

# Successful Limb Salvage in Severe Lower-Limb Degloving Injury Using MatriDerm® and Homograft: A Case Report

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**Abstract:** *Circumferential degloving injuries of the lower limb are uncommon but devastating traumatic injuries associated with extensive soft tissue loss, exposed tendons and bones, infection risk, and high amputation rates. Early aggressive debridement and timely soft tissue coverage are essential for limb salvage. We report a case of a 55-year-old male with severe circumferential degloving injury of the right leg following a road traffic accident. Management included serial debridement, vacuum-assisted closure (VAC) therapy, application of MatriDerm® with homograft, Achilles tendon stabilization with fixation to the calcaneum, and subsequent split-thickness skin grafting (STSG). Complete graft take and successful limb salvage were achieved with satisfactory functional recovery at 7-month follow-up. This case highlights the role of dermal substitutes and staged reconstruction in complex lower-limb trauma.*

**Keywords:** Degloving injury, MatriDerm®, Homograft, Limb salvage, Vacuum-assisted closure, Split-thickness skin grafting

## 1. Introduction

Degloving injuries are severe soft tissue avulsion injuries in which skin and subcutaneous tissues are forcibly separated from the underlying fascia, muscles, and bones. Circumferential lower-limb degloving injuries are among the most challenging traumatic presentations in surgical practice, associated with significant morbidity due to contamination, vascular compromise, exposed tendons and bone, and a high risk of secondary infection [1].

Conventional management often requires multiple operative procedures and may ultimately culminate in limb amputation, particularly when vital structures such as tendons and bone are extensively exposed. The Mangled Extremity Severity Score (MESS) is routinely used to predict amputation risk; a score of  $\geq 7$  is generally considered an indication for primary amputation, making limb salvage in such cases all the more noteworthy [2].

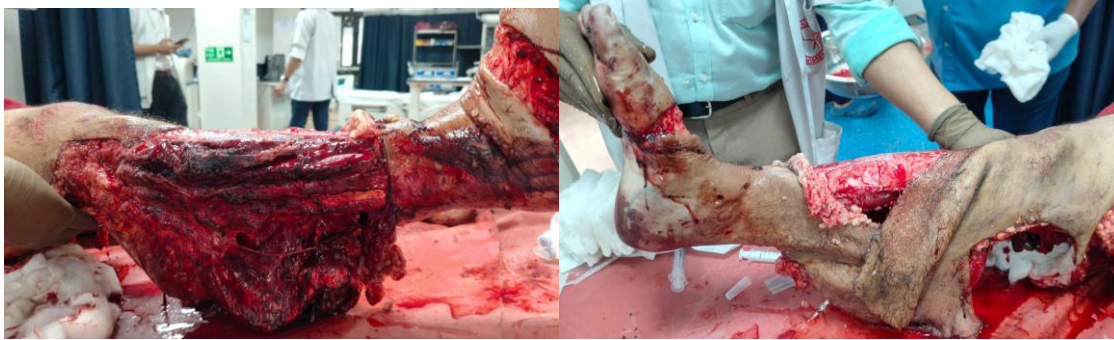
Recent advances in wound care, including negative pressure wound therapy (NPWT) and biological dermal substitutes, have meaningfully improved outcomes in complex soft tissue injuries. MatriDerm® (MedSkin Solutions, Germany), an acellular dermal matrix composed of native collagen types I, III, and V with an elastin hydrolysate coating, provides a three-dimensional scaffold for neodermis formation and promotes graft integration. When used in combination with homograft (allograft skin) and VAC therapy, it creates optimal conditions for granulation tissue ingrowth over exposed avascular structures [3,4].

We present a case of severe circumferential lower-limb degloving with exposed tibia and Achilles tendon avulsion managed successfully with a staged approach using MatriDerm®, allograft, and VAC therapy, culminating in successful limb salvage.

## 2. Case Report

A 55-year-old male was brought to the emergency department on 21 January 2025 following a high-velocity road traffic accident (RTA). On primary survey, he was hemodynamically unstable, meeting criteria for Grade IV hemorrhagic shock, and required aggressive fluid resuscitation. Secondary survey revealed an extensive circumferential degloving injury of the right lower leg with complete avulsion of the overlying skin and subcutaneous tissue, exposed tibia, and avulsion of the Achilles tendon from its calcaneal attachment. The estimated total body surface area involved was approximately 10%. The Mangled Extremity Severity Score was calculated at 7, placing the patient at high risk for primary amputation. Neurovascular status of the distal limb was carefully assessed and preserved.

After hemodynamic stabilization, emergency wound debridement with copious normal saline irrigation was performed on the day of admission (21/01/2025). Devitalized tissue was excised, and the wound was dressed with an antimicrobial dressing pending definitive reconstruction (Figure 1 and 2).



