JCRMHS

Case Report

Journal of Clinical Case Reports, Medical Images and Health Sciences

Volume 10 Issue 2, 2025

Article Information

Received date: 24/03/2025
Published date: 18/04/2025

*Corresponding author
*Camryn F. Daidone, Research, Edward Via College of Osteopathic Medicine, Monroe, USA

*Key Words:
Fish Skin Graft, Wound Debridement, Wound Healing, Necrotizing Wound

*List of Abbreviation
FBD - Fetal Bovine Dermis
FSG - Fish Skin Graft
iFSG - Intact Fish Skin Graft
PUFAs – Polyunsaturated Fatty Acids
VAC - Vacuum-Assisted Closure

The Role of Fish Skin Xenografts in Healing Complex Wounds: A Brief Case Report

Camryn FDBS[1], Naved BS[1], Leslie SMSN[2], Ahsan Raza MD[2]

[1]Research, Edward Via College of Osteopathic Medicine, Monroe, USA
[2]Department of Pharmaceutical Sciences, COMSATS Institute of Information Technology, Abbottabad 22060, Pakistan

Introduction

Chronic non-healing wounds present a substantial impact to the quality of life of approximately 2.5% of the United States population and pose a significant financial burden. The estimated Medicare cost projections for wound care was between $28.1 to $96.8 billion in 2020 alone [1]. Of these costs, up to $35.8 billion were associated with outpatient wound care costs. With the increase in incidence of chronic non-healing and complex acute wounds due to conditions such as diabetes, pressure ulcers, and vascular deficits, it is becoming increasingly important to develop a gold standard treatment and agents to facilitate effective wound healing [1].

Kerecis™, a fish skin xenograft, is a decellularized fish skin matrix derived from North Atlantic Cod Fish (Gadus morhua). Due to patented processing (cell lysis via osmotic mechanism), the skins retain a highly porous microstructure that is homogenous to human dermis, noncellular proteins, and polyunsaturated fatty acids (PUFAs). Kerecis has been introduced for the treatment of complicated wounds such as diabetic wounds, traumatic wounds, partial-thickness burns, acute surgical incisions, and necrotic wounds [2, 3]. Due to the known anti-inflammatory properties of PUFAs, fish skin xenografts have shown promise in wound healing when compared to alternative wound healing techniques [4, 5]. PUFAs possess anti-inflammatory properties and can mitigate cytokine signaling and may decrease risk for bacterial colonization in the context of wound healing.

The objective of this presentation is to highlight the use of Kerecis in treatment of a particularly complex right flank wound which included stool-contamination, necrotizing soft tissue infection due to perforated colon cancer, and sepsis. This presentation follows the wound healing through 28 days following the operation and demonstrates the efficacy of Omega-3 fish xenografts in improving healing of complex wounds.

Case Presentation

A 61-year-old female presented to the emergency department with a two week history of pain, erythema and feelings of fullness and heaviness on the right side of her abdomen. She has a past medical history of breast cancer and colon carcinoma with multiple liver metastases for which she completed her final dose of chemotherapy one week prior to presentation to the emergency department.

She has no history of smoking, no known allergies, and her review of systems is otherwise negative. Upon physical exam, the patient had cellulitis, tenderness, and erythema of the right flank. She had a white blood cell count of 19,000/L. CT scan was suggestive of a perforated cecum at site of her tumor with retroperitoneal abscess extending into her skin (Figure 1).

This patient was taken for an emergent exploratory laparotomy, drainage of abdominal and retroperitoneal abscess, open right hemicolectomy with diverting ileostomy, abdominal washout, intra-abdominal omental patch,

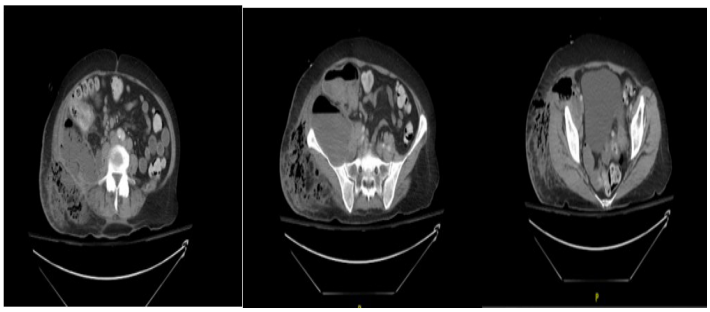

Figure 1: *CT scan taken during emergency department admission. The scan was remarkable for a large retroperitoneal abscess with lateral extension through the lower lateral abdominal wall musculature into the subcutaneous tissues. Area of retroperitoneal abscess posterior to the cecum and along the iliac is muscle measures approximately 15 cm in maximal length*

