Sodium Hypochlorite Hydrogel Debrides Necrotic Wound Tissue

Necrotic L heel ulcer

1-17-12 Patient referred to a skilled nursing facility with complications of sepsis and L heel ulcer. The ICU acquired heel pressure sore present for 4 weeks was "stalled". Pedal pulses present.

Problem
- Shock, sepsis in ICU
- Peripheral vascular disease

Treatment
- Daily dressing changes
- Hypochlorite gel* for debridement and biofilm control

1-24-13 Necrotic eschar and heavy bioburden have stalled healing in this deconditioned patient. Moist saline dressings were not effective to control biofilm bacteria. Moist dressing did not debride the adherent heel eschar. Daily sodium hypochlorite gel* dressing changes was ordered to control biofilm bacteria and to facilitate debridement.

Outcome
Wound heals without skin grafting

2-2-12 After 21 days of hypochlorite gel observe, 1. Exuberant reepithelization of the wound, the result as we now understand it of circulating bone marrow derived epithelial precursor cells, 2. Non mechanical debridement of the black eschar has occurred, 3. Importantly note how the skin beneath the eschar is "healing" suggesting that a split thickness skin graft will NOT be required to close this limb threatening pressure ulcer.

Venous stasis dermatitis and weeping ulcers

Problem
- Painful venous stasis dermatitis
- Multiple weeping venous leg ulcers
- Comorbid CHF, COPD, PVD
- Sleeps sitting up

Navy veteran, sleeps sitting up, uses prednisone for COPD, and has mild peripheral vascular disease (PVD). Stasis dermatitis, present for months, now has multiple ulcers weeping serum. Weeping serum dries to form adherent crusts and plaques that crack and create new skin ulcers. Mechanical debridement of dry plaques injures friable skin and caused bleeding and pain.

Treatment
- Hypochlorite gel* for debridement and biofilm control
- Layered compression dressings

Na Hypochlorite gel has the advantage that reactive oxygen species are released from hydro gel slowly for up to 3 days. In addition to killing biofilm bacteria, reactive oxygen species break bonds between proteins. Anecdotal experience suggested that the reactive oxygen species in hypochlorite gel was clinically effective to debride wound eschar.

Hypochlorite gel is liberally applied to wound before Robert Jones dressing is applied at weekly clinic visits. This science poster is, to our knowledge, a first human use report to use hypochlorite, in a concentrated slow release gel form, to break down protein and debride wound eschar. It has been long understood that reactive oxygen breaks chemical bonds between proteins. This study suggests that this sodium hypochlorite protein break down effect, which is similar to how HCl digests protein in the stomach, is effective for debridement.

After two weeks of hypochlorite gel and Robert Jones dressing elastic compression, photos show eschar separation without injury to at-risk skin. Skin remains exquisitely painful due to dermatitis.

14 days of hypochlorite gel and elastic compression treatment has softened dry skin and plaques of dried serum enabling debridement, without injury to the thin underlying at-risk skin.

Outcome
- Sodium Hypochlorite gel debrides VLUs
- Wounds heal in 8 weeks
- Fuzzy Wale Elastic Compression** controls stasis dermatitis

At week six, stasis dermatitis is still evident, but wounds are nearly healed.

Observe resolution of stasis dermatitis after 6 weeks of Robert Jones Dressings and hypochlorite gel.

Lymphorrhea

Problem
- Recurrent painful refractory VLU, treatment week #22
- Lymphedema of morbid obesity
- Comorbid AODM, depression
- CHF, sleeps in chair
- Refused mechanical debridement

Recurrent refractory VLU, wound clinic treatment week # 22. Lymphedema of morbid obesity is difficult to treat with elastic compression because of cone shaped obese legs. Zinc oxide protects skin from maceration under the Robert Jones dressing.

After months of therapy with honey, porcine collagen, seaweed alginate, home nurses, prayer chains and low dose tricyclic antidepressants for pain, wound clinic staff is nihilistic about these wounds .

Treatment
- Sodium Hypochlorite Gel to "debride" exuberant granulation
- Layered Jones compression dressing

Observe thick exudative funky granulation tissue. Pain, patient is depressed, prevented adequate curette debridement. Honey to debride the exuberant granulation tissue macerated the surrounding skin after one week. Clinic staff was bummed out, aka "therapeutic nihilism" that wounds were not healing.
Hypochlorite gel was selected to control the exuberant granulation tissue. Gel was liberally applied to wound under a cotton batting Robert Jones dressing at weekly clinic visits.

This science poster is, to our knowledge, the first human use report to use hypochlorite to break down protein and debride wound eschar. Prior publications feature the antimicrobial effects of reactive oxygen fee radical – we observe that hypochlorite gel* is about as effective as commercially available enzymatic debridement gels.

Photos demonstrate our "soft debridement" technique. Wounds are soaked with hypochlorite solution and debrided, via abrasion, with dry terry cloth.

Photo shows soft debridement results, note exudate on terry cloth, for three passes with dry terry cloth abrasion.

Outcome
Near complete healing with five weeks of hypochlorite gel debridement

Abstract

Problem

Complete debridement of necrotic tissue is the first principal of wound care. Often mechanical debridement is not possible because of pain, provider skills, facility policies and patient noncooperation. Enzymatic debridement is an expensive alternative to mechanical debridement.

Sodium hypochlorite (NaOHCl) is the shelf-stable salt of hypochlorous acid (HOCl), long used for wound therapy. HOCl is used by white blood cells to kill bacteria. Synthesized by the myeloperoxidase enzyme, HOCl releases oxygen free radicals that kill bacteria without harming eukaryotic cells, which are protected by a lipid membrane. 1,2

Hypochlorite solution delivers reactive oxygen species that are: effective in controlling wound odor,3 a mild local anesthetic via disruption of nociceptive receptors,4 highly effective in controlling biofilm microorganisms which release inflammatory mediators that prevent wound healing and inhibit growth of epithelial migration precursor cells,5,6 theoretically involved in the early cell signaling that recruits bone marrow epithelial cell precursors, and vascular endothelial stem cells, to the wound bed.7

Reactive oxygen breaks bonds between proteins in a manner identical to hydrochloric acid (HCl) in the stomach, which directly breaks down proteins in digestion of meat. We reported that pretreatment with HOCl solution, to break down protein bonds, enhances effective, humane, "soft debridement" of painful granulating wounds with terry cloth.8 This study asks, does commercially available hypochlorite gel function to debride wound eschar? Could hypochlorite gel serve as an alternative to enzymatic wound debridement?

Methods
Three chronic leg wounds present > 12 weeks were treated with hypochlorite gel under appropriate dressings to control biofilm bacteria.

Results
Photos document debridement and healing of all wounds. Pain and bioburden control is discussed.

Conclusion
Hypochlorite gel appears, in an anecdotal three patient series, to debride necrotic wound eschar when used under dressings for control of biofilm bacteria.

* Anasept® Antimicrobial Skin & Wound Gel, Anacapa® Technologies, Inc. San Dimas, CA

**EdemaWear®, Compression Dynamics LLC, Omaha, NE

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