Why is this Wound Not Healing?
June 8, 2017
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NPUAP Mission
The National Pressure Ulcer Advisory Panel (NPUAP) is the nation’s leading scientific expert in pressure injury prevention and treatment. Our goal is to insure improved patient health, and to advance public policy, education and research.
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NPUAP in collaboration with the European Pressure Ulcer Advisory Panel (EPUAP) and the Pan Pacific Pressure Injury Alliance (PPPIA) has worked to develop a pressure injury prevention and treatment the Clinical Practice Guideline and Quick Reference Guide. The price of these books have recently been reduced.

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NPUAP Monograph

Released in November 2012, the 254-page, 24 chapter monograph, Pressure Ulcers: Prevalence, Incidence and Implications for the Future was authored by 27 experts from NPUAP and invited authorities and edited by NPUAP Alumna Dr. Barbara Pieper.

The monograph focuses on pressure ulcer rates from all clinical settings and populations; rates in special populations; a review of pressure ulcer prevention programs; and a discussion of the state of pressure ulcers in America over the last decade.

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The planning committee members have listed no financial interest/arrangements that would be considered a conflict of interest.
Objectives

- Understand the factors that might impact wound healing
- Identify what work-up is required to assess a non-healing wound
- Discuss the nutrition recommendations for pressure injury treatment in a chronic wound.

Non-healing wound

- A non-healing or chronic wound is defined as a wound that does not improve after four weeks or does not heal in eight weeks.
- Many factors can impact wound healing
Factors that Impact Wound Healing

• Medications
• Immobility
• Radiation Therapy/Chemotherapy
• Arterial / Venous Insufficiency
• Diabetes & Other Chronic Medical Diseases
• Aging
• Smoking
• Infection
• Nutrition

Medications

• Any medication that impacts the inflammatory phase
  - NSAIDS
  - Steroids
  - Immunosuppressive medications
Factors that impact wound healing

- Radiation Therapy/Chemotherapy
- Arterial / Venous Insufficiency
- Diabetes & Other Chronic Medical Diseases
Normal Changes in Elderly Skin

- Decreased blood flow to skin
- Decreased elastin
- Flattening of the rete ridges
- Loss of subcutaneous fat
- Decreased dermal-epidermal turnover

Smoking

- Nicotine
- Carbon Monoxide
- Hydrogen cyanide
- Effects last for 1 hour after smoking

Bacterial Burden
Negative Impact on Wound Healing

- Prolongs the inflammatory stage
- Induces additional tissue destruction
- Delays collagen synthesis
- Prevents epithelialization
Levels of Bacterial Burden

- **Contamination**
  - Bacteria in a wound

- **Colonization**
  - Bacteria are replicating
  - Host remains in control
  - Usually polymicrobial
    - Surrounding skin
    - External environment
    - Endogenous sources
Levels of Bacterial Burden

- **Critical Colonization**
  - wounds with more than 100,000 organisms/gram will not heal
  - Suspect bacterial burden if a clean wound shows no improvement after 14 DAYS of topical therapy

- **Infection**
  - Invasion of the soft tissues
Probability of Host Infection

\[ P \text{ (Infection)} = \text{Bacterial burden} \times \text{Virulence} \times \text{Host resistance} \]


Wound Cultures

- Traditional swab culture detects only surface bacterial colonization/contamination
  - may not reflect the invasive organism causing infection
- Quantitative Wound Culture recommended for determining infection
  - documents bacterial burden
  - identifies bacteria actually invading wound tissue
Quantitative Analysis

- Superficial Swab
  - Z swab
  - Levine technique

- Needle aspiration

- Punch Biopsy

- Tissue sample

Z swab

Swabs using the Z-stroke entail rotating the swab between the fingers as the wound is swabbed from margin to margin in a 10 point zig-zag fashion.
Levine technique

- The Levine Technique consists of rotating the swab over a 1 cm square area with enough pressure to express fluid from within the wound tissue

- The Levine Technique is best used when in the wound is first cleaned and there is no necrotic tissue or eschar

Tissue hypoxia

- Inhibition of oxidative burst activity in polymorphonuclear leukocytes
  - ↓ intracellular production of antimicrobial metabolites
- Reduced leukocyte killing capacity
- Fecal contamination contains high numbers of anaerobes

Complications

- Osteomyelitis
- Fistulas
- Carcinoma
- Sepsis

Osteomyelitis

- Can occur in 1/3rd of pressure ulcers

- Osteomyelitis most common in:
  - Pelvis
  - Femoral head
  - Ischial bones
  - Calcaneus

- If bone is visible or palpable, likelihood of osteomyelitis is >90%
Osteomyelitis

- Work up
  - Plain x-rays
  - Lab analysis
    - ESR, CRP
  - Bone scans
  - MRI
  - Biopsy

Fistulas

- Abnormal passage between two epithelialized surfaces that connect one viscer to another or to the body surface

http://www.nhstaysideadtc.scot.nhs.uk/wound%20Formulary/Section%2010/Section%2011%20fistula%20as%20attachment.pdf
Fistulas

- Management goals:
  - Management and free drainage of exudate
  - Protection of surrounding skin
  - Prevention of infection
  - Removal of necrosis or slough
  - Promotion of granulation from the base of the wound

Sinus Tracts

- Discharging, blind-ended track that extends from the surface of the skin to an underlying abscess/cavity. May be caused by infection, liquefaction or a foreign body

http://www.nbstaysideadtc.scot.nhs.uk/wound%20Formulary/Section%2010/Section%2011%20fistula%20as%20attachment.pdf
Sinus Tracts

