We report the first use of the Integra Bilayer Matrix Wound Dressing (Integra LifeSciences Corp), a collagen sheet with glycosaminoglycans and a silicone layer, in an innovative reconstruction approach to devastating traumatic tissue loss in the periorbital area. A 36-year-old woman was involved in a motor vehicle crash with a resultant large defect from the medial canthus to the temporal fossa and from the pretarsal skin to the brow. There was denudation of skin and soft tissue to the bone at the superolateral orbital apex. The severity of tissue loss precluded placement of an autograft or allograft; thus, a skin substitute was instead used, with a successful reconstructive outcome. Application of the newer bioengineered skin products for full-thickness skin wounds should be considered for reconstruction of the periorbital area.

Treatment of traumatic injuries with eyelid involvement and significant tissue loss can be challenging. Various reconstructive techniques can be used, including local and distal flaps, simple and composite grafts, and bridging and nonbridging techniques depending on the severity of the defect. Although small defects (<1 cm) may be allowed to heal by secondary granulation, management of exposed bone in large defects requires even more careful attention. Large defects with loss of soft tissue down to bone require complex reconstructive options, which are often disfiguring. We describe a 36-year-old woman with severe tissue loss from a traumatic injury involving the upper eyelid whose reconstruction was not possible using traditional methods without causing further deformity. The degree of injury and tissue loss necessitated the use of a skin substitute, and the Integra Bilayer Matrix Wound Dressing (Integra LifeSciences Corp) was successfully used to this end.

A 36-year-old woman was involved in a motor vehicle crash in which she was the driver of the vehicle and sustained multiple injuries including denudation of the skin and soft tissue to the bone at the superolateral orbital apex. A large portion of the scalp area was degloved and contaminated in the injury. She had numerous facial fractures, including a left zygomatic complex fracture. She had a large, left-sided, soft tissue defect from the medial canthus to the temporal fossa and from the pretarsal skin to the brow (Figure 1).

The traumatic injury led to a large area of tissue loss and a paucity of soft tissue to support an autograft or allograft. Reconstruction options were considered, but the significant soft tissue loss, exposed orbital fracture, compromised blood supply, and extensive wound contamination made many of these options problematic. Tissue was advanced as possible, but an 8 × 5-cm defect was still present. The bilayer matrix graft was used to fill this remaining defect. It was secured over the surface of
the defect with interrupted 6-0 Prolene suture, was sutured along the perimeter with interrupted 6-0 Prolene suture, and was covered with an antibacterial, silver-impregnated dressing followed by a layered compression dressing to prevent shearing and detachment of the engineered tissue.

The wound was carefully inspected daily, taking care not to dislodge the graft. The implant stimulated vascularization. Three weeks after initial placement, the silicone layer was removed and a rich vascularized base had developed at the site of the graft (Figure 2). A left clavicular autograft, meshed 1:1 to cover the area, was placed over this neodermis. One month after autograft placement, a 2-cm area of non-epithelialized tissue was noted. Another autograft was harvested from the right clavicular area and secured into position. At this time, our patient also had significant lagophthalmos with cicatrix to the superior orbital rim, which was meticulously dissected. She underwent a final autograft from the internal sur-

face of the right upper arm 2 months later for recurrent cicatricial changes at the superior orbital rim and lagophthalmos. She has done remarkably well with the reconstruction (Figure 3). The skin texture and compliance over the area of the previous defect are similar to those of native eyelid skin.

COMMENT

Integra Bilayer Matrix Wound Dressing is a bilaminar membrane that acts as a scaffold for cellular invasion and capillary growth. It is composed of a dermal-like layer (cross-linked bovine tendon collagen and glycosaminoglycan) and an epidermal-like layer (synthetic polysiloxane polymer). After placement, the dermal layer becomes progressively vascularized over 2 to 3 weeks. The artificial epidermal layer is then removed and the neodermis is used as a base for an ultrathin autograft.

The Bilayer Matrix Wound Dressing belongs to a family of engineered materials designed for soft tissue reconstruction. The first generation includes the Integra Dermal Regeneration Template, which has been extensively used in the setting of thermal injuries and in reconstructive surgery—including cases in which joints, tendons, and bones have been exposed. The success of the Dermal Regeneration Template in burn reconstruction led to its use in a variety of other reconstructive applications. The Bilayer Matrix Wound Dressing was developed for treatment of traumatic wounds. We used this bioengineered tissue in the setting of traumatic bone exposure but with the added caveat of upper eyelid involvement. To our knowledge, there have been no reports of the use of this bilayer matrix in traumatic injuries involving the eyelid. The use of the Dermal Regeneration Template in thermal injuries of the eyelid has been associated with contracture during the waiting period for vascularization, with resultant ectropion and exposure keratitis. We did not experience contracture during the waiting period, but our patient did develop cicatricial changes and recurrent lagophthalmos. These

Figure 1. Preoperative photograph showing severe tissue loss and bone exposure. There is a large defect extending from the medial canthus to the temporal fossa and from the pretarsal skin to the brow.

Figure 2. Healthy granulation tissue with a rich vascularized base that has developed at the site of the Integra Bilayer Matrix Wound Dressing (Integra LifeSciences Corp).
events, however, occurred at a much later time—1 month and 3 months after graft vascularization was achieved.

A drawback to the use of bioengineered tissue in the eyelid may be contracture, but it is still a viable option in severe traumatic injuries with significant tissue loss. The costs associated with the use of this material must be considered. These costs include both the product cost and the wound management cost. Our patient was discharged to the immediately adjacent rehabilitation hospital, which allowed for the necessary wound care in a less expensive setting. Patients with burns, the use of this artificial skin has been shown to decrease the length of hospital stay. A significant advantage to the use of this bilayer-matrix engineered tissue in large traumatic periorcular wounds is the decreased operative time for application of the product compared with the extended operating room time to harvest and graft a microvascular free flap. Preservation of the normal facial contours and minimization of secondary deformity were also accomplished by use of this material.

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