The Use of a Novel Hyaluronic Acid Based Device in the Management of Difficult Chronic Wounds

Catherine T. Milne, APRN, MSN, BC-ANP/CNS, CWOCN-AP
Connecticut Clinical Nursing Associates, LLC
Bristol, Connecticut

Study # LIT043WC

This study was sponsored by:

Educare™
wound & skin care education

The clinical education division of MEDLINE

MKT1550870/LIT043WC/2M/K&M7

The Use of a Novel Hyaluronic Acid Based Device in the Management of Difficult Chronic Wounds

INTRODUCTION

Hyaluronic acid is a glycosaminoglycan that contributes significantly to cell proliferation and migration. Glycosaminoglycans are highly polar and attract water, so they are particularly useful to the body as a lubricant. One of the principal extracellular matrix (ECM) components, hyaluronic acid is an essential "building block" of the ECM, and it plays an integral role in ECM dynamic reciprocity[1] and cell surface receptor communications. Hyaluronic acid has also been studied extensively in all phases of wound healing. During the inflammatory phase, hyaluronic acid increases pro-inflammatory cytokines TNF-α, IL-1β, and IL-8 via a CD 44-mediated mechanism, but it also helps moderate the inflammatory response, which may contribute to the stabilization of the granulation tissue matrix. As wound healing progresses into the granulation stage, hyaluronic acid synthesis facilitates cell detachment and mitosis, and a hyaluronic acid rich extracellular matrix provides an open, hydrated matrix that facilitates CD44 and RHAMM mediated cell migration. In the proliferation and remodeling phases, the hyaluronic acid rich extracellular matrix facilitates keratinocyte migration via a CD-44 mediated mechanism. The degradation product of hyaluronic acid have also been shown to regulate water homeostasis, enhance angiogenesis, and protect cell from damage through free radical scavenging.[2]

Historically, hyaluronic acid dressings had the limitation of brisk degradation making practical clinical application challenging. Esterification has mitigated these issues so the 3-D scaffold can facilitate reconstruction of dermal tissue,[3] giving clinicians a new management option. During the biodegradation process, the matrix comprised of a benzyl ester of hyaluronic acid acts as a scaffold for cellular invasion and capillary ingrowth. It has been used with successful outcomes in full thickness trauma wounds,[4] complex chronic ulcers[5,6] and burn wounds[7]. The purpose of this case series was to evaluate the hyaluronic acid wound device in patients with various co-morbidities and difficult chronic wounds.

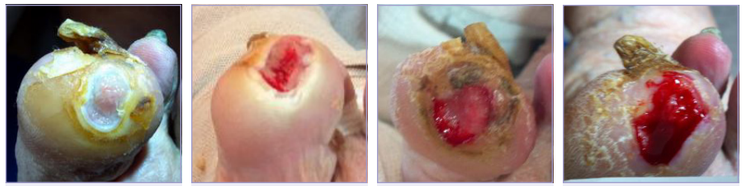
METHODS

A hyaluronic acid wound device was evaluated in a three difficult patients with multiple co-morbidities. The wound beds were properly cleansed at each dressing change. In the weeks prior to the application of the hyaluronic acid wound device, cases 1 and 2 received weekly serial debridement, but case 3 refused debridement. The hyaluronic acid wound device was applied per manufacturer's recommendations in this post-marketing product evaluation in a variety of wound types the patients did not receive serial debridement except for the removal of periwound hyperkeratotic tissue in order to prevent debridement from being a confounding factor. The hyaluronic acid wound device was secured with a fenestrated silicon contact layer and covered with an appropriate cover dressing to manage exudate. Wounds which were selected typically had minimal (less than 40% wound surface area in 4 weeks) response to modern wound care dressings and good wound care practices (successful completion of wound bed preparation and treatment of underlying disease processes). The hyaluronic acid wound device can remain in place for two to three weeks, at which point the hyaluronic acid matrix will have incorporated into the wound bed and the silicone top layer can be removed with ease. Weekly evaluations of wound bed were conducted until the silicone top layer could be removed. The wound surface area measurements and any adverse events were recorded.

