

Microdermabrasion for Treatment of Photoaging

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- Microdermabrasion offers patients a simple, relatively inexpensive treatment for photoaging with rapid recovery time.
- One of the most popular cosmetic procedures.
- Requires no anesthesia, can be used on all Fitzpatrick skin types, and has minimal risk for dyschromia, infection, or scarring.
- Can be used in conjunction with other approaches to improve treatment results.

Cutaneous resurfacing methods using lasers, chemical peels, and physical agents have conventionally been used to improve wrinkles, texture, and pigmentation alteration. In this chapter, we discuss a subset of mechanical peeling called microdermabrasion and evaluate its utility for these signs of photoaging.

Microdermabrasion offers patients a simple, relatively inexpensive treatment for photoaging, with rapid recovery time. Since its introduction in the United States in 1996,

microdermabrasion has become one of the most popular cosmetic procedures, with more than one million patients receiving treatment in 2002 (1). Although other resurfacing techniques offer potentially more effective results, microdermabrasion requires no anesthesia, can be used on all Fitzpatrick skin types, and has minimal risk for dyschromia, infection, or scarring (2). Microdermabrasion is used to treat the fine lines (and textural, and pigmentary) irregularities common in photoaged skin, as well as comedonal acne, lentiginos, striae, and scars (due to acne, surgery, and trauma). It recently was demonstrated to help with palmoplantar keratoderma, Darier's disease, and actinic keratoses (2–8). The face, dorsal hands, anterior neck, and chest are most commonly treated.

Microdermabrasion was invented in Italy in 1985 when Molimed Engineering developed the first closed-circuit, negative pressure system (9). In 1988, Monteleone further investigated its clinical usefulness for treatment of scars (10). In the mid-1990s, Mattioli Engineering partnered with Aesthetic Lasers to submit an Italian-designed machine to the U.S. Food and Drug Administration (FDA). The microdermabrasion instrument was approved and granted exempt status, which meant that American manufacturers did not require clearance from the FDA. This subsequently led to a vast explosion in the number of manufacturers (more than two dozen) and machines that currently are available for use in the United States. However, with its unrestricted status, there is little incentive for manufacturers of microdermabrasion units to conduct controlled clinical trials evaluating clinical efficacy and the mechanism of action on photoaged skin. Reported clinical and histological effects of microdermabrasion derive from a limited number of peer-reviewed clinical trials, case series, physician and patient surveys, and comparison with other similar superficial rejuvenating techniques, such as chemical peels.

REGULATORY STATUS

Of particular concern in the health care system is the increasing number of complications resulting from nonphysicians performing cosmetic procedures. At the time of this writing, there is considerable variability in the types of professional status of individuals permitted by state medical boards to perform microdermabrasion. As of May 2002, 13 states permitted only physicians to perform microdermabrasion, and 21 states allowed physicians or other licensed health professionals (physician assistant, registered nurse, nurse practitioner, licensed cosmetologist, or aesthetician) supervised directly by a physician to treat patients (11). With such variation, physicians should be advised to check with their state medical board before having other licensed health and cosmetic professionals perform microdermabrasion. It is unclear at this time whether there will be subsequent national standardization and regulatory guidelines on the type of professional status of individuals who are allowed to perform microdermabrasion.

EQUIPMENT

Despite the vast array of machines available, all microdermabrasion units deliver an adjustable high-pressure stream of aluminum oxide, sodium bicarbonate, or sodium chloride crystals through a handpiece and use a self-contained vacuum to remove spent particles and debris (dirt and shed skin). Some machines provide the option of using positive pressure, which boosts the density of crystal abrasives that are projected to the skin, and provide greater flexibility in treating problem areas, such as scars. Handpieces are disposable or reusable; the latter must be sterilized before use on another patient. Most manufac-

turers sell aesthetician and physician models, which deliver a greater force of crystal flow and generally allow for greater suction, potentially introducing greater risk to the patient. Such devices cost between \$8,000 and \$20,000, depending upon the model, manufacturer, and often who provides on-site training and video instruction.

TECHNIQUE

The depth of treatment, and therefore the degree of injury produced during microdermabrasion, is dependent upon several variables, including crystal type, particle flow rate, vacuum (or negative) pressure, skin thickness, rate of movement across the skin surface, and number of passes (2,12). The crystals used are medical-grade aluminum oxide (commonly 100 μm in size), sodium chloride, or sodium bicarbonate. The sodium salts provide a smoother and less abrasive treatment than aluminum oxide crystals, which are very angular and second only to diamond in hardness (Fig. 1) (13). However, aluminum oxide and sodium chloride produce comparable histological changes and effects on epidermal barrier function (including decreased transepidermal water loss and increased stratum corneum hydration) (14,15). Crystal flow rate can be adjusted in some models by increasing positive pressure. The strength of its vacuum, or negative pressure, is operator dependent, as are the number of passes and contact time with the skin surface. Accordingly, more negative pressure, a greater number of passes, and longer time spent in contact at any one location all produce a deeper abrasion and inflammatory reaction.

