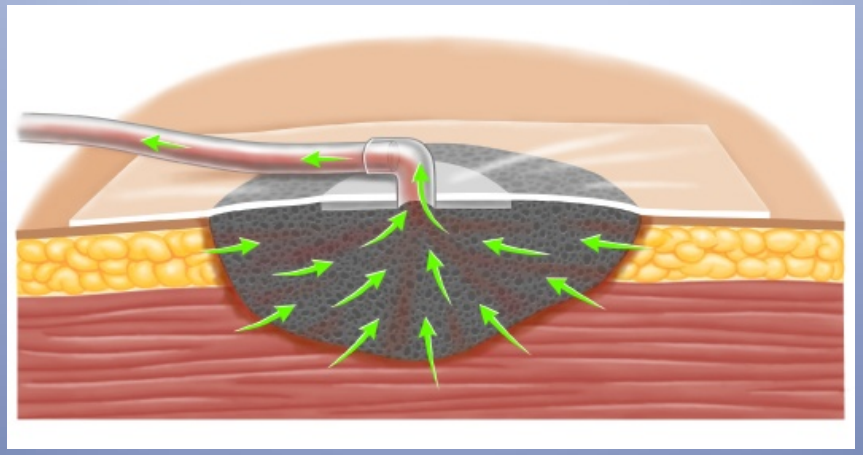


The VAC and New-Fangled Strategies for Wound Management: Valuable vs. Worthless

Jim Wood

Grand Rounds Debate

14 March 2011

Historical Perspective

- Ebers Papyrus (1550 BC): lint, animal grease, honey.
- Berlin Papyrus: open wounds expose the wounded person to "infernal beings.“
- Greeks differentiated b/w acute and chronic wounds

Historical Perspective

- Galen: 2nd Century AD
  - Roman surgeon
  - Described importance of moist wound environment.

- Wound care largely unchanged until the 19th Century with Lister

Wound-Care in the "New-fangled" Age

- Definition:
  1. Has a name (which is likely trademarked)
  2. Involves equipment
  3. Likely has a patent
  4. Not available in the 15th Century BC

Principles of Wound Care

- Optimize wound closure
- Control Contamination
- Convenient for patients and providers
- Cost effective

Test-taking Skills Aside:

- _____ is either:

  A. Worthless

  B. Universally useful

  C. _____ 

Progress?

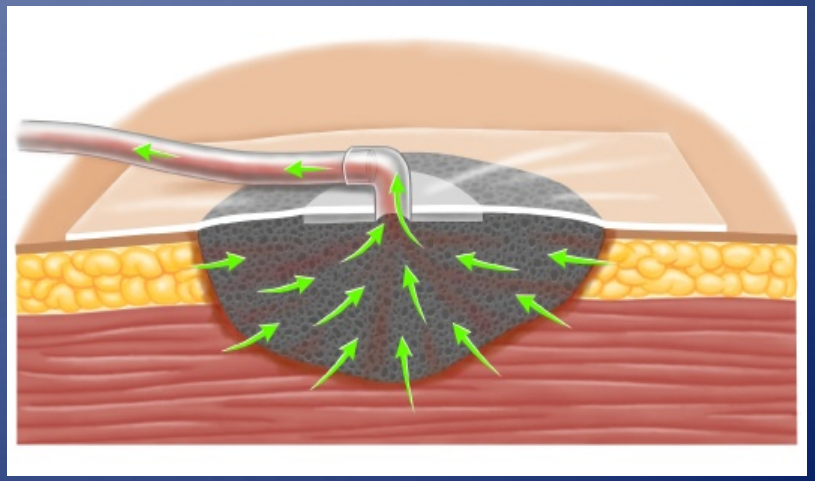
Mechanisms of wound-healing

- Local factors normally interfering with healing:
  - Dessication
  - Edema
  - Exudate
  - Poor aposition
  - Infection

- Negative pressure dressings improve healing by direct and indirect effects

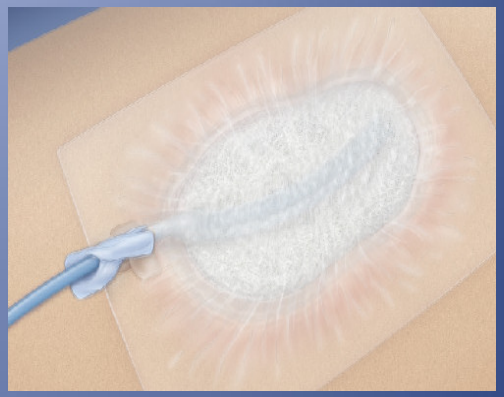
Direct Effects of NPWT

- Maintains warm and moist environment
- Removes excessive exudative fluids
- Reduces edema from interstitium
- Decreases size of wound
- Apposes grafts and flaps



Venturi *AM J Clin Dermatol* 2005
Urschel *Br J Plast Surg* 1988
Nishimura *Wound Repair Regen* 2007

Indirect Effects of NPWT



- Increased blood flow [1]
- Diminished inflammatory response [2]
- Altered bacterial environment [3]
- Celluar and biochemical changes– increased fibroblast activity, collagen reorganization, VEGF, and FGF-2 [4]

1. Morykwas Ann Plast Surg 1997; Kairinos Plast Recons Surg 2009
2. Norbury. Wounds 2007; Greene. Ann Plast Surg 2006
3. Morykwas Ann Plast Surg 1997; Moues. Wound Repair Regen 2004
4. Jacobs. J Plast Reconstr Surg 2007

Cumulative Clinical Effect

- Significant decrease in time to wound healing in animal models. (Jacobs. J Plast Reconstr Aesth Surg 2009)

- Cochrane Review 2007: 8 clinical studies reviewed– chronic wound, randomized study, specific endpoints.
  - Time to complete healing
  - Days to reach 50% wound volume
  - Reduction in wound surface area
  - Decrease in wound length, width, depth or volume
  - Time until ready for operation

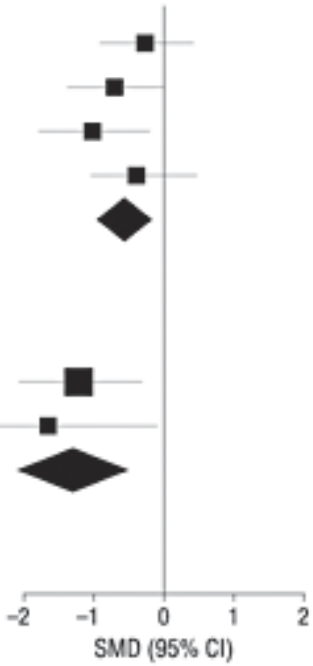
- Only one study available for each→ no comparisons possible

Negative Pressure Wound Therapy

A Vacuum of Evidence?

Sven Gregor, MD; Marc Maegele, MD; Stefan Sauerland, MD, MPH; Jan F. Krahn, MD; Frank Peinemann, MD; Stefan Lange, MD, PhD

Source	NPWT		Control		SMD (95% CI)
	Patients, No.	Mean (SD)	Patients, No.	Mean (SD)	
RCTs					
Ford et al,[22] 2002	20	−51.8 (38.0)	15	−42.1 (38.0)	−0.25 (−0.92 to 0.42)
Joseph et al,[26] 2000	18	−78.0 (72.0)	18	−30.0 (61.0)	−0.70 (−1.38 to −0.03)
Mouës et al,[23] 2004	15	−3.8 (1.9)	13	− 1.7 (2.2)	−1.00 (−1.79 to −0.20)
Wanner et al,[27] 2003	11	−25.0 (26.0)	11	−14.0 (30.2)	−0.38 (−1.22 to 0.47)
Subtotal (95% CI)	**64**		**57**		−0.57 (−0.94 to −0.20)
Test for heterogeneity: $\chi^2_3 = 2.34$; $P = .51$; $I^2 = 0\%$					
Test for effect: $z = 3.03$ ($P = .002$)					
Non-RCTs					
Etöz et al,[37] 2004	12	−20.5 (11.9)	12	−9.5 (4.1)	−1.19 (−2.07 to −0.31)
McCallon et al,[36] 2000	5	−28.4 (24.3)	5	9.5 (16.9)	−1.64 (−3.18 to −0.09)
Subtotal (95% CI)	**17**		**17**		−1.30 (−2.07 to −0.54)
Test for heterogeneity: $\chi^2_1 = 0.24$; $P = .63$; $I^2 = 0\%$					
Test for effect: $z = 3.33$ ($P < .001$)					



Arch Surg. 2008 Feb;143(2):189-96

Advantages over Traditional

- Fewer dressing changes
  - Less pain for patients
  - Less nursing time
- Management of complex wounds in unusual configurations [1]
- Improved wound healing rate in select populations [2]

1. Joseph E. Wounds 2000. Ford CN. Ann Plast Surg 2002
2. Blume PA. Diabetes Care 2008

Applications

- Acute Wounds:
  - Helps with management of complex wounds [1]
  - In trauma patients: [2]
    - Decreased # of dressing changes
    - Easier application
    - Reduced complexity of subsequent reconstruction
  - Burns: ease of positioning without splints [3]

1. Stevens P. Int Wound J 2009; Garner GB Am J Surg 2001.
2. DeFranzo AJ. J Wound Care 2009; Plast Reconstr Surg 2001; Maera JG. Plast Reconstr surg 1999
3. Kamolz LP. Burns 2004

Applications

- Chronic Wounds
  - Diabetic foot ulcers– reduced time to closure [1]
  - Pressure ulcers– improved patient comfort and less labor intensive [2]

Cost-effectiveness of Negative Pressure Wound Therapy for Postsurgical Patients in Long-term Acute Care

Jean M. de Leon, MD; Sunni Barnes, PhD; Melody Nagel, PT; Michelle Fudge, PT; Adora Lucius, RN, CWOCN; and Betty Garcia

Advances in Skin & Wound Care. **22**(**3**):122-127, March 2009

  - Faster rates of closure
  - Lower cost per cm^2

1. Blume PA. Diabetes Care 2008
2. Joseph E. Wounds 2000; Ford CN Ann Pl ast Surg 2002; Wanner MB Scan J Pl 2003

Applications

- Skin grafts / Flap fixation (2 RCT's) [1]
  - Improved graft take
  - Decreased need for re-grafting
  - Improved length of hospitalization
- Open Abdomen [2]
  - Improved rates early and late (>9d) fascial closure
- Open Sternum [3]
  - Decreased in LOS

1. Llanos S. Ann Surg 2006; Moisidis E. Plast Reconstr Surg 2004
2. Rotondo MF. J Trauma 1993
3. Damiani. J Plast Rec Aesth Surg 2011

Disadvantages?

- Bulky Vacuum Pump?
- More costly?


LSU
LSU

Conclusions

- Optimizes wound closure
- Controls Contamination
- Convenient for patients and providers
- Cost effective

The way forward

is forward.