and dermis that are treated by the laser, surrounded by areas of untreated tissue. Keratinocytes have a shorter migration path and healing is much quicker.[21] The laser spares the stratum corneum and leaves the epidermis functionally intact, so that the epidermis acts as nature's bandage, and infection rates are negligible. Adverse effects are minimal and include transient erythema, pain and xerosis. The 1,550nm erbium-doped fibre laser has shown promise in treating atrophic acne scars.[22] A study of 40 patients found that two-thirds of subjects achieved a 50–100% improvement in acne scars. Texture improvement was found to reach 75–100%,[23] Geronemus and colleagues found an average level of improvement of 41% in 17 patients by topographical analysis.[24] A post-treatment questionnaire showed that 100% of patients were satisfied with the treatment and reported an average level of improvement of 48%.[24] Improvement of hypo-pigmented acne scars has also been reported. The treatment of seven patients with atrophic hypo-pigmented scars, most resulting from inflammatory acne, with fractional photothermolysis resulted in 50–75% improvement in all but one patient, who achieved an improvement range of 25–50%.[25] In addition to the improvement in the atrophic scarring, a marked improvement of post-inflammatory erythema has been reported with fractional photothermolysis[26] (see *Figure 1*). The 1,550nm erbium-doped fibre laser has also safely used in darker skin types.[21,23,27]

Recently developed, the second generation of fractional photo-thermolysis is the 1,550nm erbium-doped laser, which adjusts spot size to allow for maximal depth of penetration for each energy level. Higher energy levels can be used and a greater volume of tissue is treated resulting in deeper dermal remodelling. The high energy levels can be used without overheating the bulk of the tissue, resulting in less pain and less risk of scarring than ablative techniques. Significant improvements in texture and topography of the skin have been observed after treatment for acne scars.[28]

Conclusion

Although treatment for acne scarring has shown limited efficacy in the past, new modalities offer promising results for treatment of atrophic acne scarring. ■

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