Porcine tri-layer wound matrix for the treatment of stage IV pressure ulcers

Paula J. Beers, BS, Cheri N. Adgerson, MD, and Susan B. Millan, MD
Gainesville, Florida

Key words: case report; OASIS; pressure ulcer; skin substitutes; stage IV; wound healing; wound matrix.

INTRODUCTION

Pressure ulcers represent a significant cause of morbidity and health care expenditure in the United States. A pressure ulcer is a lesion of localized injury to the skin or underlying tissue, usually over a bony prominence, resulting from pressure alone or in combination with shear forces. Ulcers are staged based on depth of tissue involvement. Using the revised National Pressure Ulcer Advisory Panel Staging System, a stage IV pressure ulcer is characterized by full-thickness tissue loss with exposed bone, tendon, or muscle that is visible or directly palpable.

In recent years, there has been growing interest in the use of bioengineered skin substitutes for the treatment of chronic wounds such as pressure ulcers. One such product, OASIS Ultra Tri-Layer Wound Matrix (Smith & Nephew, Inc, Hull, UK), is a dermal skin substitute derived from decellularized porcine jejunal submucosa. We present a case of impressive wound healing using OASIS Ultra Tri-Layer Wound Matrix in a patient with multiple stage IV pressure ulcers.

CASE REPORT

A 41-year-old woman with T9 paraplegia presented to the emergency department in March 2014 with fever and chronic pressure ulcers of the sacrum and vulva caused by an ill-fitting wheelchair. She had a history of a sacral pressure ulcer since 2012 with associated coccygeal osteomyelitis (Fig 1, A). She was treated previously with wound vacuum dressings and Apligraf (Organogenesis, Inc, Canton, MA), a bilayer living tissue matrix, by an outside wound care facility.

Laboratory results showed leukocytosis, anemia, and hypoalbuminemia consistent with malnutrition. Imaging found changes suggestive of chronic osteomyelitis involving the right pubic ramus and hip joint. The patient was evaluated by the plastic surgery department and determined to be a poor candidate for surgical intervention because of her poor nutritional status and current smoking. Based on wound culture results, she was started on intravenous ertapenem via peripherally inserted central catheter for osteomyelitis and recommended for outpatient wound care follow-up.

The patient presented to the wound care clinic in March 2014. Examination found a sacral wound with tunneling to 3 cm and granulation tissue noted in the wound bed (Fig 1, A). Over time, this ulcer degenerated to a stage IV ulcer with exposed muscle at the base.

Two weeks later, the patient had a left greater trochanter ulcer (Fig 2, A). The wound had a large, black eschar and necrotic tissue in the wound bed. The ulcer continued to collapse and was debrided. Ultimately, the ulcer extended to the joint capsule.

In May 2014, examination found a new sacral ulcer distal to her initial ulcer, with a large amount of necrotic tissue in the wound (Fig 3, A). The ulcer progressed until there was tunneling with palpable bone at the base of the wound. Thus, the patient’s presentation was consistent with a diagnosis of multiple stage IV pressure ulcers.

Initially, wound care therapy was directed at limiting infection, controlling malodor, and providing palliative care. Treatment was complicated by Pseudomonas aeruginosa infection, which was treated with ciprofloxacin. In June 2014, weekly debridement of all 3 was instituted. Multidisciplinary care included consultations from the departments of infectious disease, orthopedic surgery, gynecology, and vascular surgery. The patient was treated with OASIS Ultra Tri-Layer Wound Matrix and Apligraf, and her wounds healed with remarkable success.

From the Departments of Dermatology and Family Medicine, University of Florida College of Medicine.

Funding sources: None.

Conflicts of interest: None declared.

Correspondence to: Susan B. Millan, MD, UF Health Wound Care and Hyperbaric Center, 3951 NW 48th Terrace, Suite 211, Gainesville, FL 32606. E-mail: sbmillan@ufl.edu.

JAAD Case Reports 2016;2:122-4.
2352-5126
© 2016 by the American Academy of Dermatology, Inc. Published by Elsevier, Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
http://dx.doi.org/10.1016/j.jdcr.2016.01.001
and plastic surgery. No additional surgical options were available. The patient was placed on nutritional supplementation.

