Wound Management - Essentials of Topical Therapy

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Objectives-Essentials of Topical Therapy
Following this presentation the learner will be able to:

- Utilize a framework of wound bed preparation to guide selection of dressings and skin care products
- Describe main indications for common dressing categories used to fill and cover wounds
- Select appropriate topical therapy for common wound care problems

General Principles of Wound Management

- Assess the wound
- Identify wound etiology
- Determine clinical outcomes
- Identify and eliminate/minimize factors contributing to wound formation or interfering with healing
- Utilize effective topical therapy
- Evaluate patient progress and revise treatment plan as necessary
1. Assess the Wound

- Location
- Size
- Base
- Undermining, tunneling
- Dead space
- Drainage (exudate)
- Odor
- Wound edges
- Surrounding skin
- Pain

2. Identify Etiology (Cause) of Wound

We’re All in This Together!

Treatment plan and care-coordination
- Nursing
- Physician
  - Primary
  - Consulting
  - PA’S
- Physical/occupational therapy
- Nutritional therapy
Introduction to Skin

Skin Functions

- Protective barrier
  - Against aqueous, chemical, mechanical, biological and radiation damage
- Prevents desiccation
  - Loss of fluids and electrolytes
- Immune protection
- Thermoregulation
  - Circulation and sweating
- Metabolism
  - Synthesis of vitamin D
- Communication and identification
  - Body image, auto self-steam
- Excretion
  - Sweat glands
- Protective sensation
  - Pain, touch, temperature and pressure
- Excretion
  - Sweat glands
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Layers of our Skin

- Epidermis
  - Outermost layer of skin
  - Provides protective barrier
  - Constantly renewed (28-42 days)
- Dermis
  - Below epidermis
  - Vascular, nerve supply
  - Structural support provided by collagen & elastin
- Subcutaneous layer
  - Adipose (fatty) tissue
  - Insulates & cushions underlying structures
  - Shock absorber protects muscles and organs
Effects on skin

Aging
Sun & Radiation
Infants
Medications

Dry Skin

Irritants

Hemostatic Phase
Inflammatory Phase
Proliferative Phase
Remodeling Phase

Damage
Hours
Days
Weeks
Years

Wound Healing Process

Hemostatic Phase
Injury → Day 5

Inflammatory Phase
Day 3/4 → Day 18/19

Proliferative Phase
Day 21 → 1½ yrs

Remodeling Phase

Type of Cells Involved

Platelets
Macrophages
Neutrophils

Macrophages
Lymphocytes
Fibroblasts
Keratinocytes
Endothelial cells
Myofibroblasts

Wound Healing Impediments

Intrinsic factors
- Health status
  - Diabetes
  - Circulation
  - Anaemia
  - Immune status
- Age
- Nutritional status

Extrinsic factors
- Infection (mature biofilm)
- Mechanical stress
- Debris/foreign body
- Temperature
- Desiccation
- Chemical stress
- Medication
**Tissue Injury**

- **Partial-Thickness:**
  - Epidermis and superficial dermis
  - Painful
  - Regeneration

- **Full-Thickness**
  - Total loss of skin layers, epidermis, dermis, subcutaneous layers, deeper tissue may be involved.
  - Repair
  - Connective tissue fills in defect
  - New tissue is never as strong as original tissue fills in defect

*(Doughty, 2007)*

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**Wound healing (con't)**

**Regeneration**

Identical tissue replaces what was damaged

**Repair**

Dermis filled in with collagen tissue. Replaced by scar tissue. Deep dermis, fat, muscle, bone not regenerated.

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**MDS 3.0 Tissue types**

- **M0700 Most Severe Tissue Type for Pressure Ulcer**
  - Epithelial Tissue
  - Granulation Tissue
  - Slough
  - Necrotic Tissue (Eschar)
MDS 3.0

- **Granulation Tissue**
  - Pink or red tissue with shiny, moist, granular appearance

- **Epithelial Tissue**
  - New skin growing in superficial ulcer. It can be light pink and shiny, even in persons with darkly pigmented skin

Wound Base - Slough

- Nonviable tissue, loose or firm
- Soft, tan, yellow, brown, Green
- MDS definition – yellow or white tissue that adheres to the ulcer bed in strings or thick clumps, or is mucinous

Wound Base - Eschar

- Necrotic tissue
- MDS - Black or brown, or tan tissue that adheres firmly to the wound bed or ulcer edges, may be softer or harder
- Loose or firm, hard, soft, or boggy
- If wound is covered with eschar, wound size likely to INCREASE when necrotic tissue is debrided
Basic Principles of Wound Care for Pressure Ulcers with Tissue Loss (Stage II, III, IV, Unstageable)

Wound Bed Preparation
- The “DIME” concept
  - Debridement
  - Infection/Inflammation
  - Moisture
  - Edge

Effective Debridement
- Debridement removes:
  - Cellular debris that may be impairing healing
  - Microbes and toxins that may be prolonging the inflammatory phase
- Chronic wounds require ongoing maintenance debridement rather than a single intervention
- Selective and Non-selective methods
- Selection of method
  - Urgency of the need for debridement
  - Skill level of the care provider
  - Availability of products and supplies
Effective Topical Therapy

Eliminate non-viable tissue and debris:

- Debridement
  - Surgical
  - Sharp conservative
  - Chemical
  - Mechanical
  - Autolytic

Mechanical Debridement

- Irrigation
  - High pressure
  - Pulsatile
  - Whirlpool

Debridement cont.

