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Negative Pressure Wound Therapy and Debridement

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What is Negative Pressure Wound Therapy?

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- Negative Pressure Wound Therapy (NPWT) refers to a controlled negative pressure (sub-atmospheric) system that is applied topically onto a wound.
- The wound is filled with a porous material (foam or gauze wound filler) and sealed with an adhesive polyurethane drape.
- A drain connects the wound filler to the vacuum source that delivers a negative pressure.
- The suction is propagated from the vacuum source to the wound bed, leading to a negative pressure in the filler and removal of exudate

Mechanism of action

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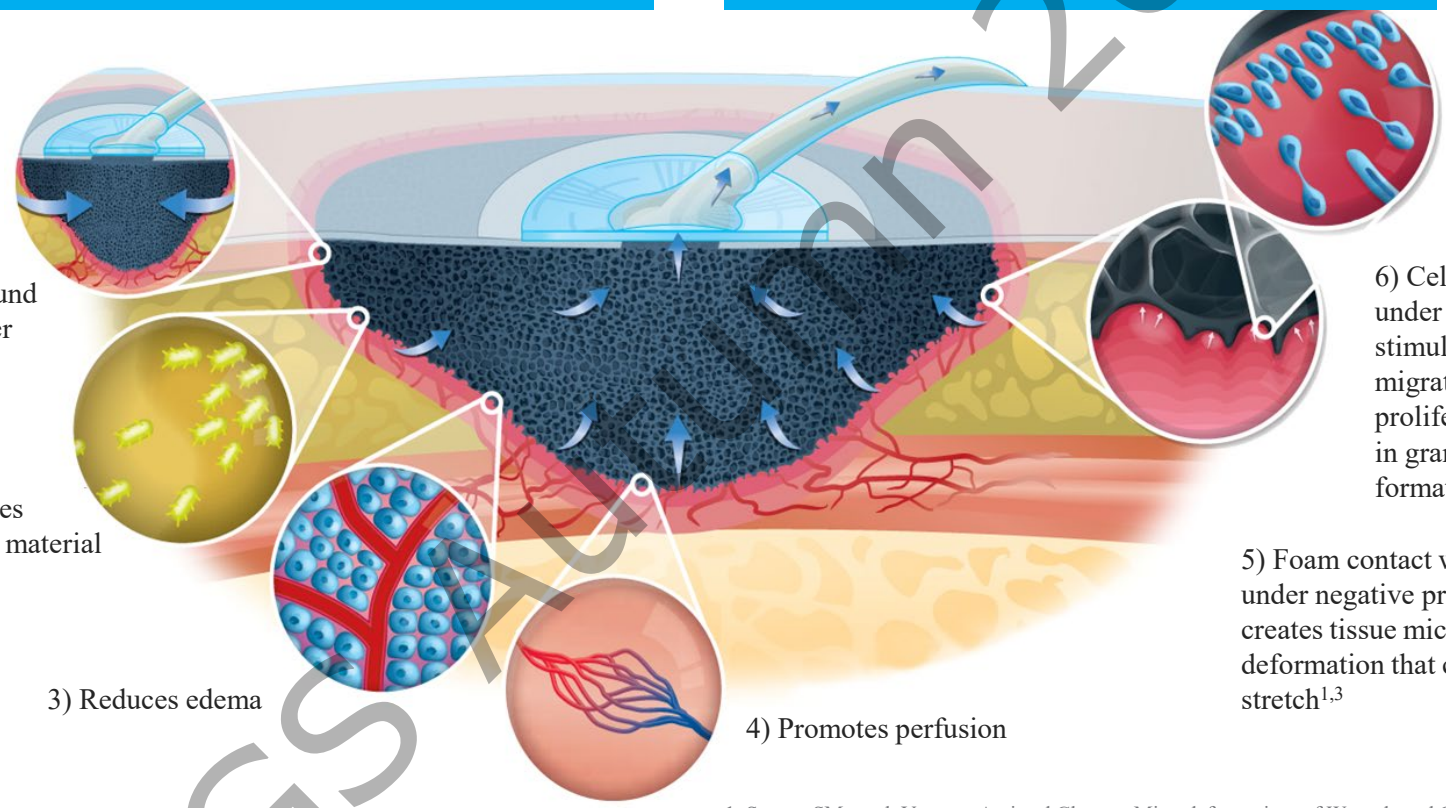
Macrostrain (Physical effects)

Mircostrain (Biological effects)



1) Draws wound edges together

2) Removes infectious material

3) Reduces edema

4) Promotes perfusion

5) Foam contact with tissue under negative pressure creates tissue micro-deformation that causes cell stretch[1,3]

6) Cell stretch under negative pressure stimulates cell migration and proliferation that results in granulation tissue formation[2]

1 Saxena SM, et al. Vacuum Assisted Closure: Microdeformations of Wounds and Cell Proliferation. Plastic & Reconstructive Surgery, 2004;114(5):1086-1095.

