History of wound healing

• 2200 BC Sumerians had tablet with “three healing gestures”—washing the wounds, making the plasters, and bandaging the wound

• Plasters were mixtures of substances including mud or clay, plants, and herbs.
  • applied to wounds to provide protection and to absorb exudate
  • Essential ingredient was oil!

• Egyptians used Honey, grease, and lint were the main components to create their plasters.
Essential Conditions for Wound Healing

1. Moist environment
2. Oxygen delivery (>25mmHg)
3. Avoid edema
4. Removal of necrotic tissue
Moist Environment

“If its wet, dry it, if it’s dry wet it”

Moist Wounds heal more rapidly

Occluded wounds retain moisture and may have less prominent scar formation

Dressings are typically changed once a day or every other day to avoid disturbing the wound healing environment and retain moisture
Oxygen Delivery

• Hypoxia is a reduction in oxygen delivery below tissue demand
• May be due to peripheral vascular disease, poorly controlled diabetes, traumatic injury, hypothermia, anemia, sympathetic vasoconstriction, or high demand for healing tissue
• Therapies: Supplemental Oxygen/Hyperbaric Oxygen Therapy
• Minimal studies and whether oxygen improves DFU is not clear.
Edema and Wound Healing

- Abnormal accumulation of fluid in the interstitium
- Is natural sequela of local inflammation due to leaky capillaries
- Chronic wounds have often arrested in this inflammatory stage
- Edema increases tissue pressure which can reduce local perfusion and reduce ability for granulation tissue to form
Assessment of patient

- Treat systemic conditions and poor nutritional status, achieve glucose control

Assessment of wound

- Immediate considerations
  - 1) Perfusion/oxygenation
  - 2) Treat infection, abscess
  - 3) Surgical debridement
  - 4) Surgical evaluation

Preliminary diagnosis

-Further assessment—wound biopsy, vascular studies, blood tests

Diagnosis and further management

- Good clinical practice

Good clinical practice

- Debridement, improve oxygenation
- Control of moisture/exudate/oedema
- Treat infection, decrease bacterial colonisation
- Specific therapies—off loading, surgery
What Factors inhibit Wound healing

Bacteria / Infection
Steroids
Devitalized tissue and/or foreign bodies
Peripheral Vascular Disease
Wound Ischemia
Cytotoxic drugs
Diabetes
Poor nutrition- Albumin <3.0
Smoking
Wound Closure

- **Primary Intention**
  - Re-approximation of tissue edges
  - Heals faster
  - Less scaring

- **Secondary Intention**
  - Wound left open, granulation tissue forms gradually
  - Used for large wounds, infected or contaminated wounds
  - Slower healing, more scaring

- **Tertiary Intention**
  - Delayed primary closure, wound cleaned, debrided and observed and left open
  - Closed at a later date
1. Debridement, improve oxygenation
2. Control of moisture/exudate/oedema
3. Treat infection, decrease bacterial colonisation
4. Specific therapies—off loading, surgery
Debridement

- Wounds that have devitalized tissue, contamination, or residual suture material require debridement
- Irrigation: decreases bacterial load and removes loose material
- Sharp excisional debridement uses a scalpel or other sharp instruments to remove devitalized tissue and accumulated debris (biofilm)
- Wet-to-dry dressings are a form of mechanical debridement
- Enzymatic debridement
- Biologic Debridement (Maggots)
Assessment of patient

Assessment of wound

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Principles of the Ideal Wound Dressing

• Absorbs excessive wound fluid while maintaining a moist environment
• Protects the wound
• Prevents bacterial invasion or proliferation
• Debrides necrotic tissue
• Does not macerate the surrounding viable tissue
• Achieves hemostasis and minimizes edema through compression
• Reduces pain during and between dressing changes
• Minimizes dressing changes
• Is inexpensive, readily available, and has a long shelf life
Other types of dressings

• Acellular bioproducts
  • Donor dermis that is decellularized retains bioactive agents and acts as a scaffold for host cell repopulation. It is thought that it aids in wound healing by promoting vascularization and providing a barrier to bacteria and a moist wound environment, which increases cell regeneration

• Growth factors
  • Limited effectiveness in healing improvement with the exception of PDGF
Wound Vac Therapy

• Negative pressure Wound Therapy: Continuously or intermittently apply subatmospheric pressure to the surface of a wound (usually we set to 125 mmHg)
• Increases blood flow
• Diminished inflammatory response – Reductions in systemic (eg, interleukins, monocytes) and local mediators of inflammation have been demonstrated in experimental models. In humans, decreased matrix metalloproteinase activity
• Changes in wound biochemistry – increases fibroblast growth and migration, encourages collaged organization, increased VEGF and FGF-2
• More rapid healing of large wounds
• Dressing and tubing are typically changed every 24 to 36 hours