**Figure 1 and 2:** Circumferential degloving injury of the right lower limb on presentation (21/01/2025), demonstrating exposed tibia and soft tissue loss.



**Figure 3 and 4:** Wound appearance following initial debridement and irrigation (21/01/2025).

On 24 January 2025, the patient underwent a second-stage procedure comprising re-debridement of residual non-viable tissue, operative stabilization of the Achilles tendon to the calcaneum using allograft, simultaneous application of

MatriDerm® over the exposed wound bed, and placement of a vacuum-assisted closure (VAC) device to secure the construct and promote graft integration (Figure 5,6,7 and 8).



**Figure 5, 6, 7 and 8:** Wound following secondary debridement, Achilles tendon stabilization with allograft, MatriDerm® application, and VAC therapy placement (24/01/2025).

Serial wound assessments demonstrated progressive and healthy granulation tissue formation over the previously exposed tendon and bone by 31 January 2025 (Figure 9 and 10). The VAC dressing was changed every 48–72 hours.



**Figure 9 and 10:** Wound status on 31/01/2025, showing healthy granulation tissue formation over previously exposed bone and tendon.

On 01 February 2025, the patient underwent re-debridement of any residual non-viable margins followed by split-thickness skin grafting (STSG) over the remaining granulated

raw surface (Figure 11 and 12). The postoperative course was uneventful, with no graft loss, wound dehiscence, or infective complications.



**Figure 11 and 12:** Appearance following split-thickness skin grafting (STSG) over the remaining raw surface (01/02/2025).

At 7-month follow-up in August 2025, the patient demonstrated complete wound healing with full graft integration, no signs of infection or graft failure, and

satisfactory preservation of limb function (Figure 13 and 14). The patient was ambulatory and reported no significant functional deficit.



**Figure 13 and 14:** Wound status at 7-month follow-up (August 2025), demonstrating complete graft take and successful limb salvage with preserved function.

### 3. Discussion

Lower-limb degloving injuries represent a major reconstructive challenge owing to the extent of tissue loss, degree of contamination, and frequent exposure of vital avascular structures including bone and tendon [1]. The primary objectives of management are hemodynamic stabilization, infection control, preservation of viable tissue, and timely achievement of durable soft tissue coverage. Early and meticulous serial debridement is the cornerstone of treatment, as it substantially reduces bacterial bioburden and limits progressive tissue necrosis [2].

Negative pressure wound therapy has well-established benefits in complex wound management, including promotion of angiogenesis, reduction of interstitial edema,

mechanical stimulation of granulation tissue, and maintenance of a moist wound environment. In cases where bone and tendon are exposed, VAC therapy buys critical time for a vascularized wound bed to develop before definitive skin coverage is attempted [3].

MatriDerm® functions as an acellular collagen-elastin scaffold that supports ingrowth of fibroblasts and endothelial cells from the wound margins, enabling formation of a neodermis. Its elastin component imparts pliability to the regenerated tissue, reducing scar contracture — particularly important over functional joints such as the ankle. Simultaneous application of MatriDerm® and a split-thickness skin graft (single-stage) has been described; however, in infected or heavily contaminated wounds with exposed avascular structures, a staged approach using

homograft as a biological temporary cover alongside MatriDerm® followed by delayed autograft is safer and associated with higher graft take rates [4].

In the present case, a MESS of 7 would conventionally suggest primary amputation; however, given preserved distal neurovascular status and a multidisciplinary decision to attempt limb salvage, a staged reconstructive strategy was pursued. The combination of Achilles tendon stabilization with allograft, MatriDerm® application, homograft overlay, and VAC therapy facilitated rapid and robust granulation tissue formation over the exposed tendon and bone, circumventing the need for complex free-flap coverage. Subsequent STSG achieved complete wound closure with functional recovery at 7-month follow-up.

This outcome is consistent with published literature demonstrating improved functional and aesthetic outcomes when dermal substitutes are used in complex traumatic lower-limb wounds [3,4]. Our case further supports the safety and efficacy of a staged multidisciplinary approach in achieving successful limb salvage even in high-risk MESS score scenarios, when distal vascularity is preserved.

#### 4. Conclusion

Severe circumferential degloving injuries of the lower limb, even with high MESS scores, can be successfully managed with a staged, multidisciplinary approach when distal neurovascular integrity is preserved. A strategy combining early serial debridement, VAC therapy, MatriDerm® application, allograft/homograft coverage, and delayed split-thickness skin grafting can reliably achieve durable soft tissue coverage and meaningful limb salvage. This case underscores the evolving and expanding role of acellular dermal substitutes in the management of complex traumatic wounds, and supports their inclusion in the reconstructive algorithm for severe lower-extremity injuries.

#### Declarations

Patient consent: Written informed consent was obtained from the patient for publication of this case report and accompanying clinical photographs.

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Conflict of interest: The authors declare no conflict of interest.

Ethical approval: Not applicable (case report with patient consent obtained).

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