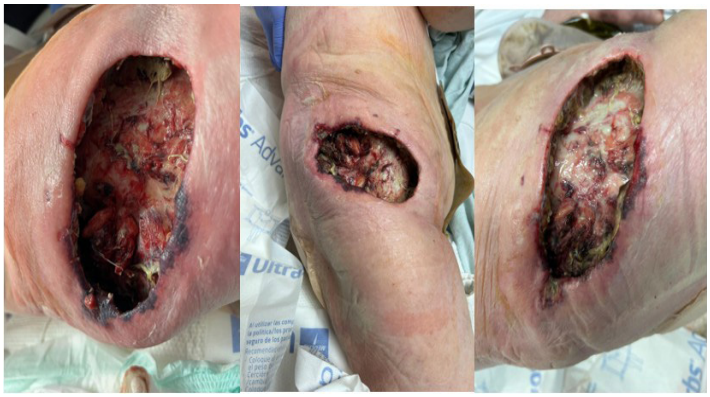

Figure 2 a-c: *Right flank wound 2 days postoperative following wound debridement. The dimensions of this wound were 15cm by 10cm by 5cm deep.*

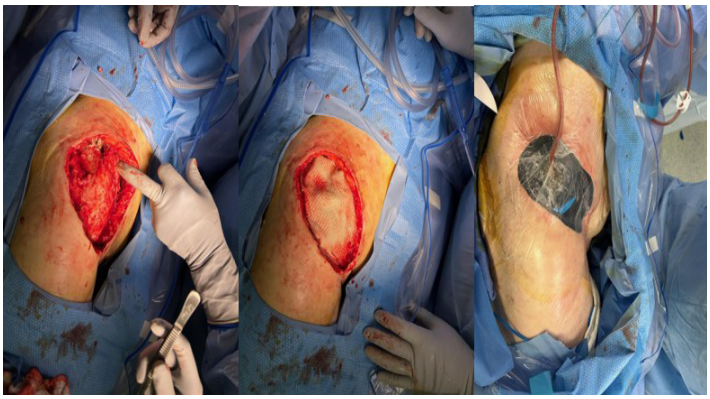

Figure 3 a-c: *Further debridement (3a), placement of xenograft (3b) and closure with wound VAC (3c). Dimensions of the wound were 17cm x 10cm x 4cm*

placement of Strattice mesh for flank hernia prevention, and debridement of necrotizing soft tissue infection of right flank. Necrotic abdominal wall tissue and invasion of the hip joint was noted during surgery. There was stool contamination of the wound necessitating extensive debridement. The wound was 15cm x 10cm x 5cm deep and was initially debrided and washed with Dakins solution and placed on a Dakins wet-dry bandage. Figure 2 shows this wound 2 days after washing and debridement.

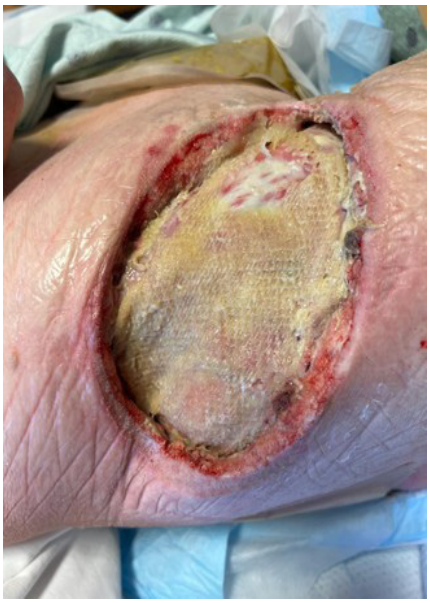

Figure 4: *Wound 5 days following xenograft placement. No signs of cellulitis, no tunneling, some sloughing of tissue*