2. McNulty: AK, et al. Effects of negative pressure wound therapy on the fibroblast viability, chemotactic signaling and proliferation in a provisional wound (fibrin) matrix. Wound, 2007; 15:838-846.

3 McNulty AK, et al. Effects of negative pressure wound therapy on cellular energetics in fibroblasts grown in a provisional wound (fibrin) matrix. Wound Repair and Regeneration. 2009 Mar;17(3):192-9.

Indication for use

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- **Open wounds such as:**
  - Chronic Wounds
  - Acute Wounds
  - Traumatic Wounds
  - Sub-acute Wounds
  - Partial-thickness burns
  - Dehisced wounds
  - Flaps/Grafts
- Closed surgical incisions that continue to drain following sutured or stapled closure
- Ulcers such as:
  - Diabetic
  - Venous Insufficiency
  - Pressure

Contra indication for use

- Do not use directly on:
  - exposed blood vessels
  - anastomotic sites
  - organs or nerves
- When there is malignancy in the wound
- Untreated osteomyelitis
- Non-enteric and unexplored fistulas or sinus
- Necrotic tissue with eschar present

Precautions

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To decrease bleeding risks:

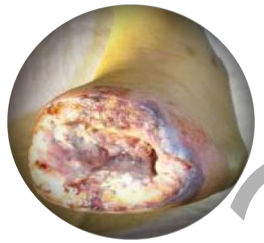
- Protect vessels and organs
- Infected vessels are at risk of complications and must be carefully noted and protected
- Cover or eliminate sharp edges
- Ensure adequate wound haemostasis

Increase patient monitoring when:

- Anticoagulants, platelet aggregation inhibitors, aspirin, etc. are prescribed
- Wounds are related to vascular surgical procedures
- Infection is present in the wound
- Haemostatic agents are used

Wound types

Chronic (e.g. DFU, VLU, PU)



Acute (e.g. traumatic, dehisced)

Sternal wounds

Infected wounds

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1. V.A.C.® Therapy Clinical Guidelines, edition 2014

Wound types

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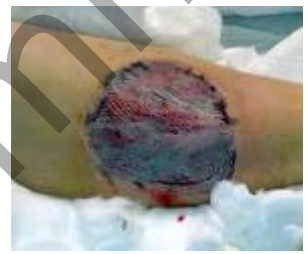
Other postoperative wounds

Meshed grafts and flaps



Enterocutaneous fistulae

1. V.A.C.® Therapy Clinical Guidelines, edition 2014

Planning treatment

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Before starting NPWT, it is important to define treatment aims, objectives and clinical endpoints of treatment.

In some circumstances, the objective will be to further avoid complications and to control symptoms, rather than to influence time to healing.

General aims are to:

- Remove exudate and reduce local periwound oedema
- Increase local microvascular blood flow/vascularity
- Promote formation of granulation tissue
- Reduce the complexity/size of the wound
- Optimise the wound bed prior to and following surgery
- Reduce complexity of surgical wound closure procedures

New technology in NPWT

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Incision management – closed post op wounds

Instillation therapy – infected/complex wound

Open Abdomen

Devices available

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Other factors/Wound bed preparation

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Wound debridement and its role in optimising wound healing with the use of NPWT

Debridement: ……is the act of removing necrotic material, eschar, devitalised tissue, serocrusts, infected tissue, hyperkeratosis, slough, pus, haematomas, foreign bodies, debris, bone fragments or any other type of bioburden from a wound with the objective to promote wound healing

(EWMA, 2013)

Methods of debridement

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Autolytic – Dressings, enzymatic, honey

Mechanical – Wet to dry debridement
Monofilament fibre pad/
Pre-moistened cloths

Biosurgical – Larvae therapy

Technical Solutions - Hydrosurgical
Ultrasound

Sharp

Surgical

Why is debridement important?

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- The role of debridement is well documented in wound bed preparation

- Effective debridement is associated with:
  - reduced exudate
  - a reduction in odour
  - the appearance of granulation tissue

Why debridement in wound healing

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Non-viable tissue and debris in a wound can:

- **Pose** a physical barrier to healing
- **Impede** normal extracellular matrix formation, angiogenesis and epidermal resurfacing
- **Reduce** the effectiveness of topical preparations such as antimicrobial and pain relief
- **Mask** signs of infection and serve as a source of nutrients for bacteria
- **Contribute** to overproduction of inflammatory cytokines
- **Prevent** the practitioner from gaining an accurate assessment of tissue destruction and inhibit correct assessment of the wound
- **Lead** to overproduction of exudate and odour

Aim of debridement

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Decrease:

Odour
Excess moisture
Risk of infection

Stimulate:

Wound edges
Epithelialisation

Improve:

Quality of life

Remove:

- Necrosis
- Slough
- Eschar
- Impaired tissue
- Source of inflammation/infection
- Exudate
- Serocrusts
- Hyperkeratosis
- Slough & pus
- Haematoma
- Foreign bodies & debris
- Bone fragments
- Other types of bioburden

