Wound Care Made Simple: Managing Patients with Upper Extremity Wounds

Presented by
Nora Barrett, OTR/L, CHT, WCC

ASHT International Committee

Virtual Education Series

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Learning Objectives

- Identify wound bed characteristics that indicate healing or non-healing traits in upper extremity wounds
- Recognize signs of local and systemic infection
- Develop a treatment plan for wound infection and hard to heal wounds

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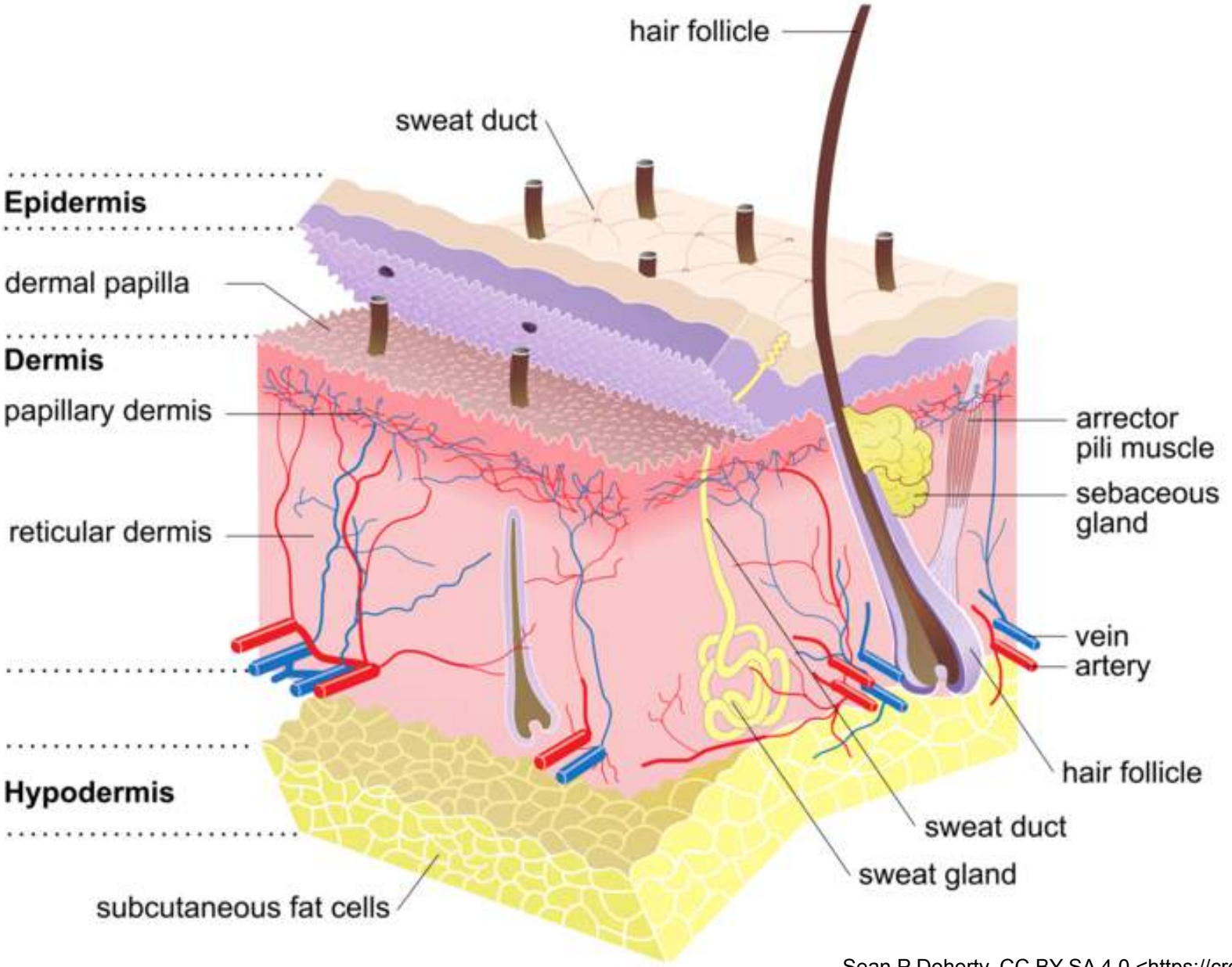
Tissue Healing Phases



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Tissue Healing Phases

- Hemostasis: platelets activated, form clot
- Inflammation: mast cells (WBC) release histamine—> vasodilation
  - Neutrophils (WBC) then macrophages remove material, debris
  - Macrophages activate cells of tissue repair, mediate transition
- Proliferation: restoration of mechanical integrity (fibroblasts)
  - Angiogenesis, granulation tissue formation, epithelialization
- Maturation: collagen fibers reorganize, gains in tensile strength