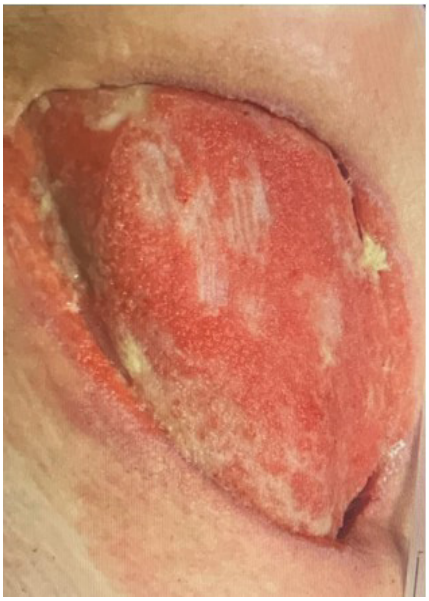

Figure 5: *Wound approximately 1 week following xenograft placement. The wound appears healthy with granulation tissue present and no tunneling. At this point, the patient was discharged home with a wound VAC*

Two days post-operation, further debridement and application of a Kerecis™ xenograft with a wound Vacuum-Assisted Closure (VAC) was completed (Figure 3). The wound was followed over the next week in the hospital with periodic VAC changes as shown in figures 5 and 6 until the patient was discharged home and followed by home health for wound care. On postoperative day 28, a follow up visit revealed that the wound had healed well with substantial granulation tissue present. The patient was then scheduled for placement of a skin graft. The patient consented to use of clinical information and the included images in a case report and no personal health information was included to protect patient anonymity.

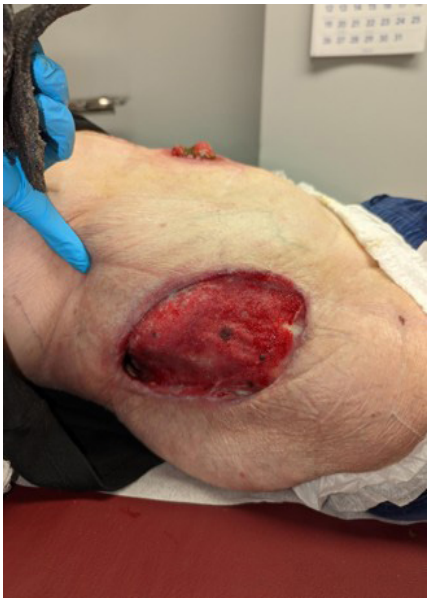

Figure 6: *Wound on 28 day postoperative follow up visit, the wound is healed with substantial granulation tissue and the patient is scheduled for placement of a skin graft.*

Discussion

Kerecis fish skin xenografts are FDA approved for treating chronic and acute surgical wounds [6,7]. The product is an acellular dermal matrix harvested from Icelandic cod with a porous microstructure similar to that of human skin. Characteristics of the xenograft include bacterial resistance, rapid cellular migration and proliferation, and inflammatory cytokine mitigation due to the abundance of PUFAs in the matrix [8]. This presentation noted excellent wound healing after one application of the Kerecis™ product for wound complicated initially by stool contamination and necrotic tissue. Additionally, this patient had recently completed chemotherapy for colon cancer and was septic upon presentation to the emergency department, both of which would predispose this patient to impairments in wound healing [9].

Previous studies support these findings and have demonstrated the efficacy of the use of intact fish skin xenografts for the treatment of necrotizing fasciitis of the leg and the superiority of fish skin graft (FSG) over xenograft alternatives such as fetal bovine dermis (FBD) in treating deep partial thickness burns [4, 10].

Despite evidence suggesting the benefits of fish skin xenografts, one substantial drawback of the use of the Kerecis™ product is the increased associated cost. This may especially be a problem within areas with low healthcare coverage. However, one study conducted a cost analysis of using the Kerecis™ product against annual healthcare costs and found that annual costs were actually decreased due to faster wound healing [11]. With wound care posing a significant financial burden nationally, the cost associated with fish skin xenografts may eventually offset the costs of chronic wound care [1].

Future studies with larger sample sizes are needed to further support the efficacy of the Kerecis™ product in treating necrotizing wounds and comparisons to other xenograft alternatives. Future research should investigate the use of fish skin xenografts in various types of wounds such as pressure ulcers and those complicated by diabetes, immunodeficiency, or vascular insufficiency.

Conclusion

Application of the Kerecis™ Fish Skin xenograft yielded outstanding results in wound healing for this patient with a wound complicated by necrotizing tissue, stool contamination and immunodeficiency from recent chemotherapy use. This supports the anti-inflammatory and angiogenic properties of the product and efficacy in healing complex wounds. This is definitely an option that needs to be considered in treating difficult wounds in patients who are already immunocompromised and the applications of this product are widespread and remain to be studied.

Acknowledgements: Thank you to all of the surgical staff at Rapides Regional Medical Center for procedural assistance and data acquisition.

Data from our study may be retrieved upon request.

Author Contributions: Camryn Daidone, Naved Salim, Leslie Smith, and Dr. Ahsan Raza provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; Camryn Daidone and Naved Salim drafted the article or revised it critically for important intellectual content; Dr. Ahsan Raza gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Sen, C.K.(2021) "Human wound and its burden: Updated 2020 compendium of estimates" Advanced Wound Care ;. vol 10(5):281-292.
2. Dorweiler, B et al.(2018) "The marine Omega3 wound matrix for treatment of complicated wounds: A multicenter experience report." *Gefasschirurgie : Zeitschrift fur vaskulare und endovaskulare Chirurgie : Organ der Deutschen und der Osterreichischen Gesellschaft fur Gefasschirurgie unter Mitarbeit der Schweizerischen Gesellschaft fur Gefasschirurgie* ; 23(Suppl 2):46-55.
3. Stone, Randolph 2nd et al.(2021) "Accelerated Wound Closure of Deep Partial Thickness Burns with Acellular Fish Skin Graft." *International journal of molecular sciences* ;22(4):1590.
4. Alexander, J Wesley, and Dorothy M Supp (2014). "Role of Arginine and Omega-3 Fatty Acids in Wound Healing and Infection." *Advances in wound care* ;3(11): 682-690.
5. Ibrahim, Mohamed et al (2023). "Fish Skin Grafts Versus Alternative Wound Dressings in Wound Care: A Systematic Review of the Literature." *Cureus* ; 15(3) e36348.
6. Baldursson BT, Kjartansson H, Konrádsdóttir F, Gudnason P, Sigurjonsson GF, Lund SH (2015). Healing rate and autoimmune safety of full-thickness wounds treated with fish skin acellular dermal matrix versus porcine small-intestine submucosa: a noninferiority study. Int J Low Extrem Wounds ;14(1):37-43.
7. Lullove, E. J., Liden, B., Winters, C., McEneaney, P., Raphael, A., & JC, L. I. (2021). A Multicenter, Blinded, Randomized Controlled Clinical Trial Evaluating the Effect of Omega-3-Rich Fish Skin in the Treatment of Chronic, Nonresponsive Diabetic Foot Ulcers. *Wounds: a Compendium of Clinical Research and Practice*; 33(7):169-177
8. Magnusson S, Baldursson BT, Kjartansson H, Rolfsson O, Sigurjonsson GF (2017). Regenerative and Antibacterial Properties of Acellular Fish Skin Grafts and Human Amnion/Chorion Membrane: Implications for Tissue Preservation in Combat Casualty Care. Mil Med ;182(S1):383-388.
9. Singh, S., Young, A. & McNaught, C-E (2017). "The physiology of wound healing" *Surgery (Oxford)*; 35(9): 473-477
10. Dueppers, Philip et al (2023). "The Use of Intact Fish Skin Grafts in the Treatment of Necrotizing Fasciitis of the Leg: Early Clinical Experience and Literature Review on Indications for Intact Fish Skin Grafts." *Journal of clinical medicine* ;12(18): 6001.
11. Lantis Ii, John C et al (2023). "Final efficacy and cost analysis of a fish skin graft vs standard of care in the management of chronic diabetic foot ulcers: a prospective, multicenter, randomized controlled clinical trial." Wounds : a compendium of clinical research and practice ;35(4): 71-79.

Citation: Camryn F. Daidone. The Role of Fish Skin Xenografts in Healing Complex Wounds: A Brief Case Report. Jour of Clin Cas Rep, Med Imag and Heal Sci 10(2)-2025.