Photodamaged skin of the hands occurs as a result of chronic exposure to ultraviolet light and is characterized by roughened surface texture, dyspigmentation, telangiectasias, rhytids, and skin laxity. Although several different noninvasive procedures have been advocated for hand rejuvenation (Table 47.1), many are characterized by an unattainable balance between effectiveness and morbidity. The necessity of epidermal removal during most skin resurfacing treatments leads to significant morbidity during the reepithelialization process, particularly in areas such as the hands, where limited pilosebaceous glands are present.

PLASMA SKIN REGENERATION TECHNOLOGY
Plasma skin regeneration is a novel process that involves the generation of plasma through the use of ionized energy that thermally heats tissue. A pulse of ultrahigh-energy radiofrequency (RF) from the device generator (Portrait plasma skin regeneration) converts nitrogen gas into plasma within the handpiece. The plasma emerges from the distal end of the device handpiece and is directed onto the skin area to be treated. Rapid heating of the skin occurs as the excited gas transfers heat to the skin, resulting in increased fibroblast activity during dermal regeneration. The retained necrotic epidermis effectively serves as a biological dressing for the efficient formation of a new stratum corneum and epidermis.

The essentially instantaneous generation of plasma with controlled application of RF energy produces individual plasma pulses that heat tissue. Adjustment of RF power and pulse width enables control of tissue effects by altering the amount of energy delivered to tissue per pulse. In practice, the energy per pulse is adjustable between 1 and 4 J. The power and duration of each RF pulse are directly proportional to plasma strength.

CLINICAL PROTOCOL
The skin areas to be treated are cleansed with mild soap and water to remove all surface debris. While intralesional lidocaine can be used for anesthesia, application of a topical anesthetic cream (e.g., EMLA or LMX-5) under plastic wrap occlusion for sixty minutes is often adequate. Once the cream has been thoroughly removed and the skin completely dried, the treatment should commence within five to ten minutes. Typical energy settings of 1.5–4 J are applied to the areas, holding the device handpiece perpendicular to the skin at a distance measuring approximately 5 mm from the skin surface. The areas are treated in a single pass with a pulse overlap of 10 to 20%. An additional pass should only be delivered if a low (1.5 J) energy setting is used. Pulse repetition rates of 1–4 Hz are chosen, subject to the discretion of the operator. While skin can be cooled with ice packs or cool water compresses posttreatment, intraoperative cooling of the skin is contraindicated because of its negative impact on the tissue heating necessary to achieve optimal clinical effect.

POSTOPERATIVE COURSE
Immediately posttreatment, a petrolatum-based ointment (e.g., Aquaphor) can be applied to the skin. Patients should be instructed to gently cleanse the treated areas with mild cleanser and water and to reapply the ointment at least three times daily to maintain a moist healing environment. Nonstick gauze dressings can be used to protect the treated areas from ultraviolet light exposure or abrasion due to clothing. Patients should be advised to avoid sun exposure, prolonged water immersion, or exposure to harsh chemicals for as long as the treated skin appears pink in color.

CLINICAL RESULTS
Clinical improvement of 50% is typically observed, with significant reduction in wrinkle severity and hyperpigmentation within one month after a single treatment (Figure 47.1). Most patients also experience increased skin smoothness. Additional treatments can be delivered for
### TABLE 47.1: Comparison of Hand Rejuvenation Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Take-Home Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma skin regeneration</td>
<td>one/few sessions needed</td>
<td>short recovery necessary</td>
<td>best for photodamaged skin (both texture and pigment), but recovery time necessary</td>
</tr>
<tr>
<td></td>
<td>highly effective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical (TCA) peel +</td>
<td>requires knowledge of two</td>
<td>moderate recovery</td>
<td>good for dyspigmentation, but limited efficacy for wrinkling</td>
</tr>
<tr>
<td>pigment-specific laser</td>
<td>procedures</td>
<td>inadequate for skin laxity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>multiple sessions needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fractionated laser</td>
<td>minimal to no recovery</td>
<td>multiple sessions needed</td>
<td>good for those with limited time for recovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mild clinical effect</td>
<td></td>
</tr>
</tbody>
</table>

Note: TCA, trichloroacetic acid.

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**FIGURE 47.1:**

- **A:** Photodamaged skin on the dorsal hand of a fifty-four-year-old woman prior to treatment.
- **B:** Dorsal hand skin four days after plasma skin regeneration treatment (1.8 J, single pass).
- **C:** At two weeks, minimal erythema is noted.
- **D:** Improvement of pigmentation and wrinkling are evident three months after treatment.
further enhancement and maintenance of clinical effect but should be delayed at least one month to assess the results of prior treatment and to give the skin ample time to heal.

**SIDE EFFECTS**

The use of higher energy settings or multiple passes yields greater clinical benefit, but also prolonged tissue healing (fourteen days versus seven days). Side effects of erythema, edema, and desquamation are uniformly experienced. Epidermal sloughing with clinical evidence of a superficial dermal wound is evident within forty-eight hours of treatment. Reepithelialization with normalization of external skin architecture occurs within a few days. Mild erythema is typical for two to four weeks. While infection, dyspigmentation, and scarring are potential risks of the procedure, the incidence is extraordinarily low when the intraoperative and postoperative protocols outlined previously are followed. No prophylactic antibiotics are recommended; however, if a postoperative infection is suspected, broad-spectrum antibiotics can be prescribed.

**SUMMARY**

Plasma skin regeneration is a highly effective rejuvenative skin treatment. Its excellent clinical efficacy and safety profile in cutaneous sites that have notoriously been difficult to treat with ablative laser technology make it my preferred treatment for photodamaged skin of the hands.

**SUGGESTED READING**
