Surgical treatment of extended keloid scar with dermal substitute, negative pressure wound therapy and partial thickness skin graft: A case study

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Introduction

Keloids (keloid disorder and keloidal scars) develop at the site of a previous injury as a thick fibrous lesion as a result of aberrant wound healing that is characterized by ongoing, yet localized inflammation. Keloids result as the overgrowth of granulation tissue (collagen type 3) at the site of healed skin, which is then slowly replaced by collagen type 1. Keloids are benign lesions that usually are firm, rubbery and shiny. They can vary from pink to the patient's skin color and be accompanied by severe itchiness and pain. Keloids can be distinguished from hypertrophic scars by their horizontal growth surpassing the original wound margins and their failure to resolve over time.^{1,2} Keloid development rests on genetic and environmental factors, they tend to occur more frequently in female patients aged 10-30.3 A positive correlation to skin pigmentation has been observed, meaning a higher prevalence in individuals with coloured skin.² Keloids are often associated – not only with cosmetic issues – but with functional impairment due to its contractional behavior.⁴ Surgical excision of keloids alone has consistently shown poor results, as it generally results in high recurrence-rates of 40 to 100 percent.³ Often therapy of keloid is multi-modal, combining local pressure, silicone sheeting, intralesional injection of cortisone and/or local radiotherapy.⁴

Case study

We present the case of a young female patient from Eritrea, with sequela from 2nd and 3rd degree burn wounds on her legs and forearms bilaterally following a gas explosion, during which the patient used her arms to shield her face. Within 3 month after injury and conservative treatment, the patient developed extended keloids at the dorsal side of her left hand (8x15 cm) and forearm (8x25 cm) with functional impairment at the wrist and elbow. Initial treatment consisted in daily massage of the scar tissue and compressive sleeve with silicone inlays. Due to an inadequate tissue response to conservative treatment and recurring episodes of pain in the scarred tissue, surgery was performed 16 months after trauma. Surgical treatment consisted of radical scar excision and staged reconstruction of the skin defect with dermal substitute and negative pressure wound therapy*, followed by partial thickness skin graft ca. 4 weeks later. After complete healing of the graft, the patient is pain-free and no longer limited in her movements. At 1.5 years of follow-up there is no sign of recurrence for keloid.





Method

After the excision of the scar lesion, the full thickness skin defect was reconstructed in stages. To reconstruct a sufficient dermal layer, we locally applied a dermal substitute, initially covered with a meshed silicone sheet (bilayer dermal matrix). To adequately steady the matrix and avoid shear stress, we used the technique of NPWT in general and a very easily manageable sleeve-like dressing in particular.

The dressing was changed approximately every 5-6 days and the arm was further immobilized with a removable splint. Once the three-dimensional dermal matrix showed a sufficient ingrowth of granulation tissue, the silicone layer was detached and a meshed partial thickness skin graft harvested with a dermatome from the ipsilateral thigh was applied. It was again temporarily sealed with a NPWT-device, in order to adequately steady the graft, accelerate its attachment to the dermal matrix and eliminate exudate.⁵

Discussion & Conclusion

The excision of large surface keloids overpassing joints and the use of a dermal matrix associated with skin grafts is a useful technique for restoring full thickness skin defects, particularly on the extremities. Yet, adequate immobilization to avoid local shear stress is often difficult and cumbersome.

NPWT is known to perfectly mold the grafts to the wound. Yet, its application using gauzes or cut out foams and several pieces of transparent and self-adhering films is often difficult and time-consuming. Accordingly, NPWT (gauzes or foams) that can be sealed by overlaying a sleeve simplifies the process, lowers the number of manipulations and thus speeds up the execution time. This type of dressing is therefore particularly interesting for extremities (including hand and foot) in a setting where repeated dressing changes are needed.

Picture A-G: Photographic wound documentation

Extended keloid involving the dorsal aspect of the left hand and forearm before (A) and after radical surgical excision (B). After mantling the sleeve over the hand and arm covering the NPWT's foam before (C) and after application of negative pressure (D). After ca. 3 weeks, good ingrowth of granulation tissue in the dermal matrix covered by a shiny silicone layer (E). After application of meshed partial thickness skin graft (F) and healed skin graft at 1.5 year post-op (G).







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