Use of Fish Skin* to Treat a Non-Healing Traumatic Wound in a Patient with End-Stage Renal Disease (ESRD)

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INTRODUCTION

End-stage kidney disease (ESRD) is a highly morbid condition with an estimated US prevalence of 2,242 cases per million in 2018 (Johansen et al., 2020)1. Chronic kidney disease (CKD) augments wound complications due to hemodynamic and metabolic disturbances, ultimately leading to the overproduction of pro-inflammatory and anti-inflammatory cytokines extending to the nonhealing manifestation (Pavlov et al., 2021)2. A traumatic injury can result in a non-healing wound in patients with renal disease. Fish skin is a novel porous acellular matrix containing proteins and lipids that augment cellular ingrowth and modulate inflammatory cytokines (Yoon et al., 2022; Seth et al., 2022)3,4. This case aimed to evaluate fish skin in a patient with a non-healing acute wound complicated by ESRD.

METHODS

The patient is an 82-year-old white female who presented to our service with the chief complaint of non-healing ulceration of the left upper extremity from a traumatic injury. The initial diagnosis was an acute traumatic injury with hematoma of the left upper forearm that presented with swelling suggesting occlusion. The patient underwent radical debridement and a fish skin graft application, followed by unsuccessful conservative treatment for approximately two months. At that time, medical necessity dictated advanced biological treatment. The patient received six subsequent applications that displayed remarkable healing with each application. All applications were applied per the manufacturer's specifications. Table 1 represents the wound area reduction per application.

RESULTS

Following the seven fish skin applications spanning approximately six weeks, the patient had a 96% wound area reduction.

CONCLUSIONS

Chronic kidney disease presents the clinician and patient with challenges, including non-healing wounds. Impaired microvasculature, specifically a diminished capillary network and microangiopathic changes, leads to poor tissue perfusion, resulting in cutaneous complications that disrupt downstream cell signaling (Pavlov et al., 2021)2 Fish skin products should be considered for treating non-healing wounds in patients with CKD and have been proven to augment acute and chronic wound healing 5,6. More extensive studies should investigate the use of fish skin for non-healing ulcerations in patients with ESRD.

*Kerecis[™], Kerecis, Isafjordur, Iceland

References

CASE: 82-YEAR-OLD FEMALE TRAUMATIC HEMATOMA

Patient History: 82-year-old female with PMHx of ESRD Wound History: Patient presented with left forearm traumatic wound with swelling Fish Skin Graft Applications: Seven applications of intact fish skin graft 96% wound area reduction and no further complications were reported.



Initial presentation



2 week follow up

1. Johansen, K. L., Chertow, G. M., Foley, R. N., Gilbertson, D. T., Herzog, C. A., Ishani, A., ... & Wetmore, J. B. (2021). US renal data system 2020 annual data system 2020 annu

3. Yoon, J., Yoon, D., Lee, H., Lee, J., Jo, S., Kym, D., ... & Cho, Y. S. (2022). Wound healing ability of acellular grafts and clinical application. International Journal of Biological Macromolecules, 205, 452-461. 4. Seth, N. E. I. L., Chopra, D. I. V. Y. A., & Lev-Tov, H. (2022). Fish skin grafts with omega-3 for treatment of chronic wounds: exploring the role of omega-3 fatty acids in wound healing and a review of clinical healing outcomes. Surg Technol Int, 40, 38-46. elinical trial of acute wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound healing. Wound healing Society [and] the European Tissue Repair Society [and] the European Tissue Repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound repair and regeneration : official publication of the Wound healing. Wound repair and regeneration : official publication of the Wound repair and regeneration : official publication of the Wound repair and regeneration : official publication of the Wound repair and regeneration : official publication of the Wound repair and regeneration : official publication of the Wound regeneration : official publica 6. 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.

- Patient Outcomes: At 6 weeks post op, wound has significantly decreased in size with

| Application Number | Date | Wound Size |
|---------------------------|---------|---------------------|
| 1 | 3/30/23 | 18.5 x 5.5 x 0.3 cm |
| 2 | 4/6/23 | 17.0 x 4.5 x 0.2 cm |
| 3 | 4/13/23 | 17.0 x 3.6 x 0.2 cm |
| 4 | 4/20/23 | 5.3 x 2.7 x 0.2 cm |
| 5 | 4/27/23 | 4.0 3.0 x 0.2 cm |
| 6 | 5/4/23 | 3.1 x 2.1 x 0.2 cm |
| 7 | 5/11/23 | 2.9 x 1.8 x 0.2 cm |



Prior to initial application of intact fish skin graft



Wound is debrided



1st application of meshed fish skin graft



3rd application of intact fish skin graft



3 week follow up



4th application of intact fish skin graft





1 week follow up

2nd application of intact fish skin graft

5 week follow up



6 week follow up

^{2.} Pavlov, S. B., Litvinova, O. B., & Babenko, N. M. (2021). Features of skin wound healing in rats with experimental chronic kidney disease. Regulatory Mechanisms in Biosystems, 12(4), 594-598.