

Stabilizing the Wound Bed With Aseptically Processed Human Placental Allograft and Meshed Human Reticular Acellular Dermal Matrix Allograft in Pediatric Limb Salvage Reconstructions

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INTRODUCTION

Pediatric lower extremity trauma poses multiple challenges in limb salvage including small blood vessel size, the need to accommodate continued growth,^{1,2} and major healing complications including fractures and infection.³⁻⁵ Additionally, small patient size severely limits donor sites.

Stabilizing the wound bed prior to final reconstruction may be key to improving outcomes. Aseptically processed dehydrated human placental amnion-chorion allograft (dHACA)* preserves inherent properties such as extracellular matrix proteins, growth factors, and antimicrobial peptides. Aseptically processed meshed human reticular acellular dermal matrix (HR-ADM)** also provides an open network structure to support host tissue ingrowth and stabilizes the wound bed.

METHODS

We present two cases where placental and dermal allograft were used to stabilize severe wounds prior to definitive reconstruction in pediatric limb salvage. Long-term outcomes and quality of life were assessed at follow-up.

Case 1 is a 7 year old male with lawnmower injuries resulting in oblique amputation of the left heel and tangential soft and bony tissue loss of the right heel. The right heel was reconstructed with local tissue rearrangement, and the left with dHACA and a sensate medial plantar artery flap.

Case 2 is a 7 year old male from the Marshall Islands who sustained Gustilo-Anderson Grade IIIB, tib-fib fractures initially treated with external fixator and wet-to-dry dressings over exposed bones. Following transfer a month later and orthopedic stabilization with antibiotic spacer, the wound was prepared with HR-ADM and negative pressure for one week prior to definitive coverage with free muscle transfer and skin grafting.

RESULTS

Both patients achieved complete wound closure and ambulation. Case 1 was complicated by wound infection on the right side, requiring IV antibiotics and surgical intervention for infection control. Given the bony loss on the left, human allograft adipose matrix (AAM)*** was added 9 months later for added tissue volume to improve fitting of shoes.

DISCUSSION

In complicated, traumatic and dirty wound injuries, allograft tissue can help stabilize the wound bed for final reconstruction. Studies have shown that placental tissues have preserved angiogenic, anti-inflammatory, and antimicrobial properties, while dermal tissues provide the open network structure to rebuild deep soft tissue loss. These allografts may be useful in wound bed preparation prior to final reconstruction in pediatric limb salvage.

CASE 1

7 year old from Marshall Islands with open tib-fib Gustillo Grade IIIb treated with external fixator and WTD over exposed bone for 2 months. Upon transfer to Honolulu, he underwent multiple debridements and an antibiotic spacer. Plastic surgery was consulted for free tissue coverage. The patient had a 17x15 cm wound with exposed tibia and antibiotic spacer. Because of severe inflammation at the time of the assessment and washout by PS, the wound was covered by a meshed HR-ADM and negative pressure therapy. A week later a free vastus lateralis and split thickness skin grafting was performed. The rest of course was uneventful. Further surgeries included elevation of free flap and exchange of antibiotic spacer with a fibular graft which showed good healing at 3 months post op (last photo).

At the time of the free flap it was noted that the meshed HR-ADM had decreased the inflammatory reaction and prepared the wound bed for flap coverage and skin grafting.



Initial wound upon plastics consult



Intraop for meshed HR-ADM application and negative pressure



1 week post application of the HR- ADM



Free flap inset (free vastus lateralis) with arterial and venous reconnection to the anterior tibialis vessels



After split thickness skin grafting over the free flap and open areas



3 months from all procedures

CASE 2

7 year old male who fell off a lawn mower with bilateral heel amputations, worse on the left. After two washouts, the lesser involved side (right) was closed with a rotation flap. At the third surgery, the left was reconstructed with a medial plantar artery pedicled flap and placental tissue given the severity of the injury to help stabilize wound bed, provide angiogenesis and for antimicrobial properties (both membrane and mini-membrane). Fourth surgery was for skin grafting to the remaining areas on the left that were still demarcating. The left side healed uneventfully, but the lesser involved side that did not have the placental tissue became infected and required debridement and prolonged course of IV antibiotics.

At 8 and 12 months post op, the patient underwent 6 cc fat allograft each time to increase volume of flap given the bone loss in order to make the shoe fit better with marked improvement. At 15 months, he is well healed with playing regular sports.



At presentation to the ER



At second washout and consultation to plastics



At third surgery of reconstruction with medial plantar artery pedicled flap



At 1 week later



At 15 months post initial injury



At second washout and consultation to plastics



At 2nd surgery following rotation flap



1 week later showing signs of infection



12 months intraop prior to injection of fat allograft to soften the area of the scar tissue



At 15 months post initial injury

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*Salera® Placental Allograft and Salera® Mini-Membrane (MTF Biologics, Edison, NJ)
**SomaGen® (MTF Biologics, Edison, NJ)
*** Leneva® (MTF Biologics, Edison, NJ)