CHAPTER 33

Microdermabrasion

Rebecca Small, MD
Assistant Clinical Professor, Department of Family and Community Medicine
University of California, San Francisco School of Medicine, Capitola, CA

Microdermabrasion (MDA) is a minimally invasive mechanical exfoliation procedure for superficial skin resurfacing. Most exfoliation modalities in use today can be broadly classified as chemical exfoliants, which include glycolic and salicylic acid peels and mechanical exfoliants. Mechanical exfoliation treatments range from simple microbead scrubs found over the counter, which partially remove the stratum corneum, to operative procedures such as laser resurfacing and dermabrasion, which can ablate the reticular dermis. The depth of resurfacing achieved with MDA is conservatively in the middle of this spectrum. Although MDA exfoliation can vary from superficial thinning of the stratum corneum to penetration into the upper papillary dermis, the target depth for most MDA procedures is removal of the stratum corneum.

Exfoliation treatments are based on the principles of wound healing. By wounding and removing the uppermost layers of the skin in a controlled manner, cell renewal is stimulated with regeneration of a healthier epidermis and dermis. Histological evaluation of facial skin after repeated MDA treatments demonstrates a reparative wound-healing process with regeneration of a compacted stratum corneum and a smoother epidermis. Skin hydration increases with improved epidermal barrier function, and fibroblast stimulation increases dermal thickness through production of new collagen and elastin.

MDA is commonly used to treat photo-damaged skin and reliably demonstrates improvement in skin texture, coarse pores, comedonal acne, and epidermal hyperpigmentation such as solar lentigines. Treatments may improve fine lines and superficial acne scarring. Certain MDA devices have also shown positive results with rosacea and papulopustular acne.

Traditionally, MDA devices have used crystals as the abrasive element. Negative pressure draws the skin to the hand-piece tip, and crystals superficially abrade the skin’s surface as they pass across the epidermis. Used crystals and cellular debris are aspirated and collected separately for disposal after treatment. Each pass of the hand piece removes approximately 15 μm of skin, and two passes of most MDA devices fully remove the stratum corneum. The depth of resurfacing achieved with MDA is comparable to a superficial chemical peel. MDA offers certain advantages over chemical peel treatments such as greater control over the depth of exfoliation, comparatively
minimal discomfort, and no "downtime" for skin flaking and peeling. Other alternatives to MDA include ablative and nonablative laser resurfacing and dermaplaning, which utilizes a specialized dulled scalpel blade that is passed across the skin.

Recent advances in MDA technology combine exfoliation with dermal infusion. During this process, topical products are delivered into the skin at the time of or immediately after exfoliation. These systems take advantage of the transient disruption to the epidermal barrier that occurs with removal of the stratum corneum to better deliver medications into the deeper dermal layers. Dermal infusion can enhance results for conditions such as dehydration, hyperpigmentation, acne, and rosacea based on the products that are used.

MDA is one of the most commonly performed cosmetic procedures in the United States, with more than a half million treatments performed annually, according to data from the American Society for Aesthetic Plastic Surgery. Treatments are technically straightforward with a low risk of side effects, are associated with a high degree of patient satisfaction, and are well suited to the outpatient office setting. MDA has become an essential medical aesthetic rejuvenation treatment (ART) for primary care professionals who desire to provide aesthetic care.

**Anatomy**

The outermost layer of the skin, the stratum corneum, is a nonliving layer of corneocytes and lipids, which serves as a barrier against microbial pathogens and environmental irritants and keeps the skin hydrated and protected from injury. Constant renewal is necessary for the epidermis to maintain its integrity and function effectively. In healthy, younger skin, epidermal renewal takes approximately 1 month for keratinocytes to migrate from the living basal layer of the epidermis to the stratum corneum surface, from which they are shed (see keratinocyte migration highlighted in Figure 1). In aged, photo-damaged skin, keratinocyte maturation is slowed, and there is abnormal retention of cells, leading to a thickened, rough stratum corneum. Disruption of the epidermal barrier results in skin dehydration and may cause increased sensitivity. Photo-damaged skin is dull and exhibits dyschromia with solar lentigines and uneven pigmentation. Dermal
thinning with loss of collagen and elastin contributes to formation of fine lines. Through stimulating cell renewal in the epidermis and dermis, MDA is able to address many of these changes seen with photo damage and intrinsic aging.

**Results and Follow-up**

MDA treatments are most commonly performed on the face, neck, chest, and hands. In general, facial skin tolerates more aggressive treatments and tends to show greater improvements than nonfacial areas. Epidermal healing is thought to be related to the density of adnexa (hair follicles and eccrine sweat glands) within a treatment area. The facial epidermis has a greater density of adnexa relative to the nonfacial epidermis, such as the neck and chest, which may account for its greater rejuvenation potential. Other treatment areas include the back and hyperkeratotic areas such as elbows and knees. Treatments may be performed for patients of all Fitzpatrick skin types (see Chapter 31 for Fitzpatrick classifications). However, aggressive treatments should be avoided in darker skin types (IV to VI) because of their increased risk of postinflammatory hyperpigmentation (PIH).

MDA combined with dermal infusion is associated with less posttreatment erythema and reduced risks of PIH.

Results from MDA treatments are cumulative, and typically a series of six treatments is recommended at bimonthly intervals. Results are not usually clinically evident after a single treatment. However, patients who have had little or no skin care previously may report improvements. Maintenance treatments may be performed every 4 to 6 weeks.

The most marked results with MDA are achieved when MDA is used in combination with other rejuvenation treatments such as chemical peels, topical skin care products, laser and intense pulsed light (IPL) photo rejuvenation, and fractional resurfacing. For example, dramatic reduction of benign pigmented epidermal lesions, such as lentigines, can be achieved when MDA is alternated every 2 weeks with laser or IPL photo-rejuvenation treatments. MDA performed prior to fractional resurfacing treatments may also reduce the incidence of posttreatment complications such as milia and acne.

**Preprocedure Checklist**

- Perform an aesthetic consultation, and review the patient’s medical history (see Chapter 28).
- Obtain informed consent (see Chapter 28).
- Take pretreatment photographs (see Chapter 28).
- Prophylaxis with an oral antiviral medication such as acyclovir or valacyclovir if there is a history of herpes simplex or varicella in or near the treatment area for 2 days prior to procedure, and continue for 3 days postprocedure.
- Prior to MDA, patients should avoid chemical peels, dermal filler injections, waxing, and direct sun exposure for 2 weeks; discontinue use of products containing retinoic acid or alpha-hydroxy acids (e.g., glycolic acid); and avoid botulinum toxin injections for 1 week.

**Equipment**

- MDA device with abrasive element (e.g., crystals, diamond tips). Aluminum oxide is the most commonly used crystal and is ideal for MDA because it is inert and second only to diamonds in hardness. Other crystals used include sodium chloride, sodium bicarbonate, and magnesium oxide. Crystal-free MDA devices have become popular because of the lack of dust and associated risks of ocular injury. Diamond-tipped devices
employ diamond-tipped pads as the abrasive element and can be used with topical solutions for dermal infusion.

- Headband.
- Facial wash and astringent to cleanse and degrease the treatment area.
- Towel to drape the patient.
- Eye protection for the patient with small goggles or moist gauze.
- For crystal MDA devices, the operator should use clear goggles for eye protection and a mask to reduce particle inhalation.
- Gauze, 4 × 4 inches
- Physical sunscreen (with zinc or titanium) and a soothing moisturizer for postprocedure application.
- Saline eyewash.

Aesthetic Indications

- Hyperpigmentation
- Rough texture, enlarged pores
- Superficial acne scarring
- Comedonal acne
- Papulopustular acne
- Rosacea and telangiectasias
- Fine wrinkles
- Keratosis pilaris
- Enhanced penetration of topical products

Improvements in papulopustular acne, rosacea, and telangiectasias have been demonstrated with certain MDA devices such as the SilkPeel (diamond-tipped with dermal infusion).