Photos: Nora Barrett

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Wound Assessment

Size

- Measure wound size weekly
- Dimensions documented as length x width x depth (cm)
  - Length: longitudinal axis (proximal<->distal)
  - Width: horizontal axis (radial<->ulnar)
  - Depth: q-tip probe to wound base, gloved finger marked or pinched at approximate surface, placed against disposable measuring tape
- Indicator of healing

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Exudate Amount

Characteristic	Amount of Exudate
None	Wound is dry
Scant	Wound is moist Dressing is dry
Minimal	< 25% of dressing saturated
Moderate	25-75% of dressing saturated
Copious	> 75% of dressing saturated

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Exudate Type

Type of Exudate	Description	Meaning
Serous	Clear, transparent Watery	Normal in inflammatory stage
Sanguineous	Active red bleeding Blood serum	Deep partial thickness and full thickness wounds during angiogenesis
Serosanguineous	Thin, water, blood, and serum	Sign of healing wound
Seropurulent	Thin, watery, cloudy, yellow-tan	Consider infection
Purulent/pus	Thick, opaque, yellow, tan, green, brown	Not normal in a wound Impending infection

Photos:
Nora Barrett

Color

Color	Indications
Red	Healthy, good blood flow
Pale pink	Poor blood flow Ischemia
White	Ischemia, maceration
Yellow or grey	Slough, non-viable necrotic
Brown or black	Eschar, non-viable necrotic
Purple	Trauma High bacteria count
Green	Non-viable tissue, associated with pseudomonas Infection

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Tissue Types in the Wound Bed

- Epithelial tissue- thin & fragile, shiny pearly or silver; needs protection, easily damaged
- Granulation tissue- beefy red tissue, response to full thickness injury
- Exposed tendon- prevent desiccation, needs moist wound environment
- Necrotic tissue- source of bacteria, prevents further granulation tissue formation or re-epithelialization; requires debridement

Photos: Nora Barrett

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Wound Healing Principles

Debridement of Devitalized Tissue

- Remove necrotic tissue overlying wound base
  - Promotes bacterial growth
  - Obscures local wound infection signs
- Basis of sharps debridement
- Dried, devitalized tissue (scab) blocks re-epithelialization

Photo: Nora Barrett

Infection & Inflammation Control

- Wound healing cannot progress if infection present
- Cleansing solution used to treat wounds with debris, suspected or confirmed infection
- Antimicrobial wound covering to treat local infection
- Antimicrobial wound covering plus Abx to treat systemic infection
    - Thick eschar or poor blow flow: Abx cannot reach infected tissue

Photo: Nora Barrett

Moisture Balance

- Moist wound environment accelerates healing
- Absorb excess drainage
- Avoid macerated wound edges
- Avoid deadly dry-out
  - Dry tissue is dead tissue

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Epithelial/Edge Advancement

- Create environment for optimal healing
- Tissue deficit must be filled for epithelialization to occur
- Remove debris, eschar or scab to allow re-epithelialization

Photos: Nora Barrett

Recognizing Infection

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Local Infection: NERDS

- Nonhealing
- Exudative
- Red, bleeding surface
- Debris
- Smell- unpleasant

- 3+ symptoms indicates local infection

R dorsal FA

Photo: Nora Barrett

Photos: Nora Barrett

Systemic Infection: STONEES

- Size larger
- Temperature increased
- expOsed or prObe to bone
- New areas of breakdown
- Exudate
- Erythema/edema
- Smell- foul

- 3+ symptoms indicate systemic infection

L volar wrist 4/20/23

Photos: Nora Barrett

5/17/23

Photos: Nora Barrett

Conditions that Limit Inflammation Expression

- Neuropathy, ischemia, venous insufficiency
- Infection defined by secondary symptoms in these populations
  - Non-purulent exudate
  - Discolored or friable granulation tissue
  - Breakdown or pocketing at wound base
  - Abnormally foul odor

Photo: Nora Barrett

Treating Infection

- Wound healing cannot progress if infection present
- Failure of chronic wound closure is linked to bacterial bioburden in the wound bed
- Cleansing solution used to treat wounds with debris, suspected or confirmed infection
- Antimicrobial wound covering to treat local infection (NERDS)
- Antimicrobial wound covering plus Abx to treat systemic infection (STONEES)
    - Thick eschar or poor blood flow, Abx cannot reach infected tissue

4/25/23

5/9/23

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5/23/23

6/6/23

6/26/23

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5/23/23

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Antimicrobial Resistance "AMR"

- Estimated 30% Abx prescribed in outpatient setting unnecessarily
- Unnecessary Abx leads to AMR
- By 2050, AMR predicted responsible for 10 million annual deaths worldwide

WHO Global Action Plan on Antimicrobial Resistance, 2015

- CDC estimates antibiotic-resistant bacteria cause more than 2 million illnesses and 23,000 deaths per year in the US

Emergence of Global Antibiotic Resistance, 2018

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DO NOT USE TOPICAL ANTISEPTICS OR ANTIBIOTICS PRIOR TO SIGNS OF INFECTION

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Treatment

Wound Coverage & Dressings

Wound Cleansing

- “Clean it like you mean it”
- Wound must be cleansed between dressing removal and recovering/ redressing
- Soap and passing water or saline acceptable in most hand wounds except deep full thickness or open dead space
- Cleansers required in wounds with debris, suspected or confirmed infection; open defects/dead space
    - Hypochlorous acid- effective against infection, breaking up biofilm
        - Non-cytotoxic to healthy cells

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What should I put on this?