The technique of microdermabrasion is relatively straightforward, and its application to the face is described here. First the treatment site is wiped thoroughly with an astringent cleansing solution (i.e., 70% alcohol) to remove dirt, makeup, and oil, and then air dried. Jewelry and contact lenses are removed, and the patient wears a cap or ties any loose hair away from the treatment field. The patient lies in a supine, partially reclined position and covers the eyes with goggles, pads, or moistened gauze. There is considerable variability in microdermabrasion negative-pressure settings reported in the literature, ranging from less than 10 mm Hg to greater than 380 mm Hg (4,5,13,16,17). Such discrepancies may be due to calibration differences between microdermabrasion vacuum units. After confirm-



Figure 1 Microcrystals of aluminum oxide. (From Ref. 13.)

ing the recommended vacuum settings from the manufacturer, it is advisable to apply the handpiece to the medial forearm or other appropriate body part so that the vacuum settings can be adjusted to leave the treated area mildly pink. Using the dominant hand, the operator maintains constant contact with the skin as the nondominant hand stretches the area being treated. The handpiece usually is moved quickly along the surface in one direction (usually medial to lateral) for the duration of the stroke, whose length should stay consistent within the treatment site. Movement may be slower over the nose, chin, and forehead skin, which generally is more sebaceous and thicker. After a single pass, the motion is repeated in the opposite direction over the same site and then moved onto untreated skin. The negative vacuum pressure should be reduced on the thinner and sensitive infraorbital and malar skin. After treatment is completed, crystal remaining on the skin can be wiped away with a soft brush. A second pass may be made in a perpendicular direction to prevent streaking. Additional passes may be performed directed obliquely from the previous pass, although it is recommended to start with fewer passes and add another at subsequent sessions. Similarly, negative pressures may be increased at future visits.

Certain areas, including scars or hyperpigmented skin, may require more aggressive treatment with additional passes, increased crystal flow, or greater vacuum. Discomfort usually is minimal to none during the procedure. Depending upon the site, most treatments take between 15 and 30 minutes. After the procedure, patients should wash the skin with a nonabrasive moisturizing soap, dry, and apply a moisturizer with at least an SPF 15 sunscreen. Patients are advised to decrease sun exposure and apply a moisturizer with a broad-spectrum sunscreen at least once daily between treatment sessions. Most patients choose to return to work immediately and report no disruption in daily activity.

Although the face is the most commonly treated area, photodamage to the dorsal hands, chest, and neck make these sites particularly suitable for microdermabrasion. Some suggestions while treating these areas are as follows. The neck should be comfortably hyperextended before treatment, and only vertical strokes should be used. The patient should make a fist prior to hand treatments, and handpiece movement should be directed parallel to the long axis of the forearm. The chest is treated in a fashion similar to that of the face, where two perpendicular passes are initially performed.

TREATMENT REGIMENS

Although patients may notice a textural difference after one treatment, they should be aware that multiple sessions usually are necessary to achieve the desired effects. As with any cosmetic procedures, patients' expectation of the procedure must be addressed, and patients must be educated about the indications, potential side effects, and long-term outcome of microdermabrasion treatments.

Most manufacturers and clinicians recommend between four and eight treatments, spaced weekly to monthly, although up to 15 treatments have been reported for acne scars (13). Alternatively, some physicians recommend more intensive therapy initially (biweekly for 6 weeks) with subsequent maintenance treatments performed every couple of months. Moreover, there is a statistically significant increase in effectiveness between patients receiving fewer than three treatments vs. those receiving more than three treatments (18).

ADJUNCTIVE USE OF OTHER REJUVENATION MODALITIES

Patients seeking softening of skin lines, actinic damage, and pigment irregularities may benefit from other adjunctive skin care regimens during microdermabrasion treatment.

Photoaging

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Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress.

ISBN: 0-8247-5450-6

This book is printed on acid-free paper.

Headquarters

Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016, U.S.A.
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Distribution and Customer Service

Marcel Dekker, Inc., Cimarron Road, Monticello, New York 12701, U.S.A.
tel: 800-228-1160; fax: 845-796-1772

Eastern Hemisphere Distribution

Marcel Dekker AG, Hutgasse 4, Postfach 812, CH-4001 Basel, Switzerland
tel: 41-61-260-6300; fax: 41-61-260-6333

World Wide Web

<http://www.dekker.com>

The publisher offers discounts on this book when ordered in bulk quantities. For more information, write to Special Sales/Professional Marketing at the headquarters address above.

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Current printing (last digit):

10 9 8 7 6 5 4 3 2 1

PRINTED IN CANADA