Contraindications

**Absolute**

- Pregnancy
- Active infection in the treatment area (e.g., herpes simplex and verrucae)
- Melanoma or lesions suspected of malignancy
- Isotretinoin (Accutane) use in the past year
- Dermatoses (e.g., eczema and psoriasis)
- Autoimmune disease
- Sunburn

**Relative**

- Rosacea and telangiectasias (not recommended with crystal MDA)
- Papulopustular acne (not recommended with crystal MDA)
- Very thin skin or excessive laxity and skin folds
- Anticoagulant therapy
- Unrealistic expectations
The Procedure

The following procedure is for treatments performed with SilkPeel, a crystal-free MDA that uses diamond-tipped pads as the abrasive element and has simultaneous dermal infusion of topical solutions (see Figure 2). Comparisons and recommendations for crystal MDA devices are also included when possible.

Results of MDA treatment for papulopustular acne are shown before (Figure 3A) and after 6 treatments (Figure 3B) performed 2 weeks apart. The topical solution used for dermal infusion included 2% salicylic acid.

**PITFALL:** Treatment of papulopustular acne and rosacea are contraindicated with crystal MDA devices.
Results of MDA treatment for hyperpigmentation are shown before (Figure 4A) and after 6 treatments (Figure 4B) performed 2 weeks apart. The topical product used for dermal infusion included hydroquinone, kojic acid, and arbutin.

Results of MDA treatment for papulopustular rosacea are shown before (Figure 5A) and after 6 treatments (Figure 5B) performed 2 weeks apart. The topical solution used for dermal infusion was 2% erythromycin and 2% salicylic acid.
Step 1. Perform a detailed skin evaluation prior to initiating treatment (see Skin Analysis Form in Step 1). Fitzpatrick skin type classification is used to describe background skin pigmentation and the skin’s response to sun exposure (see Chapter 31 for

**SKIN ANALYSIS FORM**

Name: ___________________________ DOB: ___________________________

Fitzpatrick Skin Type Classification (check one):

- **Skin Type I**: White
  - Sun exposure reaction always burns, peels, never tans
- **Skin Type II**: White
  - Usually burns, tans with difficulty
- **Skin Type III**: White
  - Sometimes mild burn, tans average
- **Skin Type IV**: Moderately brown
  - Rarely burns, tans easily
- **Skin Type V**: Dark brown
  - Very rarely burns, tans very easily
- **Skin Type VI**: Black
  - Never burns, tans very easily

Glogau’s Photoaging Classification (check one):

- **Group I**: Mild (28-35 years old)
  - No keratoses, little wrinkling, no scarring, little or no makeup
- **Group II**: Moderate (35-50 years old)
  - Early actinic keratoses, slight skin discoloration, early wrinkling, parallel smile lines, mild scarring, little makeup
- **Group III**: Advanced (50-65 years old)
  - Actinic keratoses, obvious skin discoloration, telangiectasia, wrinkling, moderate acne scarring, wears makeup always
- **Group IV**: Severe (65-75 years old)
  - Actinic keratoses, possible skin cancers, wrinkling, gravitational aging, severe acne scarring, wears makeup thickly

Skin Type

- **Dry**: _____
- **Oily**: _____
- **Combination**: _____

Pre-Procedure Evaluation

Key

- LP – Large Pores
- D – Dryness
- O – Oliness
- M – Milia
- C – Comedones
- T – Telangectasia
- R – Imitation
- SC – Scarring
- P – Pigmentation
- W – Wrinkles

Place abbreviations on facial zones in diagram to note areas of specific conditions and concerns

Zone I

Zone II

Zone III

Zone IV

Zone V

Zone VI

Zone VII

Zone VIII

Zone IX

Zone X

Zone XI

Other:

Other:

Photo Taken: Yes No

Treatment Plan:

Date: ________ Signature: ___________________________

Step 1
additional information), which is integral to determining how aggressive treatments may be. The Glogau classification is a baseline measure of a patient’s degree of photo damage.

MDA may be performed as a very superficial or superficial skin-resurfacing procedure (see Figure 6 for definitions of skin resurfacing terminology). Depths listed in the figure are from the skin surface down to the layer indicated. The depth of exfoliation with MDA increases with increasing vacuum pressure, number of passes, and a more acute hand piece handle. For diamond-tipped devices, the depth of exfoliation also increases with grit coarseness. Downward pressure on the skin may increase the depth of exfoliation with some diamond-tipped devices. The SilkPeel hand piece has a recessed diamond-tipped pad, and downward pressure on the skin does increase exfoliation depth. For crystal devices, the depth of exfoliation also increases by moving the hand piece more slowly over the skin, using larger particle sizes and higher crystal flow rates.