- Surgical
- Sharp conservative
- Chemical: tissue-specific enzymes
- Mechanical
- Autolytic: moisture retentive dressings
- Biologic
**Autolytic Debridement**

- **Dressings:**
  - Transparent film
  - Hydrocolloids
  - Hydrogel

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**Debridement-Autolysis**

- Lysis of necrotic tissue by the body’s WBC's and enzymes that enter the wound site during the inflammatory process.
- Proteolytic, fibrinolytic, and collagenolytic enzymes are released to digest the devitalized tissue in the wound.
- Naturally occurring process
- Selective
- Enhanced by moisture retentive dressings

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**Debridement cont.**

- Surgical
- Sharp conservative
- Chemical
- Mechanical
- Autolytic
- Biological
Debridement-Biologic

- Maggots
- Sterile
- No reimbursement
- Resistant organisms
- Mail order

Stable Eschar

- Do Not Debride stable eschar!

Escar on heels

- Observe!
- Debridement once eschar separates
Effective Topical Therapy

- **Basic rules to follow:**
  - If the wound is infected - treat it
    - WHS Guidelines
  - If the wound is dry - add moisture
  - If the wound is wet - absorb it
  - If wound is necrotic - debride it
  - Protect the periwound skin

Cleansing

- Cleanse wounds at each dressing change
- Doesn’t require antiseptics
- Normal saline is effective when delivered at 8-12 psi (19g needle with 30 ml syringe)
- Chronic wound cleansers designed to deliver appropriate psi

Preserve peri-wound skin integrity

- Cleanse surrounding skin!
- Non-adherent dressings
- Alcohol-free barrier films
- Moisture barriers
- Solid barrier wafers
Which Treatment Path Do You Take?

Choose a Dressing That

- protects the wound from the surrounding environment
- keeps the wound base moist
- keeps the surrounding tissue dry
- contains exudate without desiccating the wound base
- maintains the integrity of the primary dressing**
What is “Moist” Wound Healing?

- First described ~1940
- Winter’s publication-1962
  - Superficial wounds
  - Control group allowed to dry
  - Experimental group covered with thin plastic film
  - Experimental group-2x faster re-epithelialization

Advantages of Moisture Retentive Dressings

- Faster healing
  - Cytokines and growth factors remain viable, cells migrate unobstructed
  - Promotes granulation tissue formation
- Supports autolysis
- Reduces fibrosis: less scarring
- Reduces pain

Objections to Moisture Retentive Dressings

- Objections
  - Concern regarding infection
    - Bacteria increase but not correlated with higher incidence of infection
    - Risk of infection may be reduced under dressings that form a barrier
  - Dressing cost: counteracted by longer wear time and improved outcome if used correctly
Key Consideration in Dressing Selection
- Management of moisture
  - maintain a Moist Environment
- DRY - Add(+) Moisten
- WET - Subtract(−) Absorb
- Protect wound bed

Dressing Terminology
- Primary
  - Direct contact with wound base
- Secondary
  - Secures or protects primary dressing
- Moisture retentive
  - ‘Modern dressings’
- Traditional
  - Tape & gauze

Dressing Categories-Gauze
- Advantages
  - Readily available
  - Intuitive
  - Versatile
  - Disadvantages:
    - Microbial Contamination
    - Labor intensive
    - Easy to misuse
Gauze cont.

- **Technique**
  - Woven cotton or appropriate synthetic
  - Correct size/shape
  - Pack lightly (fluff)
  - Moist versus wet
  - Change to prevent strike-through

Composite Dressings

- **Combine features of two or more types of dressings**
  - Primary or secondary dressing, e.g., non-adherent pad and transparent dressing

Transparent Film Dressings

- **Description:**
  - Breathable, polyurethane film
  - Barrier properties
  - Maintains moist wound environment—excellent at autolysis
  - Primary or secondary dressing
Transparent Film Dressings

- **Indications**
  - Partial thickness/Stage I ulcers
  - Dry to minimal drainage
  - Protect “at-risk” skin from friction

Transparent Film Dressings for Friction Protection

Absorbent Acrylic Dressing

- **Indications**
  - Partial to full thickness
  - Minimal to moderate drainage
  - Clean or necrotic tissue
  - Allows observation of site
  - Wear time 3-7 days
Absorbent Acrylic Dressing

- Description
  - Absorbent particles (e.g., CMC) in adhesive matrix
  - Breathable or occlusive; determines ability to manage drainage

- Indications
  - Partial to full thickness
  - Minimal to moderate drainage
  - Clean or necrotic tissue
  - Wear time 3-7 days

Hydrocolloid Dressings

- Description
  - Absorbent particles (e.g., CMC) in adhesive matrix
  - Breathable or occlusive; determines ability to manage drainage

- Indications
  - Partial to full thickness
  - Minimal to moderate drainage
  - Clean or necrotic tissue
  - Wear time 3-7 days
Foam Dressings

- Description
  - Polyurethane pads
  - Absorbent and breathable
  - Primary or secondary dressing

- Indications
  - Partial and full thickness wounds
  - Min. to moderately-heavy draining wounds e.g.
  - Variety of wounds: pressure ulcers, dehisced surgical wounds, donor sites, venous ulcers, trachs, partial thickness burns, etc.

