Management of Difficult Wounds with Biobrane®

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Abstract—**Nine patients with open wounds are reviewed. All wounds were debrided prior to application of Biobrane®. Silver sulfadiazine was applied twice daily. All healed uneventfully after closure.**

Biobrane is recommended for treatment of difficult and large open wounds; its use reduces evaporative loss and bacterial proliferation, enabling development of a healthy wound base suitable for grafting or delayed closure. This approach can prevent the necessity for flap repair and reduce pain during wound dressing.

Wounds such as lower extremity ulcers are often resistent to therapy. Repeated debridements may result in further desiccation without progression of wound healing.

Biobrane-treated wounds develop a healthy granulating base which can be grafted or closed.

Patients and Methods

THE treatment of nine patients with difficult-to-manage woulds are reviewed (Table I). The etiology of the wounds includes trauma, pressure, postoperative wound dehiscence, systemic lupus erythematosus, and ischemia.

The management of these wounds consisted of debridement and application of Biobrane (large pore type) followed by twice daily dressings with silver sulfadiazine. Wound closure was performed either with a split-thickness skin graft or edge-to-edge closure.

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Results

The average age of the patients was 59 years. Three were male, six were female. Three patients were diabetic. All wounds but one were of the lower extremity. One patient had wounds of both lower extremities and one upper extremity.

Treatment consisted of split-thickness skin grafting in nine and delayed primary closure in two patients. The size of the skin graft varied from 12 to 900 cm^2. Biobrane was applied after one debridement in three cases, after two debridements in five, and after three debridements in one case. The total duration of application of Biobrane averaged 19 days with a maximum of 55 and a minimum of six days. All wounds healed completely, and no wound broke down subsequently. Follow-up was a minimum of two months, a maximum of 48 months, and an average of 14.7 months.

Case Reports

CASE 1.—DG, a 37-year-old male thrown from a motorcycle sustained de-gloving wounds to both lower extremities and the left upper extremity with extensive abrasions to the back and both lower extremities (Fig. 1A).

The wounds were initially debrided and left open. Two days later he was returned to the operating room with wound sepsis. The right thigh, right knee, and left elbow were incised further. He was returned to the operating room 48 hours later for further incision and drainage and application of Biobrane to all wounds. Thereafter dressings were performed in the ward. Six days later, the Biobrane was removed (Fig. 1B). All wounds were closed directly or with skin grafts. All wounds healed (Fig. 1C), and were seen at follow-up, 3.5 months later.

