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BACKGROUND. Occlusive dressings increase the speed of epidermal wound healing by decreasing wound adherence, maintaining a moisture barrier, and allowing contact with healing factors.

OBJECTIVE. To test whether a thin film of silicone and polytetrafluoroethylene blended into an interpenetrating polymer network (SPIPN) can provide improved healing over petrolatum following CO_2 laser resurfacing injury.

METHODS. A bilateral comparison of closed SPIPN versus open healing following two different CO_2 laser delivery systems for resurfacing was performed. Twenty patients were followed and evaluated at days 1, 2, 3, 7, 14, 30, 60, and 90 for exudate, erythema, rate of epithelialization, pigment changes, postoperative pain, pruritus, cosmetic results, preference, and duration of postoperative complications.

RESULTS. Results demonstrated improved healing for SPIPN compared to petrolatum alone. Markedly decreased exudate was seen in 90% of the SPIPN dressing sides. Erythema during the first 72 hours was 1.95 for SPIPN versus 2.6 for open (scale 1–4) ($P < .05$). Pruritus was 1.67 versus 2.44 ($P < .05$) for SPIPN versus open during the first 3 days postoperatively. Approximately 75% of the patients preferred SPIPN to control petrolatum. The rate of reepithelialization was also better for the SPIPN dressing, taking only 2 days versus 2.8 days for open control. Approximately 50% of the patients reported decreased pain on the SPIPN side at days 1 and 2.

CONCLUSIONS. SPIPN dressing provides an easily applied, easily tolerated dressing for use after laser resurfacing. Many patients benefit from faster healing, reduced exudate, better appearance during the postoperative period, and decreased postoperative discomfort.

PREVIOUS STUDIES OF wound healing have demonstrated the value of nonadherent dressings.[1] To promote optimal resurfacing in superficial wounds, occlusive dressings need to be applied within 2 hours after wounding and should be kept in place for at least 24 hours.[2] Perforations have increased the safety and utility of the film dressings.[3] Our own feasibility studies of perforated versus nonperforated silicone and polytetrafluoroethylene interpenetrating polymer networks (SPIPN) indicated the necessity of perforations to allow drainage of excess exudate (data on file, Dermatology Associates, Baltimore, MD, 1993–1994). The SPIPN structure is a very thin membranous sheet that is highly conforming to facial curves yet resists fracture. The SPIPN film is stretchable to mold easily and includes small perforations for exit of drainage.

For the open technique to compare to the SPIPN treated side, only white petrolatum was employed. Disadvantages of the open technique include inadequate pain reduction, high dependence on patient compliance, crusting, and a decreased rate of keratinocyte migration.

Methods

Sequential patients during a 1-month period were offered the opportunity (for a reduced fee) to participate in a study that during the healing phase required one-half of the face be treated by one method (closed with SPIPN) with the other half using the open method (white petrolatum, USP). The two centers performing the study performed facial resurfacing under light sedation using either an UltraPulse CO_2 laser (Coherent Medical, Palo Alto, CA) or the FeatherTouch CO_2 laser (ESC/Sharplan, Norwood, MA) at 10,600 nm. Parameters for the UltraPulse were three passes at 300 mJ with a computer pattern generator set on 596 for the first pass, 595 for the second pass, and 594 for the third pass; parameters for the FeatherTouch were 7 W, 6 mm round scan, 125 mm handpiece, 0.5-second duration scan, two to three passes. The SPIPN dressing was applied immediately postoperatively directly on the wound surface without concomitant use of any topical agent. The opposite side of the face was treated postoperatively with a thick layer of white petrolatum. The SPIPN dressing was overlaid with 4 × 4 gauze pads to absorb exudate through the perforations. A tubular elasticized net dressing was then applied. The pa-

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tient returned the next day for dressing inspection. The gauze pads were replaced, and a moist gauze pad was used to remove any dried exudate around the perimeter of the SPIPN dressing. The SPIPN dressing remained in place for 48 hours, changing the gauze secondary dressing as needed. In rare cases the SPIPN dressing was replaced on day 1 by patient request or to maintain proper positioning of the dressing on the wound surface.

The patients were instructed to maintain a copious layer of ointment on the control site and to frequently manage excess exudate with gauze placed in the areas drained by gravity. Healing was evaluated on days 1, 2, and 3 and weeks 1, 2, 4, 8, 12, 16, 20, and 24. Photographs were taken at all phases and used for comparison. Wound healing was evaluated as the percentage reepithelization, and patients were asked subjective questions with each evaluation. Time to complete reepithelization in days was recorded. Erythema, pruritus, pain, and exudate were scored on a scale of 0–4.

Results

Decreased exudate during the first 3 days was observed for 90% of the SPIPN dressing sides (Figure 1). Erythema during the first 72 hours was 1.95 for SPIPN versus 2.6 for open petrolatum (scale 1–4) ($P < .05$). Pruritus was 1.67 for SPIPN versus 2.44 ($P < .05$) for open petrolatum during the first 3 days postoperatively. Three of four patients personally preferred SPIPN dressing to the control petrolatum. The rate of reepithelialization was also better for the SPIPN dressing of 2 days versus 2.8 days for open control. Just over 50% of the patients reported decreased pain on the SPIPN side at days 1 and 2, while others rated the pain as equal.

Our staff was influenced by patient comments and the beneficial effects of SPIPN dressing, so following the conclusion of the study we began to use an entire face mask as the primary means to cover the laser resurfaced face. The only complication we experienced was minor shifting of the dressing on the wound surface. We found that with experience, the tubular net dressing assembly adequately addressed this difficulty. On areas where dressing slippage caused wound exposure, some drying occurred.

Figure 1. Comparison of A) SPIPN versus B) open healing on the same patient at 24 hours.

Discussion

The physical properties and handling features of SPIPN dressing are unique compared to other semiocclusive wound dressings. Comprised of a matrix of two components, this material fulfills the requirements for an ideal dressing after laser resurfacing. These include nonadherence to the wound surface, no tendency to reinjure the wound with removal, and maintenance of a moist wound-healing environment (Figure 2). Oxygen and CO_2 easily diffuse across this thin membrane. Other properties that facilitate its use are easy application by medical assistants and easy maintenance by the patient at home. The polymer network is light-

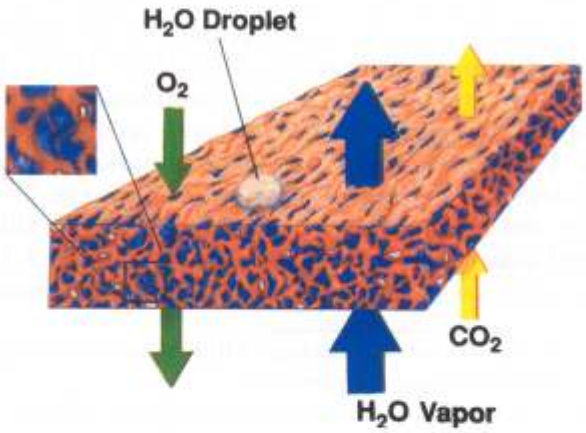

Figure 2. Structure of the SPIPN dressing (Silon-TSR, Biomed Sciences, Bethlehem, PA). Photo courtesy of Biomed Sciences.

weight and allows facial movement without much movement of the secondary dressing assembly. It is available in a face mask that is placed over the entire face and held in place tightly by tying two sets of handles around the back of the head (see Figure 3). Since it is made of the same material as many products marketed for treatment of hypertrophic scarring,[4–6] there might be some possibility of obtaining a better long-term cosmetic result (which we could not confirm) with early use of this dressing. Excellent long-term clinical results are typically seen with any wound care regimen as long as proper principles of wound care are followed[2] (Figure 4).

The SPIPN wound dressing offers significant advantages over the open technique for wound healing following laser resurfacing using various resurfacing devices. The SPIPN dressing allows faster healing with an immediate improved appearance of the laser resurfacing sites. The closed technique using this dressing offers reduced epithelialization time, reduced erythema, reduced pruritus, and reduced exudate. In our study, patients greatly preferred the thin film SPIPN over the open technique. While no long-term improved appearance could be demonstrated at 24 weeks on the SPIPN side, the healing process showed a much smoother appearance and higher patient satisfaction. Difficulties with maintaining dressing position were overcome with experience and use of the tubular net assembly. Based on this bilateral comparison study, we recommend the use of SPIPN dressing versus the open technique to reduce pain, erythema, and pruritus and to accelerate reepithelialization.

Figure 3. Application of the SPIPN face mask.

Figure 4. Improvement A) before and B) 6 months after SPIPN treatment following three passes with a scanned CO_2 laser (similar results on opposite side treated with open wound care).

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References

1. Zitelli JA. Delayed wound healing with adhesive wound dressings. J Dermatol Surg Oncol 1984;10:709–10.
2. Eaglstein WH, Davis SC, Mehle AL, Mertz PM. Optimal use of an occlusive dressing to enhance healing. Effect of delayed application and early removal on wound healing. Arch Dermatol 1988;124:392–5.
3. Winter GD. A note on wound healing under dressings with special reference to perforated-film dressings. J Invest Dermatol 1965;45:299–302.
4. Gold MH. A controlled clinical trial of topical silicone gel sheeting in the treatment of hypertrophic scars and keloids. J Am Acad Dermatol 1994;30:506–7.
5. Fulton JEJ. Silicone gel sheeting for the prevention and management of evolving hypertrophic and keloid scars [see comments]. Dermatol Surg 1995;21:947–51.
6. Phillips TJ, Gerstein AD, Lordan V. A randomized controlled trial of hydrocolloid dressing in the treatment of hypertrophic scars and keloids. Dermatol Surg 1996;22:775–8.