

# Update on the Standard of Care of Dermatologic Postprocedural Wounds

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In the United States, the number of procedures performed by dermatologists has increased exponentially with the growing incidence of skin cancer and the aging population. Neville et al<sup>1</sup> examined data from the National Ambulatory Medical Care Survey; based on 12,000 dermatology visits, documented procedures were performed at 40% of visits in 2001 compared to 29.8% of visits in 1995. Dermatologic procedures that produce minor surgical wounds are performed multiple times a day in virtually all dermatology offices and include curettage, shave or punch biopsies, electrodesiccation, laser resurfacing, cryosurgery, and chemical peels. These procedures require thorough postoperative care to ensure satisfactory outcomes for patients.<sup>2</sup>

## Wound Healing

Wound healing is an extremely well-regulated and complex process that is divided into 3 phases: inflammation, proliferation, and tissue remodeling. These reactions are mediated by cytokines, chemokines, and growth factors, as well as the effects of these mediators on cellular receptors. Chronic wounds are the result of an inadequate repair process that is unable to restore anatomic and functional integrity in an appropriate length of time.<sup>3</sup>

## Topical Solutions

Current principles for topical wound management include debridement of necrotic tissue to remove impediments to

the repair process, identification and treatment of infection, and elimination of trauma to the wound bed. Additionally, the dermatologic surgeon also must maintain an environment that is conducive to repair. In the dermatology office, the standard of care for the vast majority of minor superficial wounds includes cleaning the wound with a cleanser or irrigation, applying a topical antibiotic ointment or white petrolatum, and covering the wound with a dressing that typically is worn for 1 to 2 weeks.<sup>4</sup> Keeping the wound moist promotes reepithelialization and accelerates healing. Wounds that are covered with moisture-retentive dressings and ointments have been shown to heal an average of 3 to 4 days faster than those exposed to air or dressed with conventional gauze.<sup>5-7</sup>

## Antibiotics

The initial wound-healing studies were conducted in the 1960s and 1970s and supported the use of topical antibiotics as a means of reducing infection rates, leading to the adoption of prophylactic topical antibiotics as a part of the standard of care for surgical procedures.<sup>2</sup> Because infection rates in these early studies ranged from 12% to 40% before treatment,<sup>8</sup> improvement from antibiotics was not surprising; however, the wounds that were described in these studies included war wounds<sup>9</sup> and playground abrasions in schoolchildren<sup>10</sup> and therefore do not represent the typical wounds that are created under sterile conditions in a dermatologist's office.<sup>11</sup>

Data show that postoperative wound infection rates typically are less than 1.5%<sup>12,13</sup>; however, antibiotic resistance is emerging as a public health issue both in hospitals and communities. Some of this resistance may be the result of the overuse of antibiotics.<sup>14</sup> Dermatologists prescribe more topical antibiotics than any other

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specialty in the United States, accounting for 3 to 4 million prescriptions of topical antibiotics annually.<sup>15</sup> Mupirocin and neomycin have been reported to be culprits of drug resistance,<sup>16</sup> and several antibiotic-resistant strains of *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Propionibacterium acnes* also have been correlated with antibiotic use.<sup>12</sup> One case-control study showed that resistant strains of propionibacteria were identified on the skin of untreated family members living with patients who received topical antibiotics as well as on some of the prescribing dermatologists who participated in the study.<sup>17</sup>

Another important risk linked to topical antibiotics is their potential to incite allergic contact dermatitis, which can adversely affect normal wound-healing rates. Patch tests have shown that both neomycin and bacitracin cause allergic contact dermatitis in approximately 11% and 8% of patients, respectively.<sup>4</sup>

Two recent small double-blinded studies aimed to compare a nonantibiotic, petrolatum-based ointment (Aquaphor, Beiersdorf Inc) to other antibiotic-based first-aid ointments in treating minor wounds from dermatologic procedures.<sup>11,18</sup> Trookman et al<sup>18</sup> utilized an erbium/CO<sub>2</sub> laser in 20 participants to create 4 uniform circular wounds penetrating to the dermis. Each of the 4 wounds was treated 3 times daily for 18 days with either Aquaphor, Neosporin (Johnson & Johnson Consumer Companies, Inc)(neomycin sulfate, polymyxin B sulfate, and bacitracin zinc), or Polysporin (Johnson & Johnson Inc)(polymyxin B sulfate and bacitracin zinc), or no topical treatment. Aquaphor is an antibiotic-free, petrolatum-based ointment that also contains humectants, skin conditioners, and natural barrier lipids, allowing it to facilitate wound healing. Significant improvements in erythema and edema were observed in participants treated with Aquaphor versus those treated with both Neosporin and Polysporin ( $P \leq .007$ ). In addition, the overall wound appearance of the sites treated with Aquaphor were graded by investigators and study participants as superior to those that were treated with the antibiotic-based ointments. More importantly, the study revealed no incidences of infection, suggesting that prophylactic antibiotics are not necessary for the prevention of infection in minor clinical wounds.<sup>18</sup>

