Dehydrated human amnion/chorion membrane for the treatment of full-thickness plantar burn in a diabetic patient: a case report

Authors: Walter Chua, MD, FAPWCA

The Journal of Diabetic Foot Complications, 2014; Volume 6, Issue 3, No. 2, Pages 67-71 © All rights reserved.

Abstract:
Diabetes is associated with both wound healing complications and an increased incidence of infection. Burns carry the additional risks of infection in diabetics, as well as a higher failure rate of skin grafting. This case report details the use of a dehydrated human amnion/chorion membrane (dHACM) allograft to achieve timely healing of a large plantar foot burn in a diabetic. This is an example of the successful use of advanced wound care products in the management of challenging lower extremity wounds.

Key words: Acute Burns, Advanced Wound Therapies, Amnion, Diabetic Wound, Tissue-Based Wound Therapy

INTRODUCTION
Diabetes affects 8.3% of the U.S. population and is associated with both wound healing complications and an increased incidence of infection. These are both sources of morbidity in pedal wound treatment.\(^1\) Thermal wounds carry additional risks; these include infections in diabetics and high failure rates of skin grafting, which is the major treatment modality for large burns with significant tissue loss.\(^2\) Furthermore, plantar split-thickness skin grafts are of limited durability. Timely wound healing is essential in avoiding infection-associated complications and stalled healing.

Amniotic membrane has been used as a skin graft substitute and as a covering for various wound types. These allografts provide both a scaffold for cell migration and extracellular matrix deposition, as well as exogenous growth factors and cytokines which are important for wound healing.\(^3\) More recently, advances in preparation and preservation techniques have allowed for processing of dehydrated human amnion/chorion membrane (dHACM) allografts that are easily used for advanced wound care therapy.\(^4\) This case report details the successful healing of a plantar full-thickness pedal burn in a diabetic patient after a single application of dHACM allograft.

CASE REPORT
A 61-year-old paraplegic man with incomplete T11, ASIA D secondary to a parachuting accident in 1969, and also with Type 2 diabetes mellitus developed a plantar full-thickness left pedal burn from prolonged standing on a hot boat deck with bare feet. He was admitted to the hospital four days after the injury, at which time a physical exam revealed a large burn on the plantar...
surface of the left foot with areas of partial- and full-thickness skin loss (Figure 1). There was no history of peripheral vascular disease, and pedal perfusion was clinically normal with good digital capillary refill; hemoglobin A1c was 7.7%. After serial debridement over two weeks (Figure 2), the wound area measured 13.8 x 4.7 cm. The burn was then treated with a single application of dHACM (EpiFix®, MiMedx, Marietta, GA) which was maintained over the wound bed for one week with a silver alginate secondary dressing. Afterwards the burn was treated with hydrogel. Wound measurement and photography were performed weekly to assess healing (Figures 3 and 4), with the patient remaining on bed rest. The wound rapidly healed (essentially completely) with epithelialization four weeks after the dHACM application.

Figure 1. Initial presentation of plantar full-thickness pedal burn.

Figure 2. Wound after partial debridement.
DISCUSSION

Treating burns in a diabetic person, compared to a non-diabetic, is clinically challenging because these wounds are more prone to poorer clinical outcomes and often require longer and more complicated hospital courses. The preponderance of complications are related to infection, subsequent delayed wound healing, and skin graft failure. Therefore, it is imperative that burn wounds in diabetics be closed expediently to avoid these potential problems. This can entail using autologous skin grafting; however, advanced cell- or tissue-based products are often used to avoid both development of an additional wound at a graft donor site and related morbidity. Amniotic membrane allografts have been used since the early 20th century. Their use has been for both temporary coverage and modulation of local wound healing in a variety of wound types, including burns. These allografts support wound vascularization, cellular viability, and epithelialization. Through modern biochemistry, it is now understood that allografts supply exogenous growth factors and cytokines that stimulate wound healing, and provide a scaffold for cellular migration.

Human placental tissue contains many growth factors and cytokines that are essential for wound healing. Widespread utilization of placental tissue for allografts has been limited by the ability to preserve biological activity during processing. The PURION® Process (MiMedx, Marietta, GA) was recently developed. It gently cleans, dehydrates, and sterilizes placental
tissue obtained from screened and tested donors. This results in a dHACM allograft. Biochemical analysis of dHACM via enzyme-linked immunosorbant assay (ELISA) has isolated several key growth factors and cytokines, both tissue-bound and soluble. This is shown in Table 1.10 Clinical trials have supported these biochemical findings by demonstrating that dHACM is efficacious for healing chronic diabetic foot ulcers.11 The case presented above also illustrated that dHACM can achieve timely healing in a diabetic plantar burn, avoiding complications associated with prolonged healing.

CONCLUSION

Wound treatment in persons with diabetes can be challenging due to sequelae of the disease such as impaired immune function, perfusion, and cellular metabolism. Preventing wounds is primary; preventing complications related to impaired wound healing is secondary. Minimizing the risk of these complications can be done by timely healing of diabetic wound. This can be facilitated through using tissue-based modalities. This case report demonstrates that dHACM is an efficacious treatment for plantar burns in diabetic patients and deserves further study.

(This study was also presented as a poster at the Desert Foot Conference 2013 in Phoenix, AZ on November 20-22, 2013.)

Disclaimers

The opinions expressed in this article are those of the author and not of the U.S. Government or Department of Veterans Affairs.

The patient whose case is referenced in the article signed the VA Form 10-3203 authorizing use of photos for educational purposes.

<table>
<thead>
<tr>
<th>Table 1. Growth factors and cytokines isolated from dHCAM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibroblast Growth Factor</td>
</tr>
<tr>
<td>Epidermal Growth Factor</td>
</tr>
<tr>
<td>Granulocyte Colony-Stimulating Factor</td>
</tr>
<tr>
<td>Platelet-Derived Growth Factor</td>
</tr>
<tr>
<td>Placental Growth Factor</td>
</tr>
<tr>
<td>Transforming Growth Factor</td>
</tr>
<tr>
<td>Interleukins</td>
</tr>
<tr>
<td>Tissue Inhibitors of Metalloproteinases</td>
</tr>
</tbody>
</table>
References


