PROCEEDINGS OF THE 2017 ANNUAL SYMPOSIUM ON ADVANCING THE STANDARDS IN WOUND CARE AND HYPERBARIC MEDICINE

The Role of an Esterified Hyaluronic Acid Matrix in Wound Healing, a Case Series

Richard Simman, MD, FACS, FACCWS*

Wright State University Boonshoft School of Medicine, Dayton, OH, USA

Hyaluronic acid (HA) is an anionic, non-sulfated glycosaminoglycan, present throughout various tissues in the body, including connective and epithelial tissues. As part of the extracellular matrix (ECM), HA plays an essential role in the migration and proliferation of cells as well as in tissue hydrodynamics.¹ It interacts with a number of cell receptors, including CD44, receptor for HA-mediated motility (RHAMM) and intercellular adhesion molecule-1 (ICAM-1).² Due to the various cellular interactions of HA, it has a various roles throughout each stage of wound healing.

For medical purposes, the half-life of HA can present as a challenge because it ranges from less than one to several days, and the turnover of native HA by hyaluronidase is rapid.³ One method of prolonging the half-life is esterification, which changes the physical properties of HA to create HYAFF®. In an esterified HA matrix, Hyalomatrix®, HA is been completely esterified to slow down its rapid degradation in wound fluid optimizing the degradation rate for wound healing. Hyalomatrix is a dermal matrix comprised of a wound contact layer made of HYAFF with an outer barrier layer comprised of a semipermeable silicone membrane. The dermal matrix contact layer is biodegradable, and it acts as a 3-dimensional scaffold for cellular invasion and capillary growth.

The clinical efficacy of Hyalomatrix has been evaluated in wounds of various etiologies, including chronic wounds with exposed bone and tendon,⁴ large venous leg ulcers,⁵ diabetic foot ulcers with critical limb ischemia and exposed cancellous bone⁶ and full thickness traumatic wound defects.⁷ Due to its success in a wide range of wounds, the aim of

this retrospective case series was to evaluate the effect of Hyalomatrix on the healing of complex wounds.

For this case series, a convenience sample of 15 patients with complex wounds of different etiologies was selected. The wounds were surgically debrided prior to Hyalomatrix application to achieve a clean wound bed. Hyalomatrix was then applied and secured with NPWT or sutures. For the NPWT, a non-adherent dressing was applied over the matrix prior to securement. The wounds were seen weekly during which wound size and photographic documentation were obtained. At clinician discretion, a split thickness skin graft (STSG) was applied over granulating wound beds after one Hyalomatrix application.

Hyalomatrix was applied on 15 patients with wounds of various etiologies, including arterial (n = 1), diabetic (n = 5), pressure (n = 3), infection (n = 3), radiation (n = 1), surgical (n = 3) and trauma (n = 1). Eleven of the 15 patients received Hyalomatrix and NPWT. The median wound size was 28 cm², ranging from 4 to 120 cm². The wounds were located throughout the body: abdomen (n = 1), BKA (n = 1), chest (n = 1), foot (n = 5), hand (n = 2), hip (n = 1), knee (n = 1), leg (n = 1), neck (n = 1), and perineum (n = 1). Additionally, five of the wounds had exposed tendon, and five had exposed bone. Hyalomatrix incorporation was apparent in the first five days, and the silicone top layer was removed after approximately two weeks. Although the goal was to expedite the application of a STSG, three (20%) wounds closed with the use of the matrix alone. For the remaining 12 wounds, Hyalomatrix incorporated into the wound bed in an average of three weeks to allow for subsequent STSG applications. No graft failure seen in

* Corresponding author.

E-mail address: richardsimman@hotmail.com

Figure 1 27 YO male athletic injured his right lateral ankle playing basketball two days prior to presentation to the ER with Beta Strep group A necrotizing fasciitis. He underwent surgical excision, placed on wide spectrum abx, ICU admission and BID dressing change using Dakin's solution ¼ strength (1A). A week later and once stable he was taken to OR for second debridement and Hyalomatrix application with NPWT to cover his exposed ankle capsule and extensor tendons (1B). 3 weeks later and with one application his wound bed was ready to receive skin graft with 100% granulation tissue (1C). Two weeks later his wound healed and he was referred to PT (1D). Healed: 6 weeks Figures 1 A,B,C,D.

any of these cases. For all 15 cases, the average time to healing was five weeks.

Overall, Hyalomatrix effectively incorporated into the wound bed to facilitate the production of granulation tissue for timely and effective STSG application for optimal healing in an average of five weeks. The healthy granulating wound bed and timely grafting allowed for 100% graft take. Wound healing was satisfactory with the use of this unique and cost effective wound matrix for wound management Fig. 1.

References

1. Shu XZ, Ghosh K, Liu Y, et al: Attachment and spreading of fibroblasts on an RGD peptide-modified injectable hyaluronan hydrogel. *Journal Biomed Mater Res Part A*. 2004;68(2):365–375.
2. Park D, Kim Y, Kim H, et al: Hyaluronic acid promotes angiogenesis by inducing RHAMM-TGFbeta receptor interaction via CD44-PKCdelta. *Mol Cell*. 2012;33(6):563–574.
3. Reed RK, Laurent UB: Turnover of hyaluronan in the microcirculation. *Am Rev Respir Dis*. 1992;146(5 Pt 2):S37–S39.
4. Caravaggi C, Francesco Grigoletto M, 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;8(23):228–235.
5. Motolese A, Vignati F, Brambilla R, et al: Interaction between a regenerative matrix and wound bed in nonhealing ulcers: results with 16 cases. *BioMed Res Int*. 2013;2013:849321.
6. Caravaggi C, Barbara A, Sganzeroli A, et al: Safety and efficacy of a dermal substitute in the coverage of cancellous bone after surgical debridement for severe diabetic foot ulceration. *EWMA J*. 2009;9(1):11–14.
7. Vaianti L, Marchesi A, Palitta G, et al: 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.