All of the above are barriers to healing

Indications for debridement

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Irrespective of diagnosis and origin, debridement can be applied to all wounds with some exceptions:

- pyoderma gangrenosum
- oncological wounds
- arterial disease patients
- heel ulcers

Procedure should be determined by:

- tissue types
- bioburden
- state of wound edges
- peri-wound skin

(EWMA, 2013)

Methods of debridement

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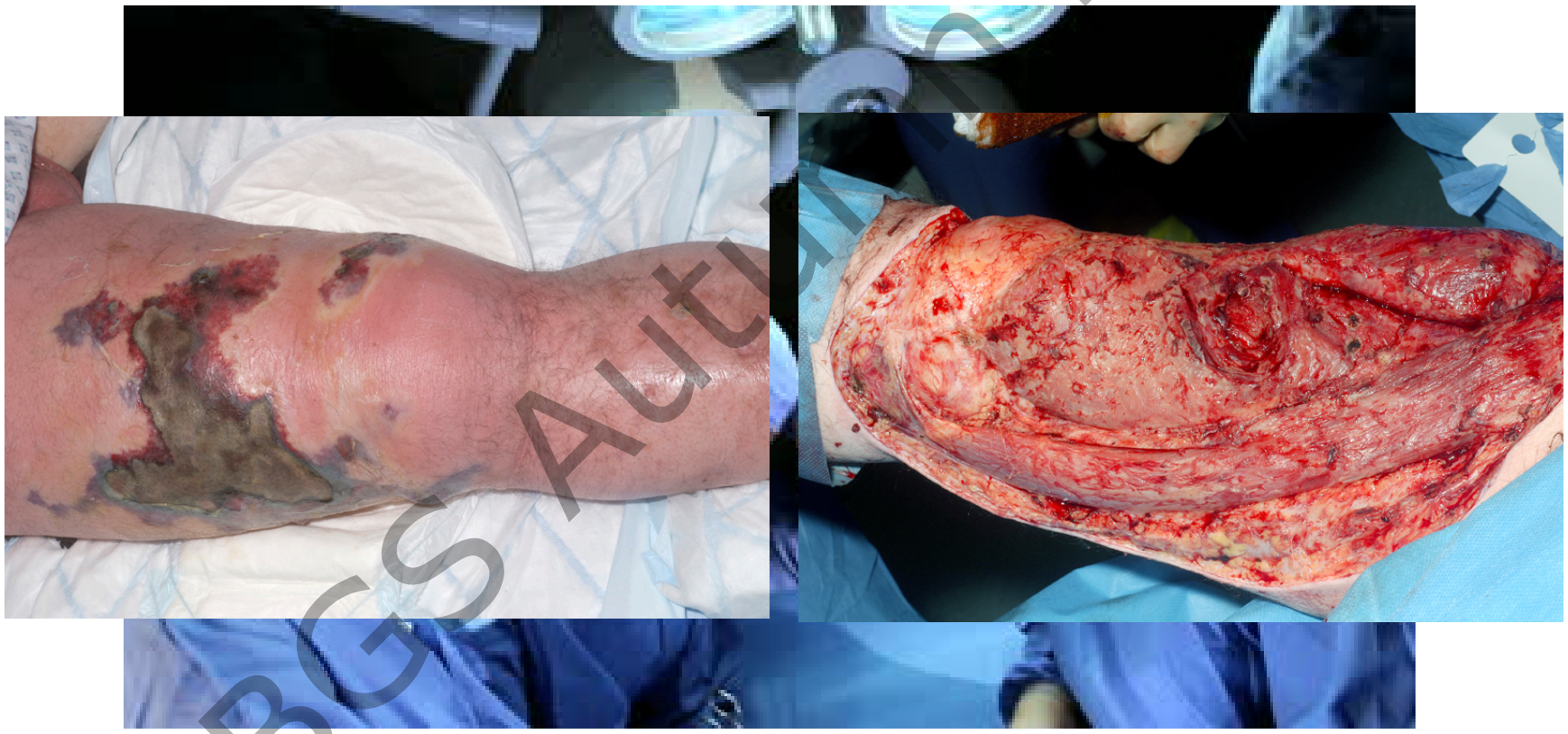
- Autolytic
- Bio-surgical
- Surgical
- Sharp
- Technical Solution

Autolytic

Bio-surgical (larval) debridement

Surgical debridement



Technical solutions: hydro-surgical debridement

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Where is NPWT used

Where is NPWT used (photos removed)

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Laparotomy – partial or full dehiscence
Post operatively
Infected vascular ulcers
Infected diabetic foot ulcers
Fournier's gangrene
Trauma wounds
Sternum
Pressure ulcers

Conclusion

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- NPWT is a treatment option for complex and non-complex wound management
- NPWT may not always be the solution
- Identified treatment aims and outcomes need to be defined – acute or chronic wounds
- NPWT in conjunction with other adjunctive therapies can be beneficial to patients
- QOL
- MDT approach when transfer of care is appropriate (acute to community)
- Skills and training of practitioners