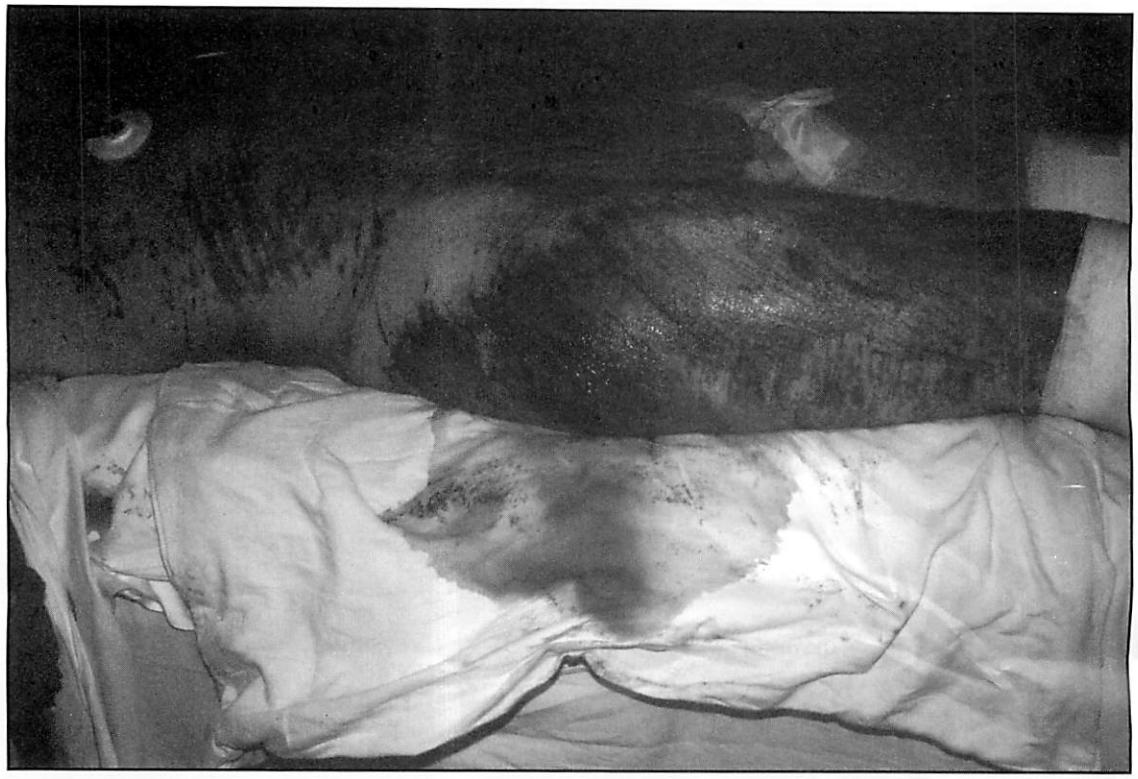
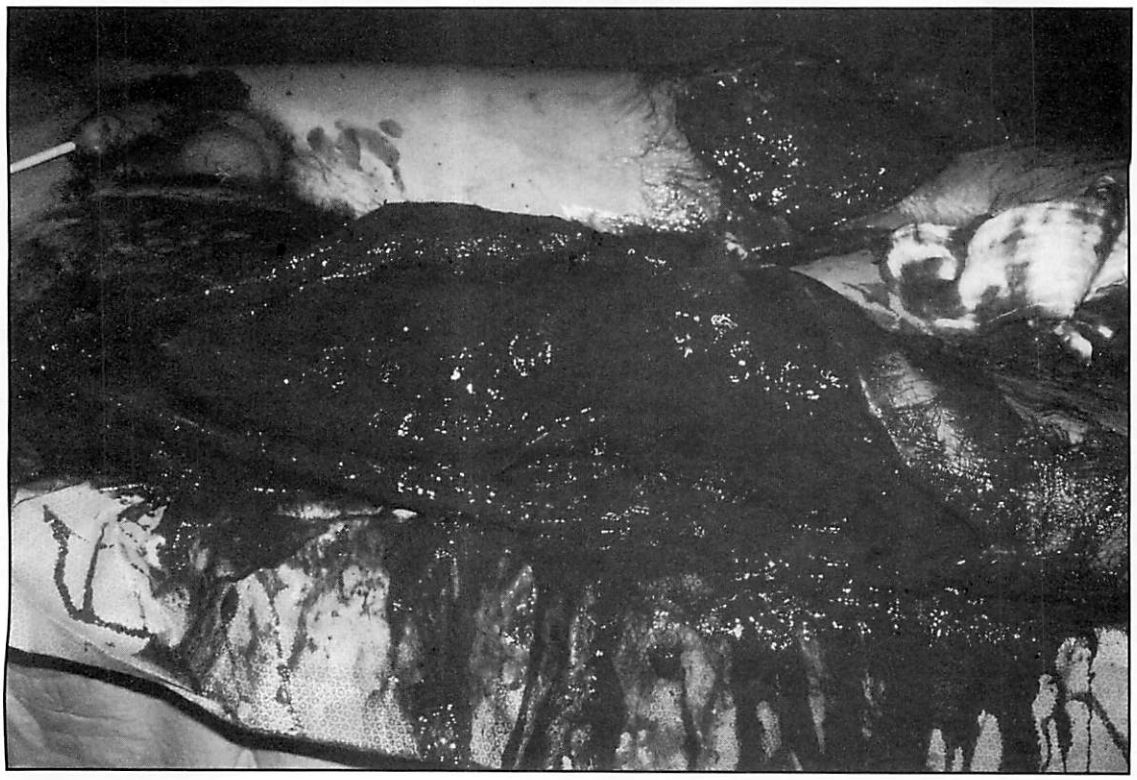


Figure 1A.—A 37-year-old man with extensive abrasions of the back and all four extremities with de-gloving injuries of the left elbow and both lower extremities.

Figure 1B.—Open wound after removal of Biobrane® and prior to closure.



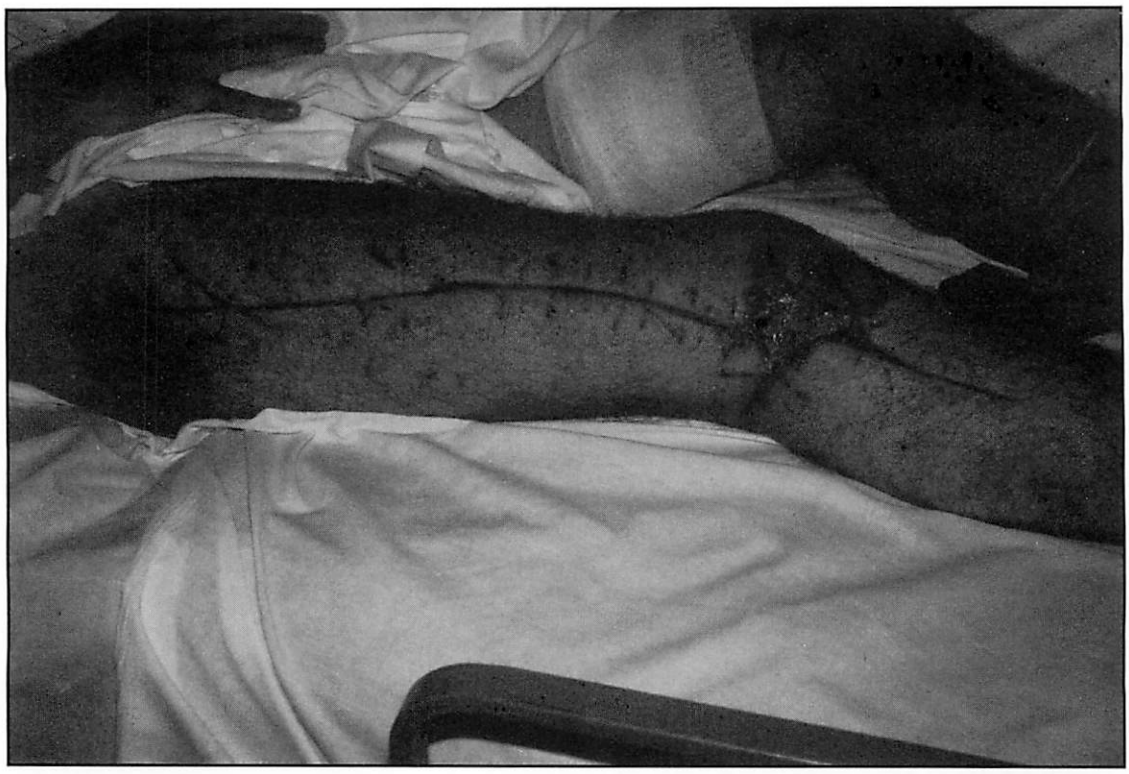


Figure 1C.—Healed wounds after delayed primary closure and split thickness skin grafting.

CASE 2.—AS is a 74-year-old white female with a history of systemic lupus erythematosus, nephrotic syndrome, hypoalbuminemia, uremia, and diabetes. She presented with a necrotic ulcer with exposed muscle and tendon of the left leg (Fig. 2A). She had been treated by her referring physician with multiple debridements over several months without improvement. After referral, all wounds were debrided and Biobrane applied. The procedure was repeated nine days later. Four days later she developed an infection of the right leg which was incised and drained. At the same time, the ulcer of the left leg was debrided for the third time (Fig. 2B) and Biobrane applied. Eleven days later the Biobrane was removed from the left leg and the wound was grafted. The wound of the right leg was debrided and Biobrane applied. Eight days later the right leg was grafted. All wounds healed uneventfully (Fig. 2C). Follow-up was 24 months later.

CASE 3.—MG is a 71-year-old white female with wound dehiscence following a Linton procedure for deep venous incompetence. She had a history of CREST syndrome (calcinosis, Raynaud's phenomenon, esophageal motility disorders, sclerodactyly, and telangiectasia), atrial fibrillation, hypertension, and tricuspid regurgitation. She presented with an ulcer of the left leg with muscle and tendon exposed (Fig. 3A). All wounds were debrided and Biobrane applied. Seventeen days later the wound was debrided again and Biobrane applied. The wound was grafted 38 days after the second procedure, with complete take of the graft. The wound has remained healed (Fig. 3B). Her last follow-up visit was at 26 months.

Discussion

Biobrane is a membrane consisting of dimethylsoloxane mechanically bonded to a very finely knit flexible nylon fabric. It is coated by direct molecular bonding with polypeptide degradation products of dermal collagen. The material is sterile and can be reautoclaved. It is packaged in a dry sterile plastic wrap and has a long shelf life with no special requirements for storage. There are two types, a large (red label) and a small (green label) pore type. The small pore type is recommended for coverage of skin graft donor sites and does not allow sufficient drainage in the case of a contaminated wound. The large pore type allows drainage of wound discharge and does not act like the wall of an abscess. If there is excessive drainage that fails to dissipate throught the Biobrane then it should be changed more frequently. These changes should be accompanied by a wound debridement until the wound is sufficiently clean for the Biobrane to adhere. The wound will then appear as a healthy red granular layer beneath the Biobrane. When the Biobrane is removed a smooth layer of granula-