- **PEARL:** Two passes with the SilkPeel using a 60-grit treatment head and vacuum setting of 5 psi (260 mm Hg) penetrates to 30 to 35 μm and will fully remove the stratum corneum.

- **PEARL:** Two passes with most aluminum-oxide crystal MDAs using a vacuum setting of 4 psi (200 mm Hg) will fully remove the stratum corneum.

- **PITFALL:** Greater depths of penetration have greater potential for improvements but are also associated with greater complication risks. Once the dermis is breached, which is typically evident as bleeding, scarring becomes a consideration.

![Figure 6](image-url)
Step 2. Position the patient comfortably, lying supine on the treatment table. Have the patient remove contact lenses, and apply a headband. Cleanse the treatment area with a gentle cleanser and degrease the skin using an alcohol-based astringent. Ensure that the skin is completely dry prior to treatment. Cover the patient’s eyes with goggles or moist gauze. For crystal MDA devices, the operator should wear clear eye protection and a mask to reduce particle inhalation.

Step 3. Select the size and coarseness of the diamond-tipped treatment head (see Step 3). The 6-mm head should be used for the face and the 9-mm head for larger areas, such as the back. Selection of the grit size is based on the aggressiveness of the treatment. The heads range in coarseness from smooth with no diamond chips, fine (120 grit) to coarse (30 grit).

- **PEARL:** With the SilkPeel, most treatments can be performed with the 100-grit head. Hyperkeratotic areas such as elbows and knees respond well to a coarser, 60-grit head. The lips can be treated with the smooth head.

- **PITFALL:** Treatment of the lips is contraindicated with crystal MDA.

Step 4. Set the vacuum flow by occluding the handpiece tip with a gloved finger, as shown in Step 4. The strength of the vacuum affects the depth of resurfacing, and small adjustments in this parameter can fine-tune the intensity of a treatment. Recommended vacuum settings vary by manufacturer. In general, conservative settings should be selected for initial treatments based on the patient’s Fitzpatrick skin type, tolerance, and treatment area using the manufacturer’s guidelines.

- **PEARL:** The SilkPeel vacuum should be set at 3.5 to 4 psi (180 to 200 mm Hg) for treatment on the face and chest, 2.8 to 3 psi (145 to 155 mm Hg) for the neck, and 5 to 6 psi (260 to 310 mm Hg) for the hands and back. For crystal MDA devices, initial treatment vacuum settings range from 50 to 200 mm Hg and are device dependent.

- **PEARL:** Patients with higher Fitzpatrick skin types are more prone to prolonged postinflammatory erythema, PIH, and the lower limits of the range for vacuum settings should be used.

- **PITFALL:** Devices utilizing simultaneous dermal infusion are associated with less discomfort. Patients may experience superficial abrasions without reporting pain.
during treatment, and patient feedback may be a less reliable indicator of treatment intensity. Observation of tissue response is therefore particularly important in determining vacuum settings with dermal infusion devices.

**Step 5.** For dermal infusion devices, select a topical solution for dermal infusion based on the presenting condition. Commonly used products include hydroquinone or other botanical lightening agents such as kojic acid and arbutin for treatment of hyperpigmentation; erythromycin and salicylic acid for acne and rosacea; and hyaluronic acid, allantoin, and glycerin for dehydration. Select a solution flow rate for dermal infusion using the manufacturers guidelines.

- **PEARL:** Two topical solutions may be used during a treatment, for example, to address dehydration and hyperpigmentation.

- **PEARL:** Typical SilkPeel dermal infusion rates range from 15 to 20 mL/min (see Step 5).

