Acne scarring is a fibrous process involving new collagen production to heal a wound. It affects a third of those with acne vulgaris and is predominant in nodulocystic acne. Options for treatment depend on acne scarring severity, scar type, scar site, and patient skin type, availability of treatment modalities and side effects risk profile. This paper reviews the management of acne scarring.

GRADING ACNE SCARS
It is important to understand the severity of scars, as treatment is directly dependant on such assessment. Grading of scar severity pre- and post-treatment can be assessed objectively using comparisons as in Table 1.

Ultimately the challenge for providers and patients is that true acne scars never completely fade. However, they visibly improve as time passes and can be concealed.

Acne scars can occur anywhere on the body, although the upper chest and shoulders are especially prone to developing scars. This is due to poorer regeneration capability, due in large part to the lower density of adnexal structures (sebaceous glands, hair follicles).

Unfortunately, hypertrophic or keloid scars (Table 2) tend to reappear even after a good initial result is obtained post treatment. Traditionally, scar revision surgery is employed. Ablative lasers, carbon dioxide, and Erbium Yag lasers are often successful as an alternative to surgery.

TECHNOLOGIES TO IMPROVE ACNE SCARS
Energy-based devices have shown good efficacy in treating acne scars. The primary laser resurfacing treatments can be divided into the non-ablative and the fractional ablative categories. Ablative lasers may provide the best results in terms of targeting texture and color of scars. Ablative laser resurfacing utilizes electromagnetic waves to erode the entire epidermis and upper layer of dermis. For a time, CO₂ ablative laser was the primary modality for the treatment of acne scars. However, it has extensive downtime of two or more weeks. Side effects include red-

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**TABLE 1. ACNE SCAR GRADE**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Flat scars</td>
<td>These can be red, brown, or pale flat marks.</td>
</tr>
<tr>
<td>2. Mild Hypertrophic and Atrophic scars</td>
<td>Sunken or raised scars, not visible at distances of 50cm or more.</td>
</tr>
<tr>
<td>3. Moderate Hypertrophic and Atrophic scars</td>
<td>Visible at distances of &gt;/= 50 cm, camouflaged, can be even out by stretching the skin.</td>
</tr>
<tr>
<td>4. Severe Hypertrophic and Atrophic scars</td>
<td>Visible at distances &gt;/= 50 cm, difficult to be camouflaged, cannot be evened out by stretching of the skin.</td>
</tr>
</tbody>
</table>

**TABLE 2. THREE MAIN FORMS OF ACNE SCARS**

<table>
<thead>
<tr>
<th>Scar Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice-pick scars</td>
<td>Visibly narrow, pitted, and deep scars</td>
</tr>
<tr>
<td>Rolling scars</td>
<td>Broad sloping edges</td>
</tr>
<tr>
<td>Boxcar scars</td>
<td>Broad sunkenness with sharply defined edges</td>
</tr>
<tr>
<td>Hypertrophic and Keloidal</td>
<td>Lumpy and thick scars</td>
</tr>
</tbody>
</table>
ness and swelling, skin dyschromia, scarring, skin infections, and eczematous reactions. Full ablative resurfacing is rarely used today.

Fractional ablative laser treatment addresses both the epidermis and dermis. It delivers hundreds of laser beamlets. The principle is controlled dermal damage in microthermal treatment zones (MTZ) to stimulate fibroblasts to aid collagen remodelling and neocollagenesis. MTZ are selected areas with dermal injury, with adjacent areas spared. The areas with injury would in turn kickstart the process of neocollagenesis, while the adjacent areas maintain cell renewal and healing. In this way, the electromagnetic energy is effective yet safe. The safety profile and speedy recovery associated with these devices are trade-offs for slower results. Patients today want treatments with minimal downtime.

There are three main types of non-ablative modalities: mid-infrared ones, pulsed dye lasers (PDL), and broadband light systems. These devices work well for dyschromia but the textural improvement in scars is minimal. PDL can be particularly effective to reduce erythema and texture of a scar. Multiple treatments are needed.

Radio frequency (RF) microneedle devices, an example of which is the Intracel from Korea, have produced significant results. It uses an insulated microneedle that delivers radio frequency energy to the dermis, reducing damage to the epidermis, hence speeding up recovery. In my practice, I use a schedule of four sessions of Intracel, and can achieve results of 60 percent or better improvement in acne scars.

“Ultimately the challenge for providers and patients is that true acne scars never completely fade. However, they visibly improve as time passes and can be concealed.”