Together with the patient, we decided to attempt more aggressive treatment of the sacral pressure ulcers and the left trochanteric ulcer. Treatment with OASIS Ultra Tri-Layer Wound Matrix was initiated in August 2014. OASIS was applied to the wounds weekly, with the exception of a single 1-week postponement in application. OASIS therapy was coupled with strict bed rest and continued nutritional supplementation.

By week 5 of OASIS application, significant improvement was noted. By week 11 of OASIS therapy, thin scar tissue had formed over the left greater trochanter and both sacral ulcers. The patient was advised to avoid sitting for more than 2 hours to prevent tissue breakdown.

The ulcers have maintained durable healing to date, as of April 2015. The initial sacral wound healed
with five OASIS applications (Fig 1, B), and the other 2 wounds healed with 11 OASIS applications (Figs 2, B and 3, B).

**DISCUSSION**

Pressure ulcer therapy is directed at eliminating external pressure, preserving surrounding tissue, debriding necrotic tissue, reducing bacterial load, relieving pain, and treating conditions such as malnutrition and anemia that impede healing and increase risk for further ulcers. Even with ideal treatment, however, only 30% of stage IV pressure ulcers resolve within 6 months. Surgical debridement and flap reconstruction are frequently used; however, recurrence is a problem, and autologous grafts also pose a challenge when donor sites are involved or unable to provide enough tissue.

The dramatic improvement observed in our patient suggests that OASIS Ultra Tri-Layer Wound Matrix may represent a promising therapy for wound closure in stage IV pressure ulcers. Dermal substitutes such as OASIS provide wound coverage, precluding bacteria, and behave similarly to the skin’s native extracellular matrix, providing scaffolding for the influx of bioactive molecules that disrupt the proinflammatory milieu of chronic wounds.

To date, effective wound healing using OASIS has been shown primarily in chronic leg ulcers. Mostow et al. found significantly increased healing of chronic venous leg ulcers in patients receiving OASIS plus compression therapy compared with patients receiving compression therapy alone. A second study found that OASIS was superior to petroleum-embedded dressings in the treatment of leg ulcers of mixed arterial/venous etiologies.

Currently, OASIS Wound Matrix is indicated for use in partial and full-thickness wounds, including pressure ulcers, chronic vascular ulcers, diabetic ulcers, trauma wounds, and surgical wounds. Treatment with OASIS offers advantages over other dermal substitutes in that it is readily available, inexpensive, and has a relatively long shelf life (2 years at room temperature).

There is no consensus on the ideal dressing to treat stage IV pressure ulcers; most clinical trials are small and have conflicting data. Given the variety of dressings available, more clinical trials are needed. However, our patient showed impressive improvement with OASIS treatment. We propose that OASIS Wound Matrix be considered as first-line therapy for stage IV pressure ulcers.

**REFERENCES**

1. Black J, Baharestani MM, Cuddigan J, et al. National Pressure Ulcer Advisory Panel’s Updated Pressure Ulcer Staging System. Adv Skin Wound Care. 2007;20(5):269-274.
2. Chern PL, Baum CL, Arpey CJ. Biologic dressings: Current applications and limitations in dermatologic surgery. Dermatol Surg. 2009;35(6):891-906.
3. Wake WT. Pressure Ulcers: What Clinicians Need to Know. Perm J. 2010;14(2):56-60.
4. Bluestein D, Javaheri A. Pressure ulcers: prevention, evaluation, and management. Am Fam Physician. 2008;78(10):1186-1194.
5. Greaves NS, Iqbal SA, Baguneid M, Bayat A. The role of skin substitutes in the management of chronic cutaneous wounds. Wound Repair Regen. 2013;21(2):194-210.
6. Mostow EN, Haraway GD, Dalsing M, Hodde JP, King D. Effectiveness of an extracellular matrix graft (OASIS Wound Matrix) in the treatment of chronic leg ulcers: A randomized clinical trial. J Vasc Surg. 2005;41(5):837-843.
7. Romanelli M, Dini V, Bertone MS. Randomized comparison of OASIS wound matrix versus moist wound dressing in the treatment of difficult-to-heal wounds of mixed Arterial/Venous etiology. Adv Skin Wound Care. 2010;23(1):34-38.
8. Dumville JC, Stubbs N, Keogh SJ, Walker RM, Liu Z. Hydrogel dressings for treating pressure ulcers. Cochrane Database Syst Rev. 2015;(2):CD011226.