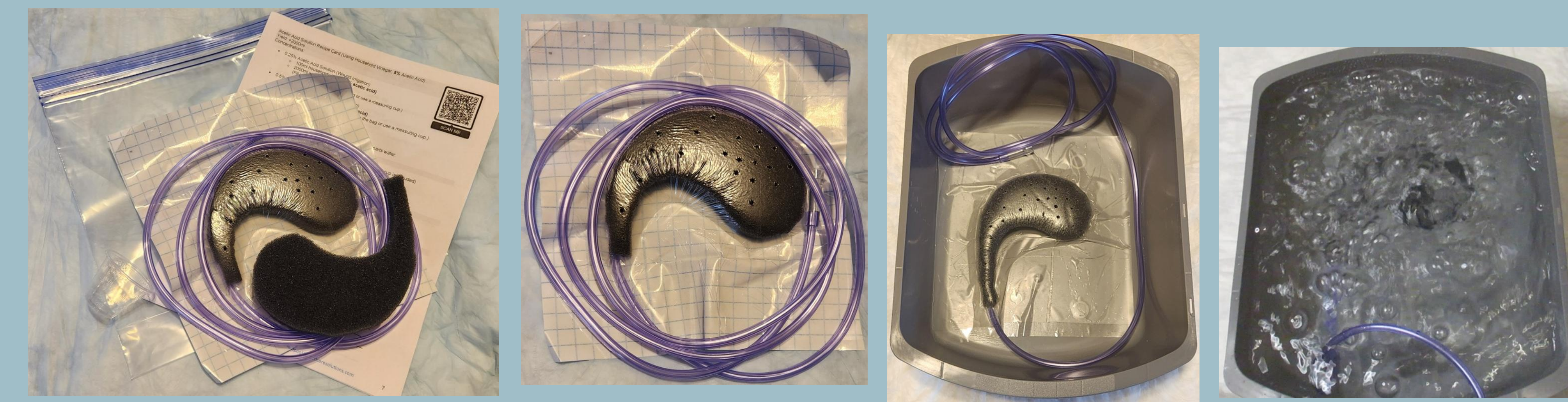


A Clean Wound is a Healing Wound: Case studies

Using a Disposable Whirlpool Hydrotherapy Set Up for Reduced Pain and Wound Debridement that is Powered By and Combined with Topical Oxygen.

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Abstract

Introduction: Cleansing and debridement of diabetic foot, peripheral artery disease (PAD), stasis ulcers and pressure injuries to clear slough and biofilm, is often painful and time consuming. Removal of slough, crusting and biofilm can greatly expedite healing times¹. Hydrotherapy is an effective approach² but also has issues with time consuming set ups, post therapy disinfection of equipment, and concerns of cross-contamination between patients. We have demonstrated improved wound cleansing and outcomes by using an improved version of hydrotherapy.

Methods: To address this challenge, we combined hydrotherapy with oxygen supply to power a disposable bubbler device. This novel approach provides oxygen bubbles that pass over wound tissues providing a cleansing whirlpool effect in a warm solution. Patient soaks the wound about 10-15minutes in an antiseptic solution with the oxygen bubbling across the wound bed. Providing a soothing and hydrating effect will enable better cleansing with the foam debridement pad.

Results: The use of hydrotherapy powered by oxygen was essential in softening biomaterial and aiding in a gentle cleansing of tissues. Photos of one of our case studies; a homeless pt with PAD, history of frost bite, amputations, and maggot infestation.* On admission the foot wounds were coated with dried blood and feces. The wound beds showed significant improvement with only one treatment, thick scale crust and eschar were removed exposing clean wound beds. Photos showed a great reduction in yellow slough covering the wound base demonstrating effectiveness. A patient with PAD showed a reduction in purple tissue around wound edges, lighting to a pink color. Others showed great reduction in eschar and slough visible in photos presented.

Discussion: Having the ability to remove slough and biofilm in a method that provides pain relief would present a great improvement for patient care. This demonstrates improved outcomes over that of standard treatments of sharp, autolytic, or enzymatic debridement. The three+ case studies with this presentation demonstrate positive outcomes of hydrotherapy with oxygen. They showed reduction in slough and biofilm with the added benefit of being staff friendly, easy disposable setup that prevents possible cross-contamination. This has potential to be an exciting new tool for use in wound care.

Case study diabetic nurse

A female nurse who stands for extended periods; chronic diabetic foot ulcer, elevated A1C, and neuropathy. Her current treatment includes betadine paint and dressings and prescribed Epsom salt foot soaks. The ulcer developed months ago and has not improved with her usual care. We incorporated oxygenating hydrotherapy using Epsom salt x3 a week, increased the soak depth to raise the PSI of the O2 bubbles. She reported significant improvement within a week. Before-and-after photos demonstrate healing of the great toe ulcer and debridement of the callused eschar area.



