Objectives

• Understand physiology of wound healing
• Apply appropriate wound management therapies
• Discuss strategies to prevent wound development in vulnerable patients
Classification of Tissue

Based on involved Tissue

- **Partial Thickness**
  - Epidermis
  - Dermis (2mm)

- **Full Thickness**
  - Subcutaneous
  - Muscle
  - Bone
Partial Thickness Wounds

- Shallow, moist, painful
- Exposure of nerve endings
- Partial Dermis loss
  - Wound Bed appears pale pink with red islets
- Epidermal Loss
  - Wound bed appears bright pink or red when basement membrane exposed
Partial Thickness Wound Repair

- **Inflammatory Response (<24h)**
  - Erythema, serous exudate containing leukocytes

- **Epithelial Proliferation & Migration (24-72h)**
  - Basal cells at the wound edge and throughout wound bed elongate and migrate laterally.
  - **Moist wound healing**
  - Fragile, at risk from shear/friction

- **Dermal Repair**
  - Collagen synthesis.
  - Dermal cells contribute to repair – scalp heals faster.
Full Thickness Wounds

1. Deeper
2. Granulation Tissue
3. Slough
4. Formation of Scar Tissue
5. Stage 3 and 4 Pressure Ulcers
Full Thickness Wound Repair
Primary Intention

1. Hemostasis
   – Bleeding offers temporary barrier to bacterial invasion.
   – Platelet activation and aggregation

2. Inflammation (D3)
   – Breakdown of damaged tissue & bacteria
   – WBC, Neutrophils, Macrophages
   – Tensile strength to incision is 0%

3. Proliferation (D5)
   – Granulation tissue is formed by Extracellular Matrix
   – Angiogenesis, new capillaries restore O2 delivery
   – Collagen Synthesis
   – Epithelium covering restored as stiff scar lacks elastin

4. Maturation/Remodeling (D21-1year)
   – New collagen is stronger
   – 80% tensile strength
Categorize by Age

• Acute
  – Traumatic or surgical
  – Occur suddenly, progress rapidly toward healing

• Chronic
  – Fail to proceed normally through repair process
  – Etiology: vascular compromise, chronic inflammation, repetitive injury, failure to close
Principles of Wound Healing

• Identify and address underlying factors
• Reduce edema
• Optimize nutrition status
• Control blood sugar
• Protect from trauma
• Treat infection
Dressing Selection
Create an optimal environment for healing

- Manage drainage
- Provide thermal insulation
- Be impermeable to water and bacteria
- Not traumatic to tissue when removed
- Cost effective
- Minimal pain on removal

TREATMENT

Factors Influencing Dressing Choice

• Anatomical site
• Surrounding skin
• Available Dressings
• Caregiver ability
• Aggressive therapy vs. palliative care
1. Cleanse the Wound

- Normal Saline
- Antiseptic Agents
  - May be cytotoxic to fibroblasts (collagen & granulation tissue)
    - Povidone Iodine
    - Sodium Hypochlorite (Dakin’s)
    - Hydrogen Peroxide
    - Iodoform
2. Protect peri-wound skin barriers
3. Debride Necrotic Tissue

- Mechanical
  - Wipe away with cleansing
  - Wet-to-dry

- Conservative Sharp Debridement
  - Certified Wound Care Nurse, ARNP

- Surgical Debridement

- Enzymatic
  - Collagenase Santyl, by Rx only

- Osmotic
  - Tenderwet, LR rinse molecules
4. Manage Drainage

- Gauze (Kerlix, string/nu-gauze, Iodoform)
- Hydrocolloid (Duo-derm)
- Calcium Alginate (Maxorb)
  - 20x weight, moist gel
- Hydrofiber (Hydrogel)
  - Contain without expansion
- Foam (Alevyn, Mepilex)
  - Non-adherent
Contain High Output
Donate Moisture when dry
5. Fill Dead Space

- Gauze
- Calcium Alginates
- Foam (Wound VAC)

Decrease bio-burden
  - Silver
    - Amorphous gel (Silvasorb)
    - Sheet (Silvasorb)
    - Powder (Arglaes)
6. Cover UP

• Provide thermal insulation
• Keeps bacteria out
• Protects from injury
Wound VAC
Mechanisms of Action
Isolation of Fistula
Lower Extremity Wounds
Typical Assessment Findings

Poor Circulation, Poor Nerve Function

• Skin - warm
• Pulses - present
• Pain
• Neuropathy
Ischemic Ulcers

• Associated with Lower Extremity Arterial Disease
• Painful
• Punched Out
Neuropathic Ulcers

• Associated with Neuropathic Disease
  – Diabetes
• Loss of Protective Sensation
• Area of repeated injury
Venous Insufficiency

- Prominent vein (varicosities)
- Telangiectasia (spider veins)
- Ankle flare
  - Collection of visible dilated capillaries at medial malleolus
- Exudate
  - Moderate to heavy drainage typical
- Typical location
  - “Gaiter Area” area of lower leg/ankle at or above medial malleolus
Venous Ulcer Characteristics

- Hemosiderin stain: Brownish, rust color in the skin from leakage of fluid & breakdown of hemoglobin in the tissue
- Areas of avascular or poorly vascularized skin
- Smooth white plaques of white tissue or lacking in normal color
Management

• Control edema
• Control exudate & protect skin
• Promote venous return
• Eliminate infection
• Stimulate granulation tissue
• Avoid sensitizers/irritants that cause dermatitis
Compression

• Cornerstone of venous ulcer treatment
• Should have specific training to apply
• Multiple compression options
Prevention

• High Risk Patients
  – Poor circulation, poor sensation, risk for infection
  – Steroids

• Promote Circulation and Nerve Function
  – Exercise, BP control

• Protect from Injury
  – Shoes, wheelchair
  – Fragile skin, skin tears
Compression stockings

Minimize Edema

• Light support 20-30 mmHg
• Medium support 30-40 mmHg
• Strong support 40-50 mmHg
• Very strong support 50-60 mm Hg*
• Cost varies from $30-$150/pair

*WOCN guide for management of LEVD 2005
Manage Moisture Incontinence

- Diarrhea Management
- Fecal Incontinence System
- Zinc Oxide/Calazime Barrier Paste
- Scheduled toileting
- Use Ultra-Sorb pads
- Low Air Loss Mattress
  - First Step, KinAir
Pressure Ulcer
Incontinence Related Dermatitis

Partial Thickness

Interventions:
• Barrier cream with zinc
• Absorptive wicking pads
• Frequent turning to avoid further breakdown

Increases risk:
Pressure Ulcer