Innovative Dressing Choices What, When, and Why

Aksone Nouvong, DPM, FACFAS

Associate Professor,
UCLA, David Geffen School of Medicine, Department of Vascular Surgery
Los Angeles, California

Chief of Podiatric Medicine and Surgery/
Associate Program Director
DVA Greater Los Angeles /Olive View-UCLA Medical Center
Los Angeles, California
## Disclosures

### Speaker’s Bureau:
- None

### Honorarium:
- None

### Consultant:
- None

### Stockholder:
- None

### Grant/Research Support:
- NIH
- Hospital Seed Grant
- Dipexium
- Olive View-UCLA/CSUN

### Medical/Scientific Boards:
- American College of Foot and Ankle Surgeon
- Olive View-UCLA IRB Board of Trustee
Learning Objectives

1. Recall different wound care modalities including: dressings, biologics and other therapy
2. Recognize new dressing technology
3. Be familiar when advance wound care therapy should be considered
WHY Advance/Innovative Therapy?

- **DM Diagnosis**
  - 2030 552 mil (8.3%) vs 2011 366 mil (7%)

- **DFU**
  - 15%-25% develop DFU – lifetime
  - Only 24.2% in 12 wks with standard treatment (Margolis)
  - $471 billion in 2012

- **Amputation**
  - q 30 sec lower limb lost worldwide (Boulton)

- **Death after amputation worse than malignancies**
  - 39-80% at 5 yrs

www.cdcinfo.cdc.gov
WHY Don’t They Heal?

- Pressure
- Infection
- PAD
- Chronic disease state
  - Glycemic control
  - Nutritional (pre-albumin)
- Chronic wounds stall within inflammatory phase
Wound healing phases

- Hemostasis
  - Platelet

- Inflammation
  - Neutrophil

- Proliferation
  - Macrophage

- Maturation
  - Fibroblast

Brett, D. Wounds 2009
Hemostasis

spill into wound

Platelets aggregate exposed Collagen (clot)

Platelets

Macrophage replace PMN
Phagocytize bacteria

PMN proteolytic enz dissolve clot destroys bacteria

Granulation. Epithelialization, MMP
Advanced/Innovative Wound Care
WHEN

• Rigid Structural Deformity
• Infection
• PAD
• Ulcer Size >3cm² (Ince et al)
• Rate of healing <50% in 4 wks (Sheehan et al)
Advanced/Innovative Wound Care

WHAT

- Treatments
  - Relieve pressure – Off Loading
  - Treat infection
  - Restore perfusion
  - Local and Advance wound care
### Advanced Wound Care

**WHAT – Relieve Pressure**

<table>
<thead>
<tr>
<th>Types of Devices</th>
<th>Pressure reduction</th>
<th>Ulcer Healing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shoes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast/wedge</td>
<td>44-64%</td>
<td>58-91% (minimal prospective trials)</td>
</tr>
<tr>
<td>Rocker-bottom, met pads</td>
<td>16-52%</td>
<td></td>
</tr>
<tr>
<td><strong>Above ankle devices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removable boots</td>
<td>65%</td>
<td>52% (Armstrong et al)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*29% compliancy w/ removable</td>
</tr>
<tr>
<td>Non-removable</td>
<td></td>
<td>83% (Armstrong et al)</td>
</tr>
<tr>
<td>TCC</td>
<td>89%</td>
<td>92% in 42 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2% &amp; 6% (Wu and Fife et al)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35% used casting ½ TCC (Prompers, et al)</td>
</tr>
</tbody>
</table>

**Surgical Treatment**

**Surgical Prophylaxis**

---

*Cavanagh et al plastic and Rec surgery 2011*
Treatment of Infection

- 58% had infection while referred to DM foot team (Eurodiale)
- Ulcer deep to bone (Lavery et al.)
- Ulcer duration > 30 days
- Recurrence
- Traumatic etiology
- PAD
Eurodiale

- < 50% of DM with ABI < 0.5 underwent adequate vascular eval / revascularization
- Limb Salvage 1 year
  - Open bypass surgery 85%
  - Endovascular revascularization 78%
- Ulcer healing 1 year
  - 60% or more following open or endo revascularization
Advanced/Innovative Wound Therapy

WHAT

>60 studies past 2 years on DFU

- Debridement
  - Surgical/enzymatic/larvae/hydrotherapy
- Antiseptics
  - Iodine/Ag+/honey/H2O2
- Excessive exudate
- Proteolytic enzymes
- Promote healing
  - Cellular therapy
  - Extracellular matrix (ECM)
  - Growth factors
  - Human skin equivalent

- Bioengineered tissue
  - Living cell (Single layer/bilayer)
  - Placenta derived graft
- Stem cell
- Epidermal harvesting system

Topical and biologic therapies for diabetic foot ulcer, Richmond et al. 2013
Wound Products

Topical and biologic therapies for diabetic foot ulcer, Richmond et al. 2013
Advanced/Innovative Wound Care
Other Modalities/Therapy

- Advance Treatment
  - NPWT
  - HBOT
  - Prophylactic Surgery
  - Electric (+local heat)
  - Electrical stimulation
  - Ultrasound
  - Shockwave
  - Magnetic
  - Laser
  - Many more

- In trial
  - Bioactive dressing
  - Nitric oxide patch
  - Soluble beta-glucans
  - Protein kinase
  - Xenoderm ointment
  - Dermagen
  - Angiotensin
  - Herbal
  - Lymphocyte, monocyte & neutrophils

Topical and biologic therapies for diabetic foot ulcer, Richmond et al. 2013
A systematic review of interventions to enhance the healing of chronic ulcers of the foot in diabetes


• IWGDF Review of publications Dec 2006 - June 2010
• 1322 papers identified, 43 full reviewed
• Focused on 10 category for treatment
• Similar finding with Cochrane, NICE and other reviews
  • No evidence to justify new therapy
  • Improved Evidence for NPWT and HBOT

IWGDF Top 10 Category for Treatment

- Sharp debride
- Larvae
- Hydrotherapy
- Antiseptics
- Application
- Dressing
- Resection
- Compression
- HBOT
- NPWT
Negative Pressure Wound Therapy

- IWGDF evidence on NPWT:
  - Effective at reducing time to granulate 90% and wound closure
  - Increased incidence of healing by 16 weeks
  - Effective in reducing amputation

- Current evidence for NPWT (Frykberg and Williams)
  - Can be utilized in all severity of ulcer
  - Significantly reduces amputation rate
  - Significant reduction cost of care

Kirby, M. British J of Diabetes and Vascular Disease. 2007
Lam, et al., JBJS 2005
Innovative Choice
NPWT Alternative

• NPWT with Instillation of solution
  • SVED
  • Quantum
  • VAC Instill
  • VAC Ultra

• NPWT single use/no canister
  • PICO
Innovative Choice
NPWT with Instillation (NPWTi)

• Same as NPWT with instillation of Solutions
  • Polyhexanide, myrcocyn/dermacyn, saline, hypochlorite, silver nitrate, iodine
  • Lidocaine

• Principal goal
  • Irrigation
  • Removal of debris and exudate
  • Wound bed cleansing
  • Microbial eradication
Innovative Choice
NPWTi Evidence for Use

• Studies
  • Animal Porcine
  • Studies on various wounds
    • Brinkert, et al. 131 subjects 98% in 14 days
    • Kim et al. 142 subjects decreased surgical and L.O.S
    • Gabriel et al. 48 trunk/ext wounds, cost saving for surgical and L.O.S
    • Lehner et al. 32 subjects infected periorthopedic implant infxn

• Limitations
  • Limited RCT
  • Studies on all wounds (Orthopaedic and abdominal)
  • DFI mainly case studies
The Impact of Negative-Pressure Wound Therapy with Instillation Compared with Standard Negative-Pressure Wound Therapy: A Retrospective, Historical, Cohort, Controlled Study

Kim et al. 2014

Objective:
- Retrospective, historical cohort 142 subj NPWT vs NPWTi (n=74)

Method:
- Evaluated outcome NPWT vs NPWTi
  - # OR visits
  - L.O.S
  - Time to final surgical procedure
  - % of wounds surgically closed before discharge
  - % of wounds that remained closed 30 days after discharge
  - Reduction in microorganisms

Result:
- # OR visits (➔ 3.0 to 2.4)
- L.O.S (➔ 14.9 to 11.4)
- Time to final surgical procedure (➔ 9.2 to 7.5)

Conclusion:
- NPWTi beneficial compared w/ NPWT
- Limitation: Selection bias, retrospective NPWT
NPWTi Guidelines

“Negative-Pressure Wound Therapy with Instillation: International Consensus Guidelines”
Kim et al. 2013

1) Indications
   • Acute and chronic contaminated/Infected wounds as adjunctive tx.
   • Not approved for exposed orthopaedic implants

2) Debridement if needed

3) Select appropriate soln
   • Polyhexanide and myrcocyn/dermacyn

4) Dwell time 10-20 mins

5) Volume of solution until foam is saturated
NPWTi Guidelines

• Consensus guidelines 2013 (Cont’s)

  6) Negative pressure should be 1-2.5 hrs
  7) Pressure 125-150mmHg
  8) Continuous is recommended
  9) Used until deemed ready for next stage
     • Closure, grafting, secondary healing

Consensus based on small numbers of evidence based studies and small panel
Innovative Choice
NPWT Alternative

• PICO

- Smaller, lighter, portable (Pt compliance)
- No canister
- Dressing breathable film
- Single use
- Preset 80 ± 20mmHg
- 7 days
- Indicated for less exudative wounds. <300ml/week
- With or without filler
- Post op closed incision

Biological Effects of a Disposable, Canisterless Negative Pressure Wound Therapy System, M. Malmsjo et al. 2014
Reduction of Diabetic Foot Ulcer Healing Times Through Use of Advanced Treatment Modalities, G Mulder et al. 2014
• Studies
  • Animal study similar wound outcome
  • Prospective, non-comparative, multicenter
    • 20 subjects for functional and clinical acceptance (high risk closed / traumatic / STSG)
    • 14 days
    • Results, improved healing and limited complications
  • Case studies (non IRB)

Future:
Currently human subject trials being conducted for VLU and DFU’s
Summary

• Why
  • Improve quality of life
  • Reduce amputation and improve morbidity/mortality

• When
  • Infection, PAD, Not reduced by 4 weeks w/ appropriate therapy

• What
  • Reduce pressure
  • Address PAD
  • Address infection
  • Advance wound care
WHOA! HALF EMPTY! DEFINITELY HALF EMPTY!!

JUST LISTEN TO YOU! ALWAYS THE PESSIMIST!
Thank You


References


24. Robson MC, Payne WG, Garner WL, et al. Integrating the results of phase IV (postmarketing) clinical trial with four previous trials reinforces the position that Regranex (beclapermin) gel 0.01% is an effective adjunct to the treatment of diabetic foot ulcers. *J Appl Res* 2005;5:35–45.


