

Use of Omega-3 fish skin adjuvant with sodium thiosulfate infusion for the treatment of a complex wound worsened by Calciphylaxis

Rimvydas (Rimi) Statkus, DPM, FACFAS*, Patrick McEneaney, DPM FACFAS, AAPWCA*; Muhammed Shamim, DPM, AACFAS** ; Peter Lovato, DPM, FACFAS*

Northern Illinois Foot and Ankle Specialists, Crystal Lake, Illinois

Northwest Illinois Foot and Ankle Fellowship, Sycamore, Illinois

*Attending Physician Northwest Illinois Foot and Ankle Fellowship; Northern Illinois Foot and Ankle Specialists ** Surgical Fellow

Statement of Purpose

End stage kidney disease (ESRD) is a highly morbid condition that affects individuals quality of life. In 2018, the incidence of ESRD in the United States was 390.2 per million. Furthermore, many of these individuals experience calciphylaxis due to ESRD. Calciphylaxis is characterized by excessive calcium deposits within tunica media layer of arteries, ultimately leading to lumina narrowing and occlusion, thereby decreased blood flow to ulceration sites. Intense pain, ischemia, necrosis and non healing ulcers often result from calciphylaxis. Diagnosis can be made by a biopsy of the affected area which may demonstrate necrotic changes. Different treatment options exist such as hemodialysis, non calcium phosphate binders, cinacalcet, selective vitamin D analogs, and aggressive wound care. We demonstrate a unique case of using sodium thiosulfate with serial debridement's, and eventual application of fish skin that led to complete healing of a chronic ulceration

Case Presentation

Patient presented to our service with chief complaint of non-healing ulceration along the lateral aspect of her leg. Her past medical history included diabetes, hypertension and end stage renal disease for many years. Her social history was negative for smoking. She had attempted many different modalities of treatment but failed to completely heal her ulceration. At the time of presentation, she was in severe pain and taking narcotics to help alleviate some of her symptoms. She was also placed on Keflex for two months by another provider. Venous studies and arterial studies were without any significant findings. There was calcification noted of the blood vessels. No off loading was required. She had failed compressive therapy. She underwent serial debridement's which initially demonstrated healthy granular tissue. However, the wound contracture seemed to be taking longer than usual.

We utilized a skin substitute containing fish skin which is rich in polyunsaturated Omega3 fatty acids DHA and EPA. These two omega 3 fatty acids are known for their anti-inflammatory properties. Additionally, the piscine grafts protein composition mimics human skin and provides a thicker matrix with a more porous microstructure. She was also sent for Sodium Thiosulfate infusion. The use of fish skin with sodium thiosulfate in combination led to a decrease in the size of the wound. The patient went on to completely heal her ulceration after conjunctive treatment through STS and fish skin as a skin substitute.

Clinical images



Figure 1: Demonstrates the wound at initial presentation. Patient was not receiving sodium thiosulfate.



Figure 2: Two weeks after application of Omega 3-fish skin with contraction of ulcer noted.



Figure 3: Significant reduction of wound size at three-month mark.



Figure 4: Increase in epithelialization.



Figure 5: Final follow-up with complete epithelialization of wound with use of sodium thiosulfate with adjuvant fish skin as a skin substitute.

Results and Discussion

Individuals that are diabetic with ESRD may demonstrate calciphylaxis which provides a barrier to healing ulcerations. We present a unique case of an individual who had failed multiple different modalities of treatment for her ankle ulceration due to a significant case of calciphylaxis. We used fish skin concomitantly with adjuvant sodium thiosulfate therapy which allowed the wound to heal completely. The use of STS also significantly decreased her pain levels.

As physicians continue to treat individuals with calciphylaxis, it is vital to consider adding adjuvant sodium thiosulfate. Traditionally, sodium thiosulfate has been used as an antidote in cyanide poisoning and as a nephroprotectant during cisplatin administration in oncological treatment. The mechanism is hypothesized to chelate cations with anti oxidative properties. Chelation of calcium-to-calcium thiosulfate, which is more soluble than other calcium salts, thereby allowing for better excretion from the human body. Furthermore, fish skin products can be considered due to their high omega-3 content as well as a substrate for granulation tissue growth. Their anti-inflammatory properties are ideal for inflammatory ulcers as seen in seronegative arthritides, calciphylaxis and autoimmune related ulcerations.

References

1. Schmitt SK. Osteomyelitis. *Infect. Dis. Clin. North Am.* 2017 Jun;31(2):325-338.
2. BadyakSF, FreytesDO, Gilbert TW. Extracellular matrix as a biological scaffold material: Structure and function. *ActaBiomater.* 2009;5:1-13.
3. DorweilerB, Trinh TT, et al. The marine Omega3 wound matrix for treatment of complicated wounds. *Gefasschirurgie.* 2018; 23:S46-S55
4. Woodrow T, Chant T, Chant H. Treatment of diabetic foot wounds with acellular fish skin grafts rich in omega-3: a prospective evaluation. *Journal of Wound Care.* 2019; Vol. 28, no 2
5. Magnusson S, BaldurssonB, KjartanssonH, et al. DecellularizedFish Skin: Characteristics that Support Tissue Repair. *The Icelandic Medical Journal,* 2015 Dec;101(12):567-73.