In another double-blind study, Draelos et al<sup>11</sup> investigated twice-daily use of either Aquaphor or polymyxin in participants with 2 seborrheic keratoses removed via shave biopsy from the chest or trunk. Clinical grading assessment of wounds treated with Aquaphor versus those treated with polymyxin showed no differences in

wound-healing parameters (ie, erythema, edema, crusting, scabbing) at any point during the 28-day study. Subjective irritation assessment showed that participants with wounds that were treated with polymyxin experienced a significant increase in burning at week 1 ( $P \leq .05$ ), but no differences were observed among both treatment groups in stinging, itching, tightness, or pain experienced. Among 30 participants receiving polymyxin treatment, only 1 case of allergic contact dermatitis was reported.<sup>11</sup> Overall, both of these studies present evidence that challenges the routine use of prophylactic antibiotics as the standard for postoperative care for superficial wounds occurring after commonly performed office-based dermatology procedures.

### Laser Resurfacing

Currently, fully ablative laser skin resurfacing procedures have no well-established standard of care for the treatment of wounds. Patients who receive ablative laser treatments require a prolonged recovery time of at least 2 weeks for facial healing. Patients typically experience edema, oozing, crusting, burning, or a combination of these adverse effects in the first week posttreatment, followed by prolonged erythema and potential pigmentary changes that last for approximately 3 months.<sup>19,20</sup> Typically, nasal bacterial carriage is a concern; therefore, the perceived risk for infection is high. Topical antibiotics generally are not used because of the large treatment area and the concern of allergic contact dermatitis; therefore, systemic antibiotics and oral antivirals frequently are administered before the laser treatment, as postoperative infection can cause permanent scarring. Dicloxacillin or azithromycin are begun at least 24 hours prior to the procedure and are continued for a minimum of 5 days postoperatively. Acyclovir or valacyclovir also are started 24 hours prior to the procedure and are continued until epithelialization is complete (approximately 10 days).<sup>2,21</sup>

The most important requirements for optimizing wound healing after laser ablation are to provide a moist environment, promote cell migration and reepithelialization, and prevent cell death. Maintaining a closed environment that is protected from infection, trauma, and temperature change generally is recommended for wound treatment and is achieved with occlusive dressings, which can be difficult to apply and adhere on an irregular surface such as the face.<sup>22</sup> Application of an ointment or cream is a practical alternative to a dressing with overlying framework. The effectiveness of this open method, however, depends on patient compliance or problems can arise. A bland emollient ointment should

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be applied immediately following frequent soaks with either acetic acid, normal saline, or cool tap water; gentle wiping of the skin; and application of cold compresses. To avoid crusting or scabbing, which can lead to delayed healing and scarring, the ointment must be applied every 1 to 2 hours.<sup>23</sup>

In a double-blind, split-face study by Sarnoff,<sup>24</sup> 20 participants received fractional CO<sub>2</sub> laser resurfacing of the perioral area, with results showing that postprocedural application of Aquaphor resulted in significantly less erythema ( $P=.031$ ) and crusting/scabbing ( $P\leq.038$ ) than the application of a medicated device (Biafine, Ortho Dermatologics).<sup>24</sup> Platelet-rich plasma (PRP) is yet another new topical method that is used to enhance wound healing after laser resurfacing. Na et al<sup>25</sup> treated 25 participants who had received CO<sub>2</sub> laser resurfacing treatments with topical PRP and reported significantly less erythema in all participants ( $P<.05$ ). Platelets contain various materials related to angiogenesis and vascular modeling. Biopsy specimens taken 1 month after the procedure showed thicker collagen bundles on the PRP-treated side as compared to the side treated with normal saline, possibly displaying the enhanced tissue remodeling effect of PRP.<sup>25</sup>

## Summary

In conclusion, every time a dermatologist performs a procedure that inflicts a minor wound, an individual assessment should be made as to how to best promote wound healing. When anatomic locations that are associated with a higher risk for postoperative infections are involved (eg, groin, distal extremities), topical antibiotics can be utilized. Many dermatologists continue to follow guidelines and recommend topical antibiotics for the treatment of minor superficial wounds; however, clean wounds with negligible bacterial burden may not benefit from the use of prophylactic antibiotics.<sup>2</sup> For cosmetic laser resurfacing procedures, proper systemic antiviral and antibiotic regimens are integral measures for infection prophylaxis in addition to the use of topical adjuncts to promote reepithelialization. Future randomized controlled trials involving larger subsets of patients will help to better establish proper standards of care when treating a minor wound created during a simple dermatologic procedure.