CASE PRESENTATIONS

Case 1

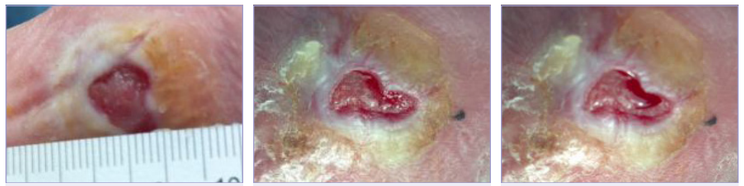
A 98-year-old female, long-term care resident with morbid obesity, severe osteoarthritis, hypertension, coronary artery disease, lymphedema, and peripheral vascular disease presented with a long-standing left great toe wound sustained when she wore ill-fitting shoes. Vascular studies showed adequate macrovascular flow but poor microvascular flow with an ABI of 0.6. Previous treatment included the use of multiple topical dressings and antimicrobials and serial debridement, but there was no noticeable improvement of pale wound bed. The18-month-old wound had a baseline size of 2.3 cm x 2.0 cm x 0.3 cm. After two weeks and three applications of the hyaluronic acid wound device, the patient's wound bed appearance improved to a healthy, beefy red, and microvascularization was achieved. The sound also decreased by 22% to 1.7 cm x 1.8 cm x 0.1 cm. The patient was lost to follow up.



Baseline | Week 1 | Week 2 | Week 6

Case 2

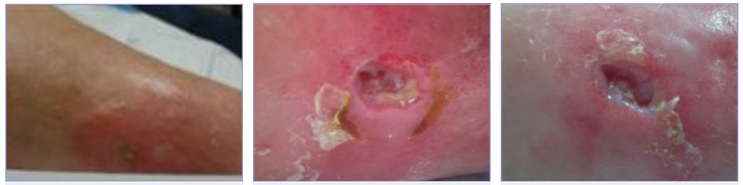
A 68-year-old male with alcohol induced peripheral neuropathy and bilateral Charcot foot deformity developed a left plantar foot wound. Due to the lack of diabetes, his insurance company denied total contact casting and cell-based therapy products. Eventually, he paid for custom molded shoes out of pocket, and the wound surface area initially decreased by 12%. However, the 14-month-old wound, 4 months with proper off-loading, then remained stagnant despite serial debridement, topical antimicrobials and systemic antibiotics. The wound size at baseline measured 1.1 cm x 1.5 cm x 0.1 cm. After four applications of the hyaluronic acid wound device, the wound achieved closure in 4.3 weeks.



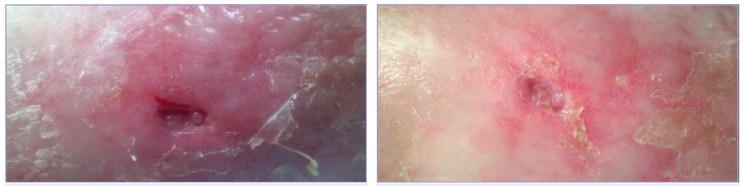
Baseline | Week 2 | Week 3

Case 3

A 57-year-old female with systemic lupus with CREST syndrome presented with recurrent leg wounds. She was receiving various long-term systemic therapies for her underlying medical condition, but her health had been slowly declining. She refused stem cell transplantation. Her right lower leg ulcer developed heterotopic bone (ossification) in the wound bed, but she refused local debridement. The patient consented to use of hyaluronic acid wound device. The 4-month-old wound had a baseline size of 1.2 cm x 0.5 cm x 0.7 cm. Within three weeks, the heterotopic bone was covered with granulation tissue, and the wound was completely closed within six weeks with three applications.



Baseline | Week 3 | Week 4



Week 5 | Week 6

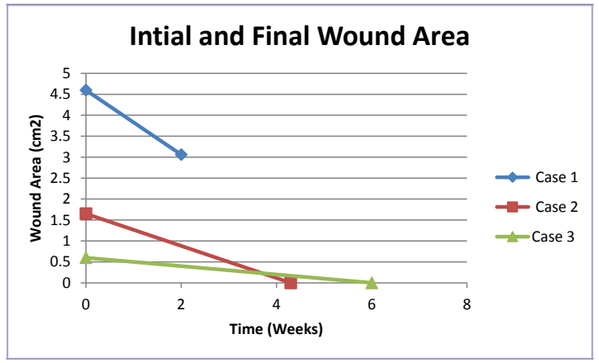


Figure 1: Wound Area

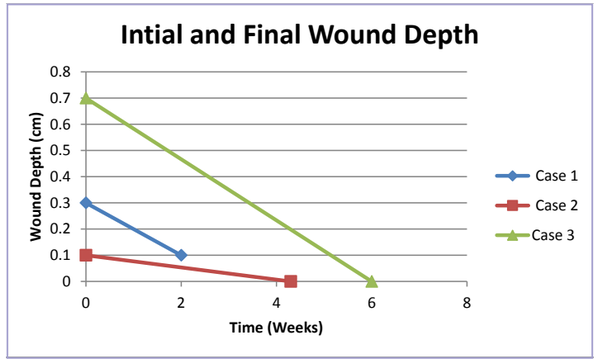


Figure 2: Wound Depth

CONCLUSION

The hyaluronic acid wound device successfully managed difficult to treat wounds of an average of 12 months duration, range of four to 18 months. The wounds of cases 2 and 3 closed after three to four applications, respectively, in an average of 5.15 weeks and have remained closed. For case1, the health of the wound bed markedly improved after application. Patient 1's wound, after lacking microvascularization and with a low ABI, finally had a healthy, red wound base with three applications of the hyaluronic acid wound device. The wound also decreased in volume by 22% and by 33% in area. The hyaluronic acid matrix was found to be a particularly viable option for patients who do not qualify for traditional wound care products due to insurance or product approval restrictions. Patients reported improved satisfaction with the use of hyaluronic acid based matrix. The formulation of this hyaluronic acid base effectively managed and two cases promoted closure of difficult chronic wounds, making it a practical option for use in the recalcitrant wound. This evaluation was consistent with the findings of a published systematic review and meta-analysis of HA derivatives.[8] Comparative effectiveness studies are warranted.

REFERENCES

1. Schultz GS, Davidson JM, Kirsner RS, Bornstein P, Herman IM. Dynamic reciprocity in the wound environment. *Wound Repair Regeneration*. 2011;19(2):134-148.
2. Chen WY, Abatangelo G. Functions of hyaluronan in wound repair. *Wound Repair Regen*. 1999; 7: 79–89.
3. Longinotti C. The use of hyaluronic acid based dressings to treat burns: a review. *Burns and Trauma* 2014;2(4): 162-168.
4. Vaienti L, Marchesi A, Palitta G, Gazzola R, Parodi PC, Leone F. Limb Trauma: the use of an advanced wound care device in the treatment of full-thickness wounds. *Strat Traum Limb Recon*. 2013;8:111-115.
5. Caravaggi C, Grigoletto F, Scuderi N. Wound Bed Preparation with a Dermal Substitute (Hyalomatrix PA) Facilitates Re-epithelialization and Healing: Results of a Multicenter, Prospective, Observational Study on Complex Chronic Ulcers (The FAST Study). *Wounds*. 2011;23(8):228-235.
6. Motolese A, Vignati F, Brambilla R, Cerati M, Passi A. Interaction between a regenerative matrix and wound bed in nonhealing ulcers: results with 16 cases. *Biomed Res Int*. 2013; 2013:849321.
7. Gravante G, Sorge R, Merone A, et al. Hyalomatrix PA in Burn Care Practice: Results from a National Retrospective Survey, 2005-2006. *Reconstructive Surgery and Burns*. 2010;64:69-79.
8. Voigt J, Driver VR. Hyaluronic acid derivatives and their healing effects of burns, epithelial surgical wounds and chronic wounds: A systematic review and meta-analysis of randomized controlled trials. *Wound Repair Regeneration* 2012;20(3):317-331.