

WARFARIN NECROSIS TREATMENT with TRANSDERMAL CONTINUOUS OXYGEN THERAPY

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INTRODUCTION

Warfarin (Coumadin; DuPont Pharma, Wilmington, DE) is a synthetic derivative of coumarin, a chemical found naturally in many plants. It has been used for years as an effective and relatively safe pharmacologic agent for the prevention of thrombosis and embolism, and is the most widely prescribed anticoagulant in North America¹. Despite its popularity and effectiveness, the use of Warfarin has several associated morbidities including hemorrhagic complications, interactions with other medications, the need for frequent monitoring of international normalized ratio (INR), teratogenicity, and Warfarin induced skin necrosis (WISN)²⁻⁵.

INCIDENCE OF WISN

WISN is relatively rare considering the widespread use of the agent and is also known as Coumadin induced skin necrosis, coumarin-congener-associated skin necrosis, and Warfarin dermal gangrene^{6,7}. The exact incidence of WISN is undetermined but estimated to be between 0.01 - 0.1% of patients treated with Warfarin, with approximately 200 documented cases worldwide⁸⁻¹².

WISN ETIOLOGY

The presentation of WISN may mimic other disorders including venous gangrene, necrotizing fasciitis, other causes of skin necrosis, and dermatological entities^{13,14}. WISN seems to have a marked predilection for anatomic regions abundant in subcutaneous fat such as the breasts, buttocks, thighs, and abdomen^{4,9,15-17}. WISN classically presents with a painful skin lesion or petechiae that progress to a localized, initially erythematous or hemorrhagic sharply demarcated ecchymosis that become bullous and eventually culminates into tender, crusted, full thickness gangrenous necrosis^{5,9,10,12,18}.

CASE STUDY

We present patient with WISN of bilateral shoulder area that was successfully treated with a Transdermal Continuous Oxygen Therapy device (TCOT) (EPIFLO[®], Ogenix Corporation, Beachwood, OH). We will discuss the management challenges involved as aggressive surgical debridement is not possible with this disorder and as a result, a more conservative management strategy was used, which may be considered for future therapies.

A 62 year old female presented to the wound care clinic for treatment of extensive wounds on both shoulders and abdomen in August of 2007. The wounds began about a year before but were stable until about 2 weeks prior to initial treatment with Transdermal Continuous Oxygen Therapy. The patient had been on Warfarin therapy for 27 years, long term dialysis, was diagnosed with breast cancer 3 years prior, and has since had a double mastectomy. Patient was noted to have both protein C and protein S deficiency, and palliative treatment was recommended by the treating physician. Initially, TCOT was applied to the right shoulder wound while negative pressure wound therapy (NPWT) (Wound VAC, KCI, San Antonio, TX) was applied to the left. The patient willingly underwent the comparative treatment and was advised that the extensive eschar and slough may act as a diffusional barrier for the oxygen therapy. It should be noted that as the patient was being treated with an anticoagulant, debridement was not performed to remove any necrotic tissue, making treatment more difficult. After 1 week of treatment, the patient was deemed non-compliant as she was unable to tolerate the pain associated with NPWT on the left shoulder, and may have intentionally removed the TCOT device on the right shoulder and was subsequently placed on standard moist wound therapy. Over a month later, the wounds remained recalcitrant to standard moist wound therapy treatment. TCOT was then reinitiated on the right side flank wound. The patient then complained of immense pain in the left shoulder and was eventually diagnosed with calciphylaxis. After 1 week, the right side flank wound was observed with some noted improvement including reduction of size, shape change of wound, defined wound edges, reduction of slough and increased granulation and a size of 11cm x 4.5 cm. The patient continued to complain of immense pain while numerous new wounds concomitantly formed. Subsequent to the success with the right flank wound after 1 week, the treating physician initiated TCOT on the left shoulder wound. The right shoulder wound which remained treated only with moist wound therapy, showed a lack of granulation and appeared less healthy than those treated with TCOT. The patient was prescribed Dilaudid for the pain and received silicone based foam dressing (Mepilex, Mölnlycke Health Care US, Norcross, GA) on all other wounds since regular gauze dressings (applied by home care nurse between visits to the clinic) became adhered to wound tissues. The right side flank wound and left shoulder wounds showed consistent and continuous improvement including a continued reduction in slough and eschar and increased granulation, nonetheless, the wound on the right shoulder was not treated with TCOT. After 3 weeks and 2 weeks respectively, the right flank had now reduced in size to 9.0 cm x 3.5 cm with significant improvement in granulation and wound margin health and the left shoulder wound changed shape and reduced to 2 smaller wounds joined by an isthmus and measured 5.2 cm x 4.2 cm and 3.5 cm x 2.5 cm. The untreated right shoulder wound (treated only with standard moist wound therapy treatment) measured 4.5 cm x 3 cm, lacked granulation tissue and appeared less healthy than TCOT treated wounds. Interestingly, the patient reported a change in pain from burning and extremely painful to more tolerable puritic type of sensation after two weeks of TCOT treatment; complete resolution of pain resulted in all wounds treated with the TCOT device after a month. After 4 weeks and 3 weeks respectively, the right flank wound decreased in size to 7 cm x 1.5 cm, and the left shoulder decreased to 3 x 1.5 cm and 4.2 cm x 2.5 cm. The untreated right shoulder wound (treated only with standard moist wound therapy treatment) increased in size to 5.4cm x 1.4 cm.

The left shoulder wound and right flank wound continued to heal with complete epithelialization noted in 22 weeks or about 5.4 months and wounds in close proximity to treated wounds improved as well. As time progressed, the wounds treated with TCOT continued to demonstrate excellent granulation and the wounds that were in close proximity to the topical oxygen treated wounds but not treated with the device were slowly showing improvement including the untreated right shoulder wound (treated only with standard moist wound therapy treatment). The patient's outlook and demeanor also noticeably improved. Three months after presenting to the wound clinic, Warfarin was discontinued by the treating physician and heparin therapy initiated. After almost 8 months following the initial presentation to the clinic, the patient was completely healed and very happy with the results.



Abdominal Wound prior to TCOT



Abdominal Wound after 2 weeks w/TCOT



Abdominal Wound after 22 weeks w/TCOT



Left Shoulder Wound prior to TCOT



Left Shoulder Wound after 2 weeks w/TCOT



Left Shoulder Wound after 22 weeks w/TCOT

DISCUSSION

This case is interesting in that TCOT device demonstrated efficacy in healing recalcitrant wounds secondary to Warfarin necrosis when compared to standard of care treatments. Transdermal continuous oxygen therapy may serve as an efficacious alternative treatment option for patients especially when other advanced treatment modalities such as NPWT may be too painful and not well tolerated in this patient population.

CONCLUSION

As surgical treatment is required in over 50 % of all cases, including mastectomies and amputations¹⁹, TCOT may serve as an efficacious non invasive alternative to help treat WISN and its associated painful symptoms.

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TCOT device utilized in case study