**Step 6.** Move the hand piece smoothly and slowly across the skin as shown in Step 6 for treatment of the face. Exfoliation with the SilkPeel will not occur unless the tip is moving across the skin. For the first pass, strokes should be from the central face to the periphery. The procedure usually starts at the forehead, proceeds down the bridge of the nose, and then covers the cheeks, chin, and mouth. Stretch the skin between the fingers, place the hand piece perpendicular to and in good contact with the skin, and move the hand piece across the skin parallel to the tension line between the fingers. Observe skin for the desired clinical endpoint of mild erythema. Reassess tissue response and patient tolerance throughout the treatment and adjust settings accordingly. After completion of the first pass for the entire face, make a second pass following the same stroke pattern as the first pass. The second pass for crystal MDA is usually perpendicular to the first pass. For treatment of the neck, have the patient lift the chin to extend the neck, use vertical strokes, and perform only one pass. For treatment of the chest, perform two passes with strokes from the midline to the periphery. For treatment of the hands, have the patient make a fist around a towel and perform two passes with strokes parallel and then perpendicular to the axis of the forearm.

- **PITFALL:** Petechiae or pinpoint hemorrhages indicate that the settings are too intense and must be reduced.
PEARL: Reduce treatment intensity near thinned skinned areas such as the periorbital area. With the SilkPeel, reduce the vacuum pressure to 2.8 to 3 psi (145 to 155 mm Hg).

PITFALL: With crystal MDA, do not leave the hand piece in one spot because this will increase abrasion depth and may cause injury to the skin.

Step 7. At subsequent visits, parameters may be increased to intensify treatments. In general, only one parameter should be changed to intensify treatments in any given visit. Typically, the number of passes is increased for a few treatments to achieve the desired clinical endpoints, and vacuum settings are increased in the later treatments. A total of two to four passes may be made on thicker skinned areas (see Table 33.1 for skin thickness in different facial areas) such as the forehead, upper lip, and chin or problematic areas, taking into account tissue response and patient tolerance. Grit coarseness may also be increased at subsequent visits to intensify treatments.

PEARL: Acne scars require more aggressive treatments. With the SilkPeel, a 100-grit head with 6 psi and up to four passes cross-hatched over the area may be performed.

Step 8. Apply a soothing topical product and a full-spectrum sunscreen with SPF 30 or greater (containing zinc or titanium).

PEARL: If using a crystal MDA, remove all crystal debris from the face with moist gauze prior to product application, paying close attention to the periorbital area.
Step 9. Sanitize and sterilize reusable equipment parts between patient treatments per the manufacturer guidelines. Step 9 shows the waste container after treatment with skin surface debris and used dermal infusion solution for disposal. After the patient’s treatment is completed, the dermal infusion bottle is replaced with a disinfectant solution that is circulated to sanitize the machine prior to the next patient. The diamond-tipped heads are autoclaved after each treatment for sterilization.

Complications

- Superficial abrasion
- Activation of herpes simplex
- Pain or temporary discomfort
- Prolonged irritation and/or erythema
- Postinflammatory hyperpigmentation (increased risk with high Fitzpatrick skin types)
- Petechiae or purpura
- Ocular injury
- Urticaria (with crystal MDA)
- Remote possibility of scarring (with crystal MDA)

Pediatric Considerations

MDA may be performed for adolescents with parental consent but is otherwise contraindicated for pediatric patients.

Postprocedure Instructions

Patients typically experience mild erythema and dryness for 1 to 2 days posttreatment with crystal MDA but may not experience these aftereffects with MDA utilizing dermal infusion. A nonocclusive soothing moisturizer may be applied frequently as needed for dryness. The patient should avoid irritating topical products such as retinoids, astringents, glycolic acid, and depilatories and not undergo waxing, dermal filler injections, or laser or IPL treatments for 1 week. The patient should also avoid direct sun exposure for 1 week and use a daily full spectrum sunscreen with SPF 30 or greater (containing zinc or titanium). If scabbing occurs, advise patients to avoid picking, because this may result in scarring, and apply bacitracin daily until healed.

Coding Information and Supply Sources

MDA is not reimbursable by insurance. The charges for treatments vary widely and are largely determined by local prices. Patients may pay for individual treatments, which generally range from $100 to $150. However, because MDA is most effective as a series of treatments, packages of treatments (usually six) may be offered so that patients achieve the best possible results and have the greatest satisfaction.
ICD-9 Codes

Acne vulgaris 706.1
Melasma 709.09
Dyschromia, unspecified 709.0
Wrinkling of skin 701.8
Scarring 709.2

Supply Sources

Microdermabrasion Devices


Patient Education Handout

A patient education handout, “Microdermabrasion Treatments,” can be found on the book’s companion Web site.

Bibliography


