Delayed sandwich technique for covering complex wounds: Integra™ beneath a split-skin graft

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The challenge of complex wounds regularly confronts practitioners in a variety of clinical environments. Wound closure is the primary objective but the ultimate aim is to allow the patient to return to normal life. This case study presents the results of a delayed sandwich technique used to cover a complex wound using Integra™ Bilayer Matrix Wound Dressing (Integra Life Sciences, Dublin) beneath a split-skin graft.

Introduction

Integra is a dermal regeneration scaffolding template used for the treatment of severe burns where the dermis layer of the skin is severely damaged. It provides a scaffolding system that generates a neodermis — a dermis-like tissue that will normally adequately accept a split-skin graft after 14 to 21 days. The template consists of two layers. The outer layer is made of a thin silicone film that acts as the epidermis and functions to control fluid loss and acts as a bacterial barrier, while the inner layer is constructed of a complex of three-dimensional porous matrix cross-linked collagen and gylcosaminoglycan fibres. This acts like a scaffolding system for the regrowth of dermal layers of the skin.

Once in place the dermal skin begins to regenerate. It can take 2–3 weeks for the neodermis to grow. It is at this stage that the outer silicone layer is removed in theatre to expose the neodermis which is the wound bed for the application of a thin epidermal skin graft. There are reported cases of physicians modifying the original composition of Integra by manually separating the silicone layer from the matrix and stacking and rolling the Integra matrix to aid the adjustment of tissue contour defects (Frame and Frame, 2006). This would be suitable for wounds that have a concave surface. Alternative treatment may include camouflage or prosthetics or more extensive reconstructive surgery. This case study reports the results of using Integra matrix wound dressing without the silicone layer as a ward dressing to support and protect a wound before the application of a delayed skin graft.

Background and initial management

Patient X sustained an injury to his Achilles tendon while playing cricket. He was devastated as his whole life and career revolved around sport. Surgical intervention was the only treatment option and his Achilles tendon was repaired under a general anaesthetic by an orthopaedic surgeon. Following surgery, a plaster of Paris was applied for three weeks. Immediately following removal of the plaster, the patient sustained a full-thickness, central dehiscence directly over the Achilles tendon repair. This was associated with tension, swelling, pain, stiffness in his ankle and a halo of erythema and tenderness surrounding the wound.

After two weeks of treatment by outpatient nursing staff, the patient was referred to the plastic surgery nurse's outpatients team because the wound was deteriorating. The wound was found to be complex. Clinically it appeared infected, showing signs of re-epithelialisation at the wound margins. The wound interface appeared swollen and over-granulated, with purulent exudate. The surrounding skin appeared macerated and under obvious tension. The patient was experiencing pain, which was impeding physiotherapy and recovery.

The purulent exudate continued to erupt followed by the emergence of sutures from the depths of the wound, which led to further breakdown. After two months the plastic tissue viability nursing team asked the orthopaedic surgeon to take the patient back to theatre to explore the tissue mass and surgically debride the wound. After a further three weeks the patient's wound dehisced in two places. The surrounding tissue became indurated,

Figure 1. Debridement of wound and removal of sinus capsule.

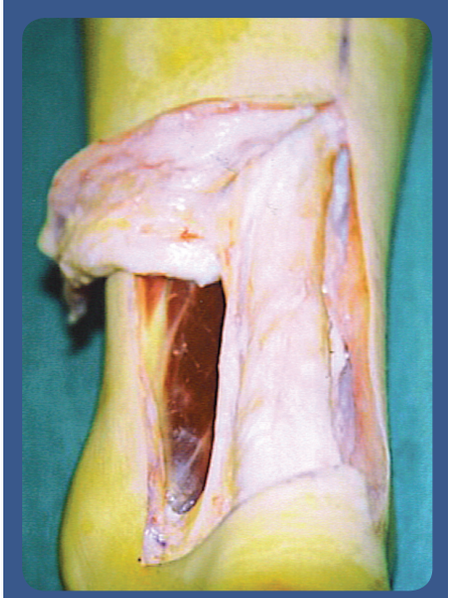

Figure 2. Elevated rotation flap.