## References

1. Neville JA, Housman TS, Letsinger JA, et al. Increase in procedures performed at dermatology office visits from 1995 to 2001. *Dermatol Surg.* 2005;31:160-162.
2. Del Rosso JQ. Wound care in the dermatology office: where are we in 2011? [published online ahead of print January 7, 2001]. *J Am Acad Dermatol.* 2011;64(suppl 3):S1-S7.
3. Schreml S, Szeimies RM, Prantl L, et al. Wound healing in the 21st century [published online ahead of print June 23, 2010]. *J Am Acad Dermatol.* 2010;63:866-881.
4. Sheth VM, Weitzel S. Postoperative topical antimicrobial use. *Dermatitis.* 2008;19:181-189.
5. Winter GD. Formation of the scab and the rate of epithelization of superficial wounds in the skin of the young domestic pig. *Nature.* 1962;193:293-294.
6. Hinman CD, Maibach H. Effect of air exposure and occlusion on experimental human skin wounds. *Nature.* 1963;200:377-378.
7. Field FK, Kerstein MD. Overview of wound healing in a moist environment. *Am J Surg.* 1994;167(1A):2S-6S.
8. Forbes GB. Staphylococcal infection of operation wounds with special reference to topical antibiotic prophylaxis. *Lancet.* 1961;2:505-509.
9. Heisterkamp C 3rd, Vernick J, Simmons RL, et al. Topical antibiotics in war wounds: a re-evaluation. *Mil Med.* 1969;134:13-18.
10. Langford JH, Artemi P, Benrimoj SI. Topical antimicrobial prophylaxis in minor wounds. *Ann Pharmacother.* 1997;31:559-563.
11. Draelos ZD, Rizer RL, Trookman NS. A comparison of postprocedural wound care treatments: do antibiotic-based ointments improve outcomes? [published online ahead of print January 17, 2001]. *J Am Acad Dermatol.* 2011;64(suppl 3):S23-S29.
12. Del Rosso JQ, Kim GK. Topical antibiotics: therapeutic value or ecologic mischief? *Dermatol Ther.* 2009;22:398-406.
13. Whitaker DC, Grande DJ, Johnson SS. Wound infection rate in dermatologic surgery. *J Dermatol Surg Oncol.* 1988;14:525-528.
14. Weber CJ. Update on antimicrobial resistance. *Dermatol Nurs.* 2006;18:15-18.
15. Del Rosso JQ, Leyden JJ. Status report on antibiotic resistance: implications for the dermatologist. *Dermatol Clin.* 2007;25:127-132, v.
16. Spann CT, Taylor SC, Weinberg JM. Topical antimicrobial agents in dermatology. *Dis Mon.* 2004;50:407-421.
17. Ross JI, Snelling AM, Carnegie E, et al. Antibiotic-resistant acne: lessons from Europe. *Br J Dermatol.* 2003;148:467-478.
18. Trookman NS, Rizer RL, Weber T. Treatment of minor wounds from dermatologic procedures: a comparison of three topical wound care ointments using a laser wound model [published online ahead of print January 17, 2001]. *J Am Acad Dermatol.* 2011;64(suppl 3):S8-S15.
19. Nanni CA, Alster TS. Complications of carbon dioxide laser resurfacing. an evaluation of 500 patients. *Dermatol Surg.* 1998;24:315-320.
20. Manuskiatti W, Fitzpatrick RE, Goldman MP. Long-term effectiveness and side effects of carbon dioxide laser resurfacing for photoaged facial skin. *J Am Acad Dermatol.* 1999;40:401-411.
21. Batra RS. Ablative laser resurfacing—postoperative care. *Skin Therapy Lett.* 2004;9:6-9.
22. Zitelli J. Wound healing for the clinician. *Adv Dermatol.* 1987;2:243-267.
23. Atiyeh BS, Dham R, Costagliola M, et al. Moist exposed therapy: an effective and valid alternative to occlusive dressings for postlaser resurfacing wound care. *Dermatol Surg.* 2004;30:18-25.
24. Sarnoff DS. A comparison of wound healing between a skin protectant ointment and a medical device topical emulsion after laser resurfacing of the perioral area [published online ahead of print January 17, 2011]. *J Am Acad Dermatol.* 2011;64(suppl 3):S36-S43.
25. Na JI, Choi JW, Choi HR, et al. Rapid healing and reduced erythema after ablative fractional carbon dioxide laser resurfacing combined with the application of autologous platelet-rich plasma. *Dermatol Surg.* 2011;37:463-468. ■