- What is the history of wound?
- What has already been used?
- Does it need to be washed daily or can it be kept dry and secure/protected for several days?
- Is this patient (or caregiver/family member) capable of daily/ frequent dressing changes?

Necrotic Tissue

- Cleansing and debridement to remove debris, non or loosely adherent necrotic tissue
  - Sharps conservative
  - Mechanical
- Dressing must promote autolytic debridement
  - Hydrogel
  - Medical Grade Honey
  - Hydrocolloid or Bordered foams

Photos: Nora Barrett

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Suspected or Confirmed Infection

- Local infection (NERDS)
  - Antimicrobial cleanser
  - Topical antiseptics/antibiotics
  - Antimicrobial dressing
- Systemic infection (STONEES)
  - Same as above PLUS Abx

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Heavy Exudate/Maceration

- Superficial or Deep Wound
  - Absorptive product based on amount
  - High= Alginate/Hydrofiber
  - Low/Moderate= Foam
- Dead space/open defect in deep wound must be filled
  - Packing
  - Antimicrobial packing if suspected/ confirmed infection

Photos: Nora Barrett

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Dry

- Superficial wound
  - Petrolatum
  - Impregnated gauze
  - Transparent film
- Deep wound
  - Hydrogel with covering

Photos: Nora Barrett

Petrolatum based ointments

- Aquaphor/Vaseline/White Petroleum Jelly
  - Hydrophobic
  - Coats, protects and repels
  - Traps in moisture
  - “Clean and greasy”

Photo: Nora Barrett

Wound Coverage Type	Decriptors	Indications
Petrolatum ointment	White, greasy ointment	Dry skin, abrasions, partial thickness wounds
Impregnated gauze	Non-adherent gauze strips treated with petrolatum, oil emulsion or antibiotic ointment	Post-operative wounds with minimal drainage, dry wound edges; packing dead space
Transparent films	Thin, clear, non-adherent polyurethane coverings	Skin tears and superficial wounds with no drainage
Contact layers	Thin, porous, non-adherent sheets	Protect fragile wound bed
Hydrogels	Hydrophilic polymer gel or flat sheets that regulate fluid balance	Dry, minimally draining wounds Exposed tendon Fill dead space
Hydrocolloids	Thick opaque wafer dressings that provide totally occlusive moist environment	Clean (uninfected) minimally draining wounds
Foams	Open cell polyurethane coverings that provide moist environment and thermal insulation	Minimal to moderately draining wounds Under compression
Active leptospermum	Medical grade honey in gel or sheets that create moist environment	MInimal necrotic tissue Minimal to moderate exudate
Alginates	Highly absorptive calcium spun seaweed in flat sheets or rope that provide moist environment	Highly exudative wounds Bleeding control Fill dead space
Hydrofibers	Highly absorptive multi-layered pads of sodium carboxymethylcellulose that provide moist wound environment	Highly exudative partial, full thickness or bleeding wounds

Table created by Nora Barrett for ASHT Clinical Assessment & Recommendations: Wounds. (Under review) 2023

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Hard to Heal Wounds

“Chronic” is a thing of the past

- “Chronic wound”
  - Does not promote action or sense of urgency
  - Suggests the wound cannot be healed
  - Minimal management acceptable
  - Inadequate focus, resources dedicated to wound healing

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Hard to Heal, Recalcitrant Wounds

- “Hard to heal” wound
  - Failed to respond to evidence based standard of care
  - Typically exhibits exudate, slough, increase in size and inflammation
  - 4-step Wound Hygiene protocol of care
    - Regularly & repetitively

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Wound Hygiene 4-Step Protocol

- **Cleanse** the wound and periwound
  - Every dressing change
  - Include 10-20cm periwound
- **Debride** the wound
  - Remove dead, devitalized tissue and biofilm from wound bed
- **Refashion** the wound
  - Remove irregular, necrotic or crust from wound edges
  - Facilitates re-epithelialization and wound contraction
- **Dress** the wound
  - Appropriate for exudate level
  - Prevent contamination, inhibit biofilm regrowth

Young healthy patient
Glass lac to L ulnar FA
2 months prior

Photos: Nora Barrett

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Wound Care Takeaways

- Accurate wound assessment is paramount
- If something is working (to promote wound closure), stick with it
- If something is not working (especially after using for 2 weeks), change it; reassess
- “If the wound is dry, add moisture. If the wound has drainage absorb it. If the wound has necrotic tissue, debride it.”

  - Baranoski & Ayello

- There is often more than one option for wound coverage

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