Contact Layers

- Contact layer
  - Various materials
  - Indications
    - Protect wound base
    - Prevent pain
Wound Contours

Characteristics of defect:
- Tunneling
- Undermining

Fill dead space with:
- Alginates
- Gauze
- Hydrogels

Absorbent Wound Fillers

- Alginates
  - Highly absorbent, fibrous material derived from seaweed
  - Gels as it absorbs
  - Indications
    - Fill (pack) dead space
    - Large amount drainage

Absorbent Wound Fillers

- Manage large amounts of exudate 20x their wt.
- Maintain a moist environment
- Reduce/ replace gauze
- Control maceration
- Can be used in shallow, deep, or tunneling wounds
- Autolytic debridement
- Infected or non-infected wounds
- Can last 2-7 days
Where Would You Use an Alginate?

Wound Hydration

Hydrogel Dressings

- Description: hydrating liquid or liquid impregnated gauze
- Indications
  - Non-draining to minimal drainage
  - Partial to full thickness
  - Clean, necrotic or infected wounds
Hydrogel Dressings cont.

- Contain within wound edges
- Protect wound edges/surrounding skin
- Change frequency
  - Keep wound base moist
  - Every 24-48 hours

Evaluate Patient Progress - Be Open to Change

Revise Treatment Plan as Necessary:
If the wound shows no improvement in 2 weeks...reevaluate for possible change in treatment.

Why Does a Wound Fail to Progress?

- Local factors:
  - Infection
  - Inflammation
  - Ischemia
- Other factors
  - ↑ MMPs
  - ↓ Growth factors
  - ↓ Nitric oxide
Why Does a Wound Fail to Progress?

Other factors
- Necrotic tissue
- Location
- Size
- Foreign objects

Infection
- All chronic wounds are colonized with bacteria
- Infection = “10⁵” col./ml. (not always!)
- Culture: if signs of infection present
  - Biopsy: most accurate
  - Swab: most common
  - Never culture necrotic tissue

Antimicrobials
- Antiseptics
  - Examples: Povidone iodine, “Dakin’s, H2O2
  - Indication (traditional): Skin disinfection
  - Non-selective: Cytotoxic to viable cells
Antiseptic Solutions

- Dakin’s Solution
  - Effective against Staphylococcus and Streptococcus
  - Toxic to fibroblasts
  - May injure periwound skin
- Acetic Acid
  - Effective against pseudomonas
  - Toxic to fibroblasts

Modern Antimicrobials

- Cadexomer iodine
- Silver

Silver-Mechanism of Action

- The silver ions react with the cell’s DNA, preventing replication.
- The silver ions enter the cytoplasm and bind with enzymes that control cell metabolism, heading the cell death and activating the cell's suicide pathways.
Silver Dressings

- Antimicrobial barrier dressing
- Controlled release of ionic silver
- Non-cytotoxic
- Effective for 3-7 days
- Many substrates
  - Films, wound fillers, composites, contact layers, foams, hydrocolloids, etc.
- *Dressings require moisture so silver can dissolve*

Chronic/Stalled wounds

- Wounds not responding to standard treatment protocol in 4-6 weeks
- Options
  - Collagen products w/wo silver
  - Matrix with metal ions
  - Growth Factors
  - Biosynthetic Dressings

Other Options for Non-healing Wounds

- PHI technology
  - Metal ions, citric acid, polyethylene glycols
- What are Growth factors?
  - Proteins: Platelets, macrophages
  - Action
    - cell growth
    - cell migration
    - Regulatory effect
  - Necrotic tissue and infection must be managed!
  - Only one commercially available- Regranex®
  - PDGF
  - Indications-limited
Considerations
- Edema control
- Nutrition
- Topical care
- Patient education

Case Study – Venous Ulcer

Is This a Stage II?
- No! But why not?
- Superficial moist lesions with irregular borders
- "Moisture lesions" (DeFloor)
- Causative factors
  - Moisture
  - Incontinence
  - Perspiration
  - Friction
  - At risk-immobile, obese
Case Study-Skin Tear

Case Study – Neuropathic Ulcer

Considerations
- Off-loading
- Topical care
- Patient education

Difficult Locations
Management of Patient-intrinsic Factors

- Diseases/conditions:
  - Immuno-compromise
  - Diabetes
  - Reduced perfusion
    - Arterial: LEAD
      - Non-diabetic
      - Diabetes
    - Venous
    - Malnutrition
    - Immobility

- Large wounds
  - Dressings
  - Negative Pressure Wound Therapy (NPWT)
    - V.A.C.®Therapy™
  - Pouching (rare)

- Small wounds: dressings

Management Options for Difficult Sizes
Management of Foreign Objects: