AADO
Then 8th Orthopaedic Nursing Conference 2014
Pre-conference Workshop
Wound Management Workshop
12 October 2014

Current Trend In Wound Management

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APN, O&T, PWH
BASIC WOUND MANAGEMENT THEORIES
Wound Healing Process

- Hemostasis
- Inflammation
- Proliferation
- Maturation & Remodeling
Facilitates the wound-healing process:
- prevention of tissue dehydration and cell death
- accelerated angiogenesis
- ↑breakdown of dead tissue and fibrin
- potentiating the interaction of growth factors with their target cells

↓ Pain

Charles KF and others, 1994, Overview of wound healing in a moist environment
Wound Bed Preparation

- An ongoing debridement phase
  - Autolytic debridement
  - Surgical and sharp debridement
  - Enzymatic debridement
  - Mechanical debridement
  - Biological therapy

- Management of exudate
  - Dressing selection

- Resolution of bacterial imbalance
  - Wound contamination
  - Wound colonization
  - Critical colonization
  - Wound infection

GREGORY SS & others, Wound bed preparation: a systematic approach to wound management, WOUND REP REG 2003;11:1–28
Wound Bed Preparation

An ongoing debridement phase

- Autolytic debridement
- Surgical and sharp debridement
- Enzymatic debridement
- Mechanical debridement
- Biological therapy

- Exogenous proteolytic enzymes that are manufactured
  - Collagenase-based debridement
  - Papain-based debridement

Wound Bed Preparation

An ongoing debridement phase

- Autolytic debridement
- Surgical and sharp debridement
- Enzymatic debridement
- Mechanical debridement
- Biological therapy

- Wet to dry gauze
- Pressurized irrigation
- Whirlpool therapy

Wound Bed Preparation

An ongoing debridement phase

- Autolytic debridement
- Surgical and sharp debridement
- Enzymatic debridement
- Mechanical debridement
- Biological therapy

➢ Sterile maggots

TIME principles

<table>
<thead>
<tr>
<th></th>
<th>Tissue management (non-viable)</th>
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<tbody>
<tr>
<td>I</td>
<td>Inflammation &amp; infection control</td>
</tr>
<tr>
<td>M</td>
<td>Moisture Balance</td>
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<tr>
<td>E</td>
<td>Epithelial Edge advance</td>
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It is recognised that healing of many chronic wounds is impaired by formation of biofilms. A biofilm forms when bacteria (often several species) attach to a wound and encase themselves in an exopolymeric substance. These bacteria vary in morphology and physiology to planktonic, single cell bacteria. The bacteria living in a biofilm are likely to have increased metabolic efficiency, substrate accessibility, improved resistance to environmental stress and substances, and increased ability to cause local tissue damage and infection. A biofilm is very difficult to directly eradicate. Penetration of a biofilm by antibiotics and topical antimicrobials is very limited.
<table>
<thead>
<tr>
<th>Wound Healing Approach</th>
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<tbody>
<tr>
<td><strong>Patient Centered</strong></td>
<td>✓ Understand Patient’s concerns</td>
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<td></td>
<td>✓ Motivate Patient’s willingness</td>
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<td>✓ Gain Patient’s compliances</td>
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<td><strong>Holistic</strong></td>
<td>✓ Assess whole patient, not “hole” in patient</td>
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<td></td>
<td>✓ Explore contributing factors</td>
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<td></td>
<td>✓ Apply preventive measures</td>
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<td><strong>Multidisciplinary</strong></td>
<td>✓ O&amp;T Surgeons, Dermatologists, Vascular surgeons</td>
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<td></td>
<td>✓ Nurses, PT, OT, P&amp;O, Podiatrist, Dietitians</td>
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<tr>
<td></td>
<td>✓ GOPC, CGAT, Wound clinics, DM clinics, Home helpers</td>
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</table>
WOUND MANAGEMENT METHODS
Negative Pressure
Wound Therapy

Mechanism:
– Reduces localized edema
– Stimulates localized blood flow
– Promotes granulation tissue formation
– Reduces bacterial load
Maggot Debridement Therapy (MDT)

- The beneficial effects of using larvae in wounds were first noticed in 1557; first clinical application was during American Civil War (1861-1865)
- *Not a NEW discovery: being rediscovered with reduced effectiveness of antibiotics*
- FDA approval in 2004
TopClosure Method
Hyperbaric Oxygen Therapy

Administration of oxygen at pressure greater than sea level

Rationale for Hyperbaric Oxygen in Problem Wounds:
- Enhances fibroblast replication
- ↑ collagen synthesis
- ↑ neovascularization
- ↑ leukocyte bactericidal activity
- ↑ O2 tension → greater capillary oxygen diffusion distances
In conclusion, this study shows the effectiveness of HBO in improving wound healing and reducing repetitive surgery. We believe that HBO is a useful adjunct in the management of severe (grade III) crush injuries of the limbs in patients more than 40 years old.
TRENDS ON WOUND MANAGEMENT

- Portable, Ambulatory, Small Size Products to facilitate
  In hospital Care → Home / Community Care
Not HBO!!!
Topical oxygen as an adjunct to wound healing: a clinical case series

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Abstract

Background: Disrupted vasculature and high energy-demand to support processing and regeneration of wounded tissue are typical characteristics of a wound site. Oxygen delivery is a critical element for the healing of wounds. Clinical experience with adjunctive hyperbaric oxygen therapy in the treatment of chronic wounds have shown that wound hyperoxia increases wound granulation tissue formation and accelerates wound contraction and secondary closure. Nevertheless, the physiologic basis for this modality remains largely unknown. Also, systemic hyperbaric oxygen therapy is associated with risks related to oxygen toxicity. Topical oxygen therapy represents a less explored modality in wound care. The advantages of topical oxygen therapy include low cost, lack of systemic oxygen toxicity, and the ability to receive treatment at home, making the benefits of oxygen therapy available to a much larger population of patients. Materials and methods: Over 9 months, seven surgeons treated 58 wounds in 32 patients with topical oxygen with follow-up ranging from 1 to 8 months. The data presented herein is a retrospective analysis of the results we have achieved using topical oxygen on complex wounds. Results: Thirty-eight wounds in 15 patients healed while on topical oxygen. An additional five wounds in five patients had preoperative oxygen therapy; all wounds initially healed postoperatively. In two patients, wounds recurred post-healing. In ten wounds, topical oxygen had no effect; and two of those patients went on to require limb amputation. There were no complications attributable to topical oxygen. Three patients died during therapy and one died in the first postoperative month from underlying medical problems. Two patients were lost to follow-up. Conclusions: In this case series, topical oxygen had no detrimental effects on wounds and showed beneficial indications in promoting wound healing. © 2002 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Acute and chronic wounds; Oxygen therapy; Diabetes
Continuous Topical Oxygen for the Treatment of Chronic Wounds: A Pilot Study

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ABSTRACT
Oxygen is essential for all stages of wound healing. Previous research has shown topical administration of oxygen to have positive effects on wound healing. In this study, the application of transdermal continuous topical oxygen therapy (TCOT) was evaluated for its effect on chronic wound healing in 9 patients. After 4 weeks of treatment, mean wound surface area and wound infection checklist scores were significantly reduced. Signs of bacterial damage were also reduced. Findings from this study suggest TCOT may be beneficial in promoting chronic wound healing.

KEYWORDS: continuous topical oxygen, chronic wounds, oxygen and wound healing

ADV SKIN WOUND CARE 2012;25:543–547

INTRODUCTION
Normal cutaneous ulcer healing usually follows a well-orchestrated trajectory. A complex network of biochemical pathways and sequential cellular interactions ensure an integrated progression of hemostasis, inflammation, proliferation (matrix deposition), wound closure, and remodeling. Wound healing, however, is often stalled at the inflammation or proliferation stage, producing chronic wounds that do not heal at the expected rate. Chronic nonhealing wounds are a burgeoning problem, and they consti-
NPWT machines and products decrease in size
TRENDS ON WOUND MANAGEMENT

- Single product → Combinations
Medihoney + NPWT

Active Leptospermum Honey and Negative Pressure Wound Therapy for Nonhealing Postsurgical Wounds

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The use of negative pressure wound therapy (NPWT, V.A.C. Therapy®, KCI, San Antonio, TX) has grown rapidly over recent years. The modality creates a healing-friendly environment by promoting the growth of granulation tissue and removing exudate and infectious material. While the evidence base supporting this treatment grows, certain issues specific to NPWT require attention. According to the manufacturer’s specifications and in order to maximize the benefits of NPWT, all devitalized tissue (including eschar and hardened slough) should be removed as thoroughly as possible before NPWT application. This may require sharp or surgical debidement. If the patient is not a candidate for sharp debidement, an alternative debidement technique was used. As a result, the presence of dead tissue, and foreign matter disturb the delicate balance of a wound, which can lead to delayed healing, increased inflammation, and potential infection (Baraff, 1997). Necrotic tissue also prevents epithelial cells migrating over the wound bed (Zwolak, 2004).

A low bacterial load and management of wounds, especially with necrotic tissue, are the most essential in promoting the healing process. A radical debridement was used in the case report, and the wound bed was left for the use of the honey in the NPWT. Following 24 days of treatment, the wound bed was debidement (or removal), and the sloughy area on the outer edge was also reducing in size. The color of the granulation tissue had improved significantly, and it now appeared as well perfused. Epithelial cell overgrowth to the margins of the wound was most significant and prepare the wound bed for the use of honey with NPWT. When wounds were dramatically near depth, the NPWT was improved by approximately 3-5 cm. After treatment, the wound was sized and NPWT continued to heal with proper trajectory and were continuing in time of discharge.

Case report one
A 54-year-old female patient who had been visited by the district nurse presented with sustained leg ulcers. The granulation tissue was removed using a hand debrider to prepare the wound bed for the use of Medihoney. The area was irrigated using normal saline, and the debrider was used to remove any necrotic tissue, leaving the wound bed healthy. A dressing was then applied, and the patient was discharged for daily treatments.

Case report two
This 48-year-old male patient presented with a leg ulcer that had not responded to conventional treatments. The wound was deep and red, and the patient was referred to a specialist for further treatment. The specialist prescribed Medihoney, and a NPWT was applied. Treatment was continued for 4 weeks, and the wound showed significant improvement. The patient was discharged after 3 weeks, and the NPWT was continued at home.

Figure 1: Wound at the front of the mid-right thigh at first presentation.

Figure 2: Wound at the front of the mid-right thigh at after treatment.

Figure 3: Wound at the front of the mid-right thigh at before treatment.

Effectiveness in Wound Bed Preparation! (Synergistic Effect)
High Osmolarity (high sugar level): causes a mass outflow of bacteria, endotoxins & sloughy material away from wound bed; increases autolytic debridement & reduce inflammatory response (e.g. oedema & exudate) & odour

Low Water Content: insufficient water to support bacteria growth

Acidity (pH 3.2-4.5): inhibits microbial growth & improves oxygen diffusion; control protease activity; stimulate angiogenesis & healing

Antioxidants: scavenge free radicals that arise from inflammation; reduces cellular damage
• F/5
• PHx: good
• Fell from motorcycle with left heel caught by the wheel in 07/2012
• Attended China hospital with wound exploration, debridement & tendon repair performed, then came back to HK for further mx in 08/2012
• Option for conservative mx
• Wound Culture: no growth

~ 6 weeks

Portable NPWT Device
Combined NPWT and TopClosure in management of diabetic foot

Cited from:
http://www.ijps.org/article.asp?issn=0970358;year=2012;volume=45;issue=2;spage=291;epage=301;aulast=Topaz on date 2014.10.10

**Maintenance of negative-pressure wound therapy while undergoing hyperbaric oxygen therapy.**

Chong SJ, Kwan TM, Weihao L, Joang KS, Rick SC.

**Author information**

**Abstract**

**BACKGROUND:** Both negative wound pressure therapy (NPWT) and hyperbaric oxygen therapy (HBOT) are useful modalities in the treatment of problem wounds. However, none of the commercially available portable negative-pressure devices have been certified safe for use in a recompression chamber. Thus, the NPWT device is removed while the patient undergoes HBOT. The purpose of this study is to demonstrate that wound negative pressure can be effectively and safely maintained during HBOT.

**PATIENTS AND METHODS:** In a small, prospective, randomised crossover trial, we used commonly available clinical materials to connect the NPWT suction tubing to the negative suction generating device in the hyperbaric chamber. Six patients each underwent one HBOT session with continuous NPWT and one HBOT session without concurrent NPWT. We assessed the patient's pain score, the amount of exudate aspirated by the NPWT during HBOT, and the appearance of the wound dressing after each session was assessed in a blinded manner.

**RESULTS:** There were no differences in pain scores between the two HBOT sessions. The amount of exudate aspirated during HBOT with NPWT ranged from 5 to 12 ml. Five of the six patients had a better appearance scoring of their dressing when NPWT was maintained during HBOT (P = 0.006).

**CONCLUSION:** We successfully demonstrated a simple design that allows the maintenance of NPWT during HBOT without causing additional pain, and with continued extraction of exudate. The maintenance of NPWT during HBOT also allowed the dressing to be maintained undisturbed.
Improved wound management by regulated negative pressure-assisted wound therapy and regulated, oxygen- enriched negative pressure-assisted wound therapy through basic science research and clinical assessment

Moris Topaz

Abstract

Regulated negative pressure-assisted wound therapy (RNPT) should be regarded as a state-of-the-art technology in wound treatment and the most important physical, nonpharmaceutical, platform technology developed and applied for wound healing in the last two decades. RNPT systems maintain the treated wound's environment as a semi-closed, semi-isolated system applying external physical stimulations to the wound, leading to biological and biochemical effects, with the potential to substantially influence wound-host interactions, and when properly applied may enhance wound healing. RNPT is a simple, safe, and affordable tool that can be utilized in a wide range of acute and chronic conditions, with reduced need for complicated surgical procedures, and antibiotic treatment. This technology has been shown to be effective and safe, saving limbs and lives on a global scale. Regulated, oxygen-enriched negative pressure-assisted wound therapy (RO-NPT) is an innovative technology, whereby supplemental oxygen is concurrently administered with RNPT for their synergistic effect on treatment and prophylaxis of anaerobic wound infection and promotion of wound healing. Understanding the basic science, modes of operation and the associated risks of these technologies through their fundamental clinical mechanisms is the main objective of this review.
Evidence-based decisions for local and systemic wound care

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Correspondence to: Dr D. T. Ubbink, Department of Quality Assurance and Process Innovation, Academic Medical Centre, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands (e-mail: d.ubbink@amc.nl)

Background: Decisions on local and systemic wound treatment vary among surgeons and are frequently based on expert opinion. The aim of this meta-review was to compile best available evidence from systematic reviews in order to formulate conclusions to support evidence-based decisions in clinical practice.

Methods: All Cochrane systematic reviews (CSRs), published by the Cochrane Wounds and Peripheral Vascular Diseases Groups, and that investigated therapeutic and preventive interventions, were searched in the Cochrane Database up to June 2011. Two investigators independently categorized each intervention into five levels of evidence of effect, based on size and homogeneity, and the effect size of the outcomes.

Results: After screening 149 CSRs, 44 relevant reviews were included. These contained 109 evidence-based conclusions: 30 on venous ulcers, 30 on acute wounds, 15 on pressure ulcers, 14 on diabetic ulcers, 12 on arterial ulcers and eight on miscellaneous chronic wounds. Strong conclusions could be drawn regarding the effectiveness of: therapeutic ultrasonography, mattresses, cleansing methods, closure of surgical wounds, honey, antibiotic prophylaxis, compression, lidocaine–prilocaine cream, skin grafting, antiseptics, pentoxifylline, debridement, hyperbaric oxygen therapy, granulocyte colony-stimulating factors, prostanoids and spinal cord stimulation.

Conclusion: For some wound care interventions, robust evidence exists upon which clinical decisions should be based.

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Published online 6 July 2012 in Wiley Online Library (www.bjs.co.uk). DOI: 10.1002/bjs.8810
Table 8  Summary of strong levels (1 and 2) of evidence and recommendations for wound care

<table>
<thead>
<tr>
<th>Wound type</th>
<th>Recommendation and effect size of the treatment</th>
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| Acute wounds | Prevent infection with prophylactic antibiotics, particularly in hands; NNT 4 (3, 8)  
Mammalian bites$^{27}$  
Superficial and partial-thickness burns$^{20,29}$  
Laceration and soft tissue wounds$^{17}$ |  
Apply local honey for quick healing, as WMD of 5 (−5.1, −4.3) days is reported compared with conventional dressings  
In acute wounds do not use silver sulfadiazine as topical agent; NNH 13 (7, 1667)  
When in need of cleansing, use tap water of drinking quality rather than sterile saline solutions; NNT 3 (3, 7) |
| Chronic wounds |  
Venous ulcers$^{30,36,39}$ |  
Systemic treatment with pentoxifylline increases complete wound healing; NNT 4 (3, 7)  
Use compression therapy for wound healing, adding high compression; multicomponent systems or elastic bandages are the most effective  
Use hyperbaric oxygen therapy to decrease major amputation rate; NNT 5 (3, 12)  
Use local hydrogels to promote complete wound healing; NNT 5 (3, 10)  
Use systemic prostanoids in patients with critical leg ischaemia to relieve rest pain, NNT 11 (7, 28), and improve ulcer healing, NNT 9 (6, 17)  
Use spinal cord stimulation to improve limb salvage; NNT 9 (5, 45)  
Use high-specification foam mattresses, NNT 13 (10, 21), and low air-loss mattresses, NNT 5 (3, 9), to prevent pressure ulcers on the ward, and pressure-relieving overlays on the operating table; NNT 17 (10, 54)  
Do not use local therapeutic ultrasound to heal pressure ulcers |
| Diabetic ulcers$^{41,43}$ |  |
| Arterial ulcers in patients with critical leg ischaemia$^{49,50}$ |  |
| Pressure ulcers$^{51,56}$ |  |
Acknowledgement

Choi Kah Leng, APN, O&T, PWH
9ABC O&T staffs
Reference

- Glenn S. Management of Wounds with Antibacterial Medical Honey (Leptospermum sp) and Topical Negative Pressure (TPN). Wounds UK 2010; 6(1):143-145.
Question / Sharing?