RF microneedling works for both atrophic and hypertrophic scars. The benefit is based on dermal matrix remodelling. Downtime is minimal and less than with fractional lasers. Side effects of post-inflammatory pigmentation on darker skin types is much reduced compared to fractional laser, and the results are comparable.

More recently, the plasma laser have been used, achieving good results with minimal downtime and epidermal damage. Plasma lasers rely on the fourth state of matter to ionise particles. The laser energy removes oxygen from cells, hence reducing the risk of charring the skin. The heat reaches a sufficiently high temperature to stimulate neocollagenesis to improve scar texture and tone. The safety profile is high, with low risk of hypo- and hyperpigmentation.

Patient skin type is an important factor in selecting an energy-based device. Skin type can be classified from Fitzpatrick 1-6. Darker skin types have a higher risk of post-inflammatory hyperpigmentation. Hence, they benefit more from fractional laser compared to traditional full ablative lasers.

**TABLE 3. MATCHING SCAR TYPES AND TREATMENT**

<table>
<thead>
<tr>
<th>Treatment Principles</th>
<th>12,13,14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Energy-based devices effectively address multiple aspects of acne scarring, however, multi-modal approaches are now the norm.</td>
<td></td>
</tr>
<tr>
<td>2. Combinations, including the integration of fillers, PRP, and emerging technologies, as appropriate, is key moving forward.</td>
<td></td>
</tr>
<tr>
<td>Grade 1 scars, meaning those with flat red, white, or brown marks</td>
<td>Topical treatment with silicone based gels combined with careful use of pigment, vascular and fractional lasers +/- Injectables, PRP</td>
</tr>
<tr>
<td>Grade 2 mild scars</td>
<td>Fractional, vascular and pigment lasers, as well as microneedling +/- Injectables, PRP</td>
</tr>
<tr>
<td>Grade 3 scars</td>
<td>Full ablative and fractional lasers, and may require scar revision surgery occasionally +/- Injectables, PRP</td>
</tr>
<tr>
<td>Grade 4 scars</td>
<td>Require a multimodality approach15</td>
</tr>
</tbody>
</table>

**Side effects of fractional ablative treatments:** 16,17,18
- Excessive skin peeling, scaling and crusting.
- Swelling for up to 7 days post treatment – this can be reduced with regular icing.
- Post inflammatory hyperpigmentation – high frequency in darker skin patients and those with previous episodes.
- Acneiform eruptions, herpes, bacterial, fungal infections, and contact dermatitis
"The major complication of acne is scarring, which results in severe comorbidity for patients. On the bright side, there exist several options to treat acne scarring. Studies support combination treatment to achieve the best results."

COMBINATIONS ARE KEY

Energy-based devices alone may not be sufficient to reduce acne scars. Other modalities that may be used include microneedling, high intensity focused ultrasound systems, and platelet rich plasma (PRP) among others.6 (See Dr. Chang’s review of PRP in the November edition of PracticalDermatology, available online at PracticalDermatology.com/2017/11.)

Dermal fillers have emerged as particularly useful to address acne scars. A soft filler like Restylane can be used to fill the depression in atrophic scars, and subcision can be employed to breakdown the fibres that are anchoring the skin down.

In my practice, I commonly combine this approach with RF microneedling or fractional laser, over four sessions. The results are significant. Studies have suggested that the use of platelet rich plasma can speed up recovery from in-office procedures, including energy-based interventions.7

An emerging concept is the use of “Microbotox” to improve the appearance of acne scars.

CONCLUSION

The major complication of acne is scarring, which results in severe comorbidity for patients. On the bright side, there exist several options to treat acne scarring. Studies support combination treatment to achieve the best results. The safety and efficacy has good evidence, but there is a dearth of split-face trials.8

Fractional laser resurfacing and radio frequency energy devices used alone or with other devices are a foundation of treatment, but combinations of energy-based interventions and other techniques are the norm. Energy-based devices are important for their ability to stimulate new collagen production, with results visible within three months.9,10 Look for increasing evidence for and adoption of plasma lasers.

Microneedling, fillers, PRP, and microbotox will continue to gain prominence in the future for acne scar revision. Dermal fillers1 can be used to fill atrophic scars and lift the sunken, depressed skin.

Dr. Daniel Chang specializes in Aesthetic and Regenerative Medicine and is a Key Opinion Leader and Regional Trainer. Dr. Chang founded Asia Aesthetic Academy in 2015 and has developed a number of signature treatments, including the DC 3D-Dreamlift and the DC 3D-Noselift. He maintains a Korean Aesthetics site and can be reached via his website: drdanielchang.com

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17. Fraxel® Laser Treatment Reliant Technologies, Inc.

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