- Management goals:
  - Allow cleansing and draining
  - Do not plug
  - Protection of surrounding skin
  - Prevention of infection
  - Removal of necrosis or slough
  - Promotion of granulation from the base of the wound

Carcinoma in Pressure Ulcers

- Marjolin’s ulcer
  - Most commonly found in burn wounds and osteomyelitis
  - Most common type: squamous cell carcinoma
  - Other types:
    - Basal cell
    - Melanoma
    - Fibrosarcoma
    - Angiosarcoma
    - Osteosarcoma
    - Others
Occurrence

- Most malignancies in pressure ulcers occur in the sacral or iliac areas

- Rich lymphatic drainage to the pelvic region
  - Higher rates of metastasis

- Little support for chemo; Radiation can be effective for palliation

Marjolin’s Ulcer

- Occurs in 1.7% of chronic wounds

- Incidence of SCCa in pressure ulcers is 0.5%

- Very aggressive

- Metastatic rate in pressure ulcers is 60%
  - Burns (38%)
  - Osteo (14%)

- Biopsy if wound present for >6 months
Prognosis

• Factors affecting prognosis
  – Tumor type
  – Location
  – Rate of metastasis

• Survival rates
  – 65-75% in 3 years
  – 35-50% if metastatic disease present

SIRS

• Defined as a systemic response to infection
• Criteria:
  – Fever of more than 38° C (100.4° F) or less than 36° C (96.8° F)
  – Heart rate of more than 90 beats per minute
  – Respiratory rate of more than 20 breaths per minute or arterial carbon dioxide tension (PaCO₂) of less than 32 mm Hg
  – Abnormal white blood cell count (>12,000/µL or < 4,000/µL or >10% immature [band] forms)
SIRS

- Non-specific
- Can be caused by multiple conditions:
  - Infection
  - Ischemia
  - Trauma
  - Inflammation
  - Combination of above

Sepsis

- Bacteremia
  - Not always related to SIRS or sepsis
- Sepsis
  - Systemic response to infection
  - SIRS + infection
- Associated with:
  - Hypoperfusion
  - Organ dysfunction
  - Hypotension
Does Nutrition Really Make a Difference?

Two observations:
1. “Healing is a matter of time, but sometimes also a matter of opportunity.”

2. “Let food be thy medicine and medicine be thy food.”

Hippocrates
Image from Dreamstime Photos
Undernutrition-Malnutrition Continuum

- Too tired to shop or cook
- Too tired to eat
- Limited food budget

- Illness
- Injury or surgery
- Loss of reserves


2014 NPUAP-EPUAP & Pan Pacific Pressure Injury Alliance (PPPIA) CPG

Nutrition Recommendations

- Nutrition screening
- Nutrition assessment
- Care planning
- Energy intake
- Protein intake
- Hydration
- Vitamins and minerals

Image by Dreamstime
Reassess Energy Requirements

Provide 30 to 35 kcalories/kg body weight for adults with a pressure ulcer who are assessed as being at risk of malnutrition.

Adjust energy intake based on weight change or level of obesity. Adults who are under weight, or who have had significant unintended weight loss, may need additional energy intake.

Reassess Energy Requirements: Action Plan

1. Collect more data on actual food intake over 2-4 days
2. Determine amount and quality of protein eaten per meal
3. Recheck height & weight
4. Assess for chewing & swallowing problems
5. Reassess need for therapeutic diets
Reassess Hydration Status

Provide and encourage adequate daily fluid intake for hydration for an individual assessed to be at risk of or with a pressure ulcer. This must be consistent with the individual’s comorbid conditions and goals.

Monitor individuals for signs and symptoms of dehydration, including change in weight, skin turgor, urine output, ↑ serum Na, and/or calculated serum osmolality.

Reassess Water Requirements: Action Plan

1. Collect more data on actual intake water over 2-4 days
2. NFPA for signs and symptoms of dehydration
3. Recheck weight history
4. Assess for swallowing problems
5. Assess need for thickened liquids if ordered
Reassess Protein Requirements

Offer 1.25 to 1.5 gms protein/kg body weight daily for adults with an existing pressure ulcer and who are assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes.

Provide adequate protein for positive nitrogen balance for adults with a pressure ulcer.

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Reassess Protein Requirements: Action Plan

1. Collect more data on actual protein intake over 2-4 days
2. Determine amount and quality of protein eaten per meal
3. Assess for chewing & swallowing problems
4. Reassess need for therapeutic diets

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Images from Dreamstime Photos

2014 NPUAP-EPUAP & Pan Pacific Pressure Injury Alliance (PPPPIA) CPG
Protein Sources are Not Nutritionally Equal

Incomplete Protein Protein ≠ Complete

Food For Thought

Which menu promotes tissue synthesis?

- Menu 1 (no B, light L, heavy S)
- Menu 2 (equal at each meal)
- Menu 3 (light B, light L, heavy S)
- No difference in outcomes
Leucine Triggers Tissue Synthesis

![Graph showing Leucine (mg/gm PRO) for various sources.]

Source Protein in Dietary Supplements per Selected Manufacturers’ Websites & USDA Nutrient Analysis Database

Options when Intake is Insufficient

Offer high calorie, high protein nutritional supplements in addition to the usual diet to adults with nutritional risk and pressure ulcer risk if nutritional requirements cannot be achieved by dietary intake.

Supplement with high protein, arginine, and micronutrients for adults with a pressure ulcer Category/Stage III or IV or multiple pressure ulcers when nutritional requirements cannot be met with traditional high calorie and protein supplements.

Images from Dreamstime Photos