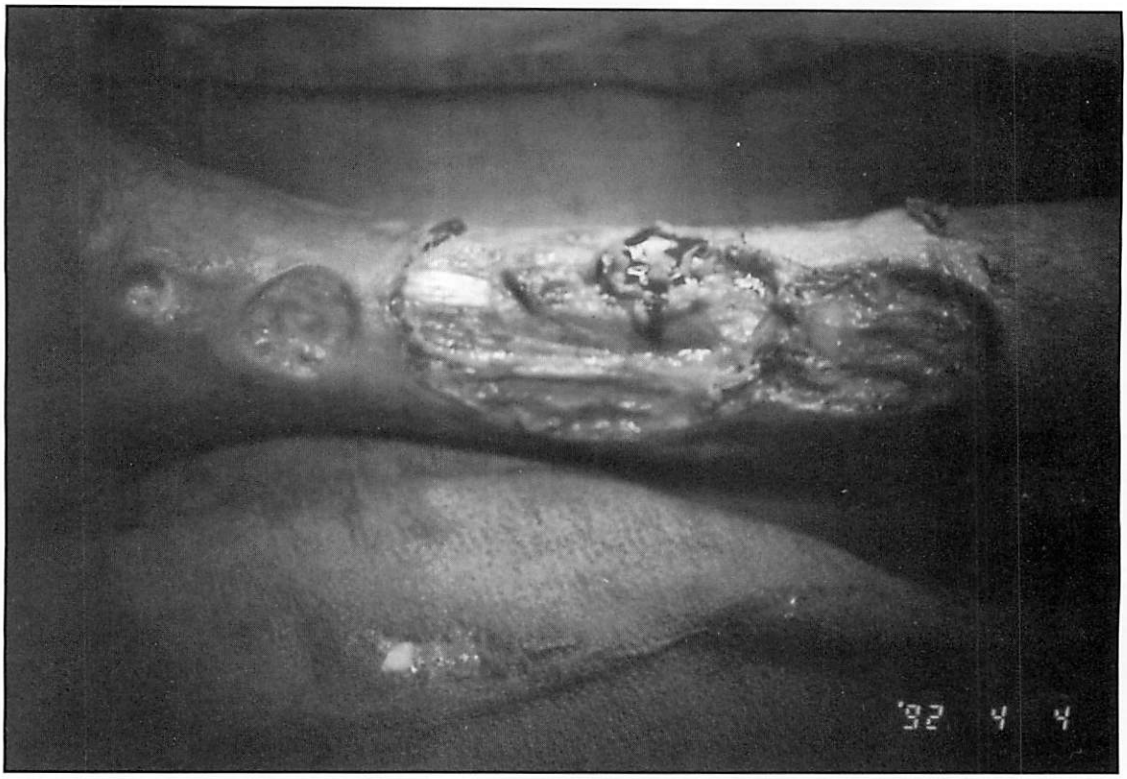
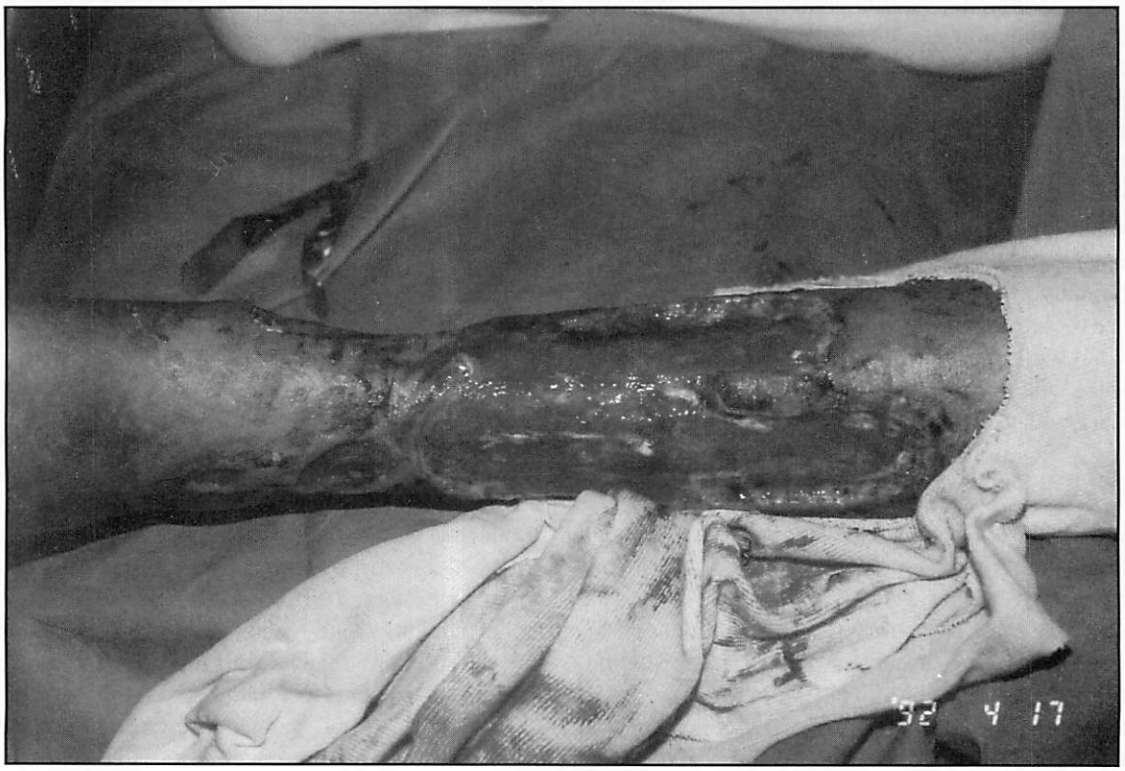


Figure 2A.—A 74-year-old woman with extensive ulceration of the left leg with necrotic tissue and exposure of muscle and tendon.

Figure 2B.—Open wound after two applications of Biobrane®.



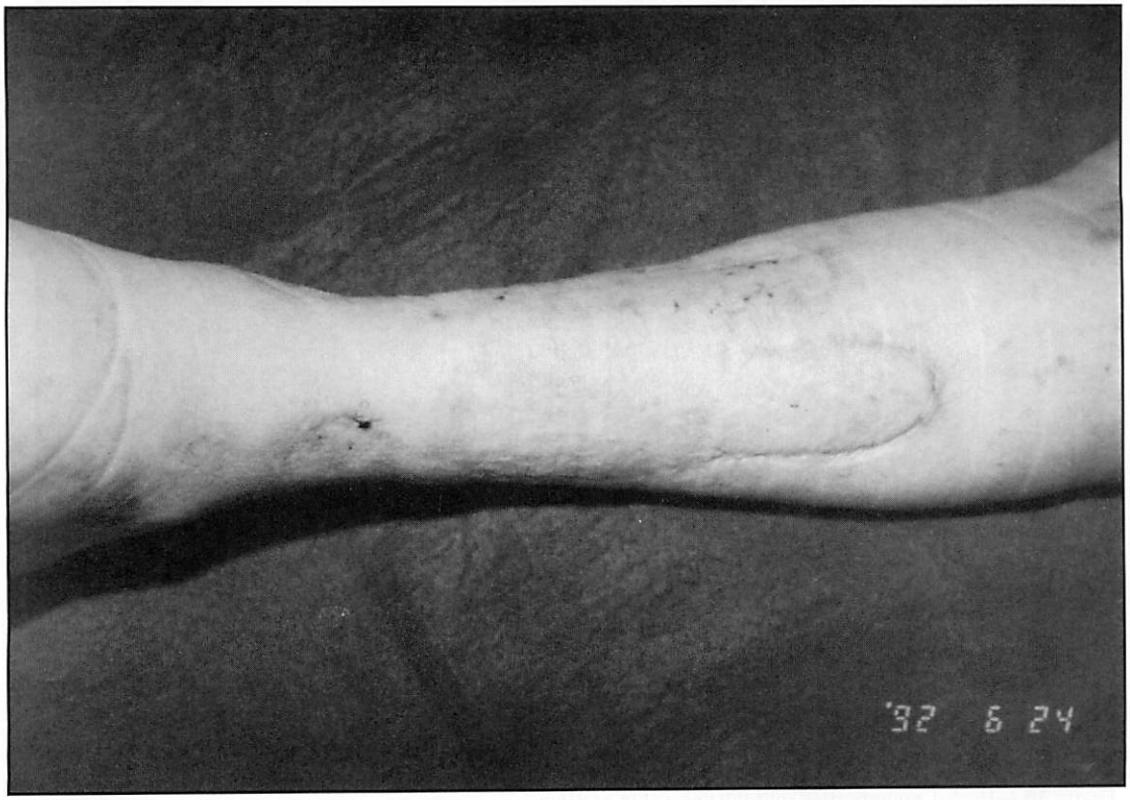
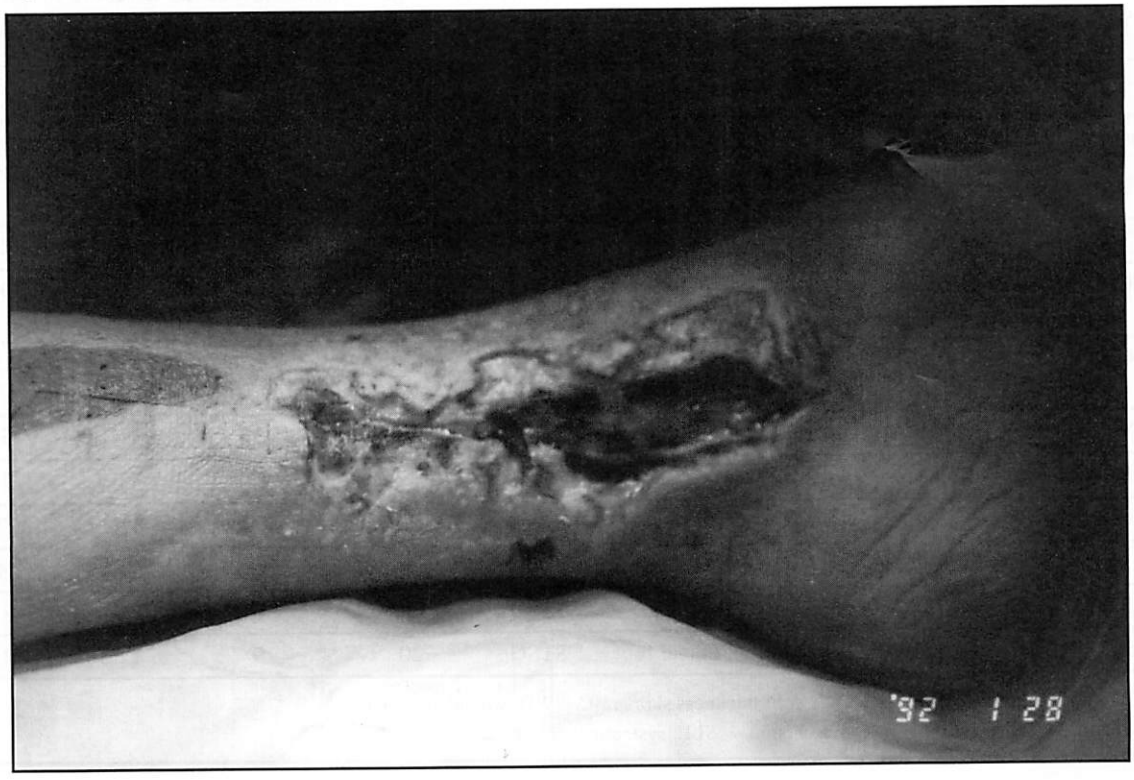


Figure 2C.—Healed wounds after split thickness skin grafting.

Figure 3A.—A 71-year-old woman with wound dihiscence following a Linton procedure with necrotic tissue and exposure of muscle and tendon.



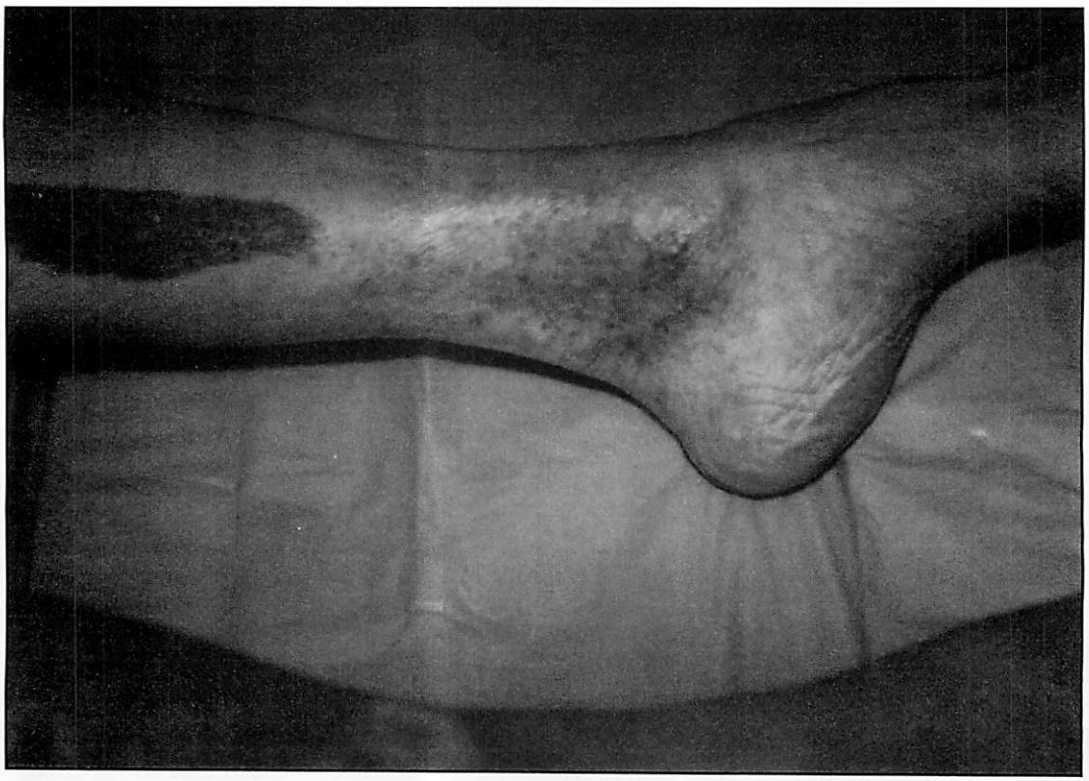


Figure 3B.—Healed wounds after split thickness skin grafting.

tion tissue will be apparent which will readily accept a skin graft.

Biobrane adheres to fresh wound surfaces as well as human allograft does.[1] It reduces evaporative water loss by 90% in test animals.[1]

Frank et al has shown reduced bacterial counts in burn wounds with application of Biobrane.[2] It was found to be a safe and effective alternative to biological dressings, adhering to the wound surface as a result of physical entrapment by fibrin.[2] Biobrane does not debride dead

Table 1.—List of Patients

Name	*Age*	*Mechanism of injury*	*Number of applications*	*Anatomical region*	*Method of closure*	*Skin graft surface area cm²*	*Duration of Biobrane® application (days)*	*Diabetic*	*Follow-up (months)*
JW	20	TR	2	thigh	STSG	900	11	NO	48
GC	30	WD	1	back	DPC STSG	20	14	NO	9
DG	37	TR	1	thigh	DPC STSG	150	6	NO	3.5
EV	65	PR	1	Achilles tendon	STSG	12	24	NO	5
EP	67	TR	2	dorsal foot	STSG	20 estimate	11	YES	7
MG	72	WD	2	leg	STSG	200 estimate	55	NO	27
AS	74	SLE	3 / 1	leg	STSG	260	24 / 8	YES	24
LP	77	TR	2	leg	STSG	190	6	NO	7
JL	89	ISCH	2	dorsal foot	STSG	20	9	YES	2

DPC: delayed primary closure, STSG: split thickness skin graft, WD: wound dehiscence,
TR: trauma, PR: pressure, ISCH: ischemia, SLE: systemic lupus erythematosus

tissue and requires a clean viable uninfected surface to adhere.[3]

Zachary et al showed the efficacy of topical treatment with silver sulfadiazine and mefenide acetate on Biobrane in reducing bacterial counts in infected wounds.[4]

Alternatives to Biobrane are other commercial preparations such as Vigilon®, Duoderm®, Op-site®, and Tegaderm®. Vigilon® must be changed daily. The other three have the negative feature of collection of wound exudate beneath the dressing with possible bacterial proliferation. Biological alternatives are human cadaver skin and porcine xenografts. Both have problems with availability, sterility, and cost. Porcine grafts must be changed frequently.

Conclusion

Debridement of nonviable tissue may result in dehydration of denuded tissue with further loss of tissue viability. Deeper structures, such as muscle and tendon, may be exposed complicating wound closure.

The method of treatment described may allow granulation of a wound over exposed tendon. Application of Biobrane prevents bacterial contamination and desiccation of the wound. In addition, wound care may be performed in the ward with significant relief of pain and without sedation or intramuscular analgesics.

REFERENCES

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