Case Study Classic Diabetic Foot Ulcer

Male in his 40's with type 1 diabetes, chronic kidney disease stage 2, peripheral neuropathy, substance dependence, and a history of homelessness developed a diabetic foot ulcer. Poor living conditions and inadequate self-care, pt left the wound uncovered, walking on hospital floor.

Classic diabetic foot ulcer with surrounding callus and discoloration, extending out. The wound contained floor debris, dried blood, and hair.

Treatment was a 15-minute warm betadine oxygenating hydrotherapy using the oxygen bubbling device, gentle cleansing with the foam pad, and application of medical honey under a foam dressing.

Post-treatment, debris, dried blood, and macerated skin had been removed, resulting in a clean, pink/red wound bed with less biofilm and reduced persistent callused skin.



Case Study Charcot's foot deformity

A 56-yr old Caucasian male with morbid obesity, insulin-dependent diabetes, bilateral diabetic foot ulcers, venous insufficiency, and left foot Charcot's joint received post I/D care. Discussion with the pt addressed the potential need for below-knee amputation; however, due to severe stasis dermatitis and morbid obesity, there is an elevated risk of above-knee amputation. The decision was made to proceed with IV antibiotics and wound care management.

Photo documentation before and after a single 20-minute oxygenating hydrotherapy session revealed a reduction in slough, diminished yellow biofilm, and improvement in the wound bed color from a dusky hue to a bright red appearance.

Right Photo taken after x5 treatments 7 days after start of wound care; beefy red granulation tissue is forming to sides and center of wound, no apparent biofilm; surgeons decide to cancel possible BKA/AKA; patient discharged from hospital to home.



Case study Diabetic Foot severe cracks and fissures

The patient is a older female with multiple comorbidities. (type 2 diabetes mellitus, chronic kidney disease stage 3a, among other problems)

Upon initial hospital admission, the patient presented with significant pain resulting from severe deep cracks/ fissures and small multiple ulcers. She reported persistent discomfort despite the application of soaks and topical creams.

Podiatry was consulted, identified a potential yeast component, ordered to treat using oxygenating hydrotherapy with acetic acid 0.5% and anti-yeast ointment. The patient underwent four soaks during the week, resulting in improvement at discharge. Three weeks later, she returned to the hospital with complete resolution of her symptoms.



About a month later, the patient presented again with similar symptoms. The condition regressed despite adherence to prescribed soaks and ointments at home, without oxygenating hydrotherapy. Following an additional week of treatment, significant improvement was observed once more. Notably, after the second treatment session, oxygenating hydrotherapy loosened debris within the fissures, enabling the nurse to remove a considerable amount of sock lint. Contact was later made with patient after last discharge reported again had a complete healing.



Case Study IV Drug user abscess after I/D

40-yr old IV drug user with type 1 diabetes, injected an unknown drug into the top of the foot, resulting in necrosis and infection, post I/D The photos show before and after a single 15-minute soak with oxygenating hydrotherapy, revealing less slough, reduced yellow biofilm, and a wound bed color improvement from dusty to bright red.



Conclusion and Recommendations

A clean wound is a wound that is healing¹. Hydrotherapy with topical oxygen therapy³ works collaboratively to produce optimal results². Healing times are faster with a less painful debridement compared to traditional methods due to the wounds being cleansed and infused with oxygen simultaneously. Our new approach to these two therapies will make effective and time efficient therapy accessible to all patients whether they are receiving care in the hospital, nursing facility, or their own homes; this makes the benefits achievable across the entire spectrum of care. Hydrotherapy has been unavailable to patients that are outside of the clinical setting due to the cumbersome and expensive equipment that was required prior to the availability of this new innovation. Previously this equipment was difficult to set up and came with an increased risk of infection.

Home healthcare staff will be able to administer treatments that will cleanse, debride wounds, and promote tissue growth. Nursing facilities will be able to perform hydrotherapy both quickly and with ease even in their busy setting with high patient loads. The setup of our oxygenating hydrotherapy unit takes only a few minutes. The process is streamlined and clear directions are provided within the kit for easy reference. The clean-up process is as simple as folding all components up into the drape and dropping them into the trash leaving nothing to clean or sanitize. Due to the simple nature of this innovation nursing staff will be more likely to incorporate oxygenating hydrotherapy into their patient's treatment regimen.

In conclusion, the presented case studies make it clear that healing times will be reduced in wounds with the use of these combined therapies. Patients are more cooperative during the debridement process due to the less painful nature making it a more pleasant experience all thanks to the utilization of oxygenating hydrotherapy! When the results of treatment are immediate, nurses feel encouraged, patients feel more hopeful, physicians are happier, and the hospitals will ultimately see these results reflected in their bottom line.

References
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