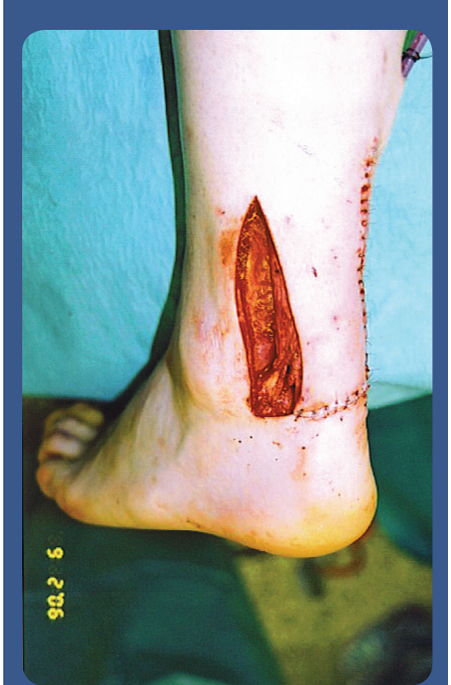

Figure 3. Position and suturing of local rotation flap to the defect.

swollen and the wound again expressed purulent exudate. The team approached the orthopaedic surgeon and asked for a referral to the plastic surgery department as they felt the wound may require soft tissue reconstructive surgery. Following consultation, the patient underwent a further exploration which involved extensive debridement of the wound under general anaesthetic where more sutures were removed alongside a sinus capsule (*Figure 1*).

Wound reconstruction

The wound reconstruction involved a local rotation flap to cover the tendon (*Figures 2 and 3*). The remaining defect required delayed application of a split-skin graft. There was, however, an added complication in that the sural nerve was exposed (*Figure 4*). Integra™ Bilayer Matrix Wound Dressing was used to cover and protect the exposed nerve directly under the delayed skin graft while undertaking an aseptic dressing procedure on the ward. Delayed skin graft application in rotation flap defects, or other wounds, is not a new concept, however, it can be challenging when the nerve is exposed. Skin graft inhibition directly over nerves are not always successful and the friction of a movement could induce a nuroma and therefore inhibit the patient's reconstruction recovery.

The nerve was too central to reposition and there was not available tissue to cover the sural nerve. Intregra provided a biodegradable padding and cushion for the nerve and also a dermal regenerative scaffolding template that ultimately would prevent complications and enhance the overall outcome of the reconstruction.

The consultant agreed that the dressing change and application of Integra and skin should take place 24 hours post-operatively. Integra was prepared according to the manufacturer's guidelines. A 20mm^2 was applied directly over the nerve leaving a 0.5cm margin parallel to the wound edges (*Figure 5*). This enabled the overlying split-skin graft to adhere to the wound bed, stabilising the graft, and allowing the diffusion of nutrients to ensure its survival. The wound was dressed with Mepitel (Mölnlycke, Oldham), gauze, Velband padding (Smith and Nephew, Hull) and crepe. The patient remained on bed rest for four days and the dressing was first checked 48 hours after application.

The patient was discharged at day four and continued to be seen at regular intervals for eight weeks in the plastic surgery outpatients' clinic. Wound appearance after 10 days is shown in *Figure 6*. Four months after surgery the patient returned for his follow-up consultation. There was an excellent contour of ankle, no pain, swelling or sign of infection, minimal loss of sensation and a graft which had contracted by 50% of its original dimensions (*Figure 7*).

The texture and suppleness of the graft itself continued to improve. The patient has now resumed all his normal activities, including participating in sport and is extremely pleased with the result. The sandwich technique proved to be favourable for this complex wound. Neither the rotation flap or the use of delayed application of Integra matrix wound dressing directly beneath a split-skin graft sustained any complication and there was no evidence of nuroma, seroma, infection, rejection, pain, compromised tissue viability or concaved contour. The end result provided an acceptable contour to both patient and practitioners.

Conclusion

In conclusion, while Integra is not suitable as a wound dressing for all complex wounds, it is a useful adjunct when faced with extreme clinical challenges in wound care management. **WUK**

References

Frame JD, Frame JE (2006) Modifying Integra as a regeneration template in deep tissue planes. *J Plast Reconstr Aesthet Surg* 59: 460–4

Figure 4. Exposure of sural nerve (indicated by arrow).

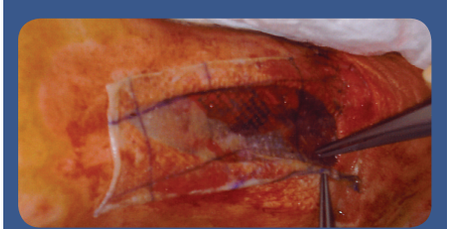

Figure 5. Skin graft application with wound margin overlap to allow for displacement.

Figure 6. Ten days post application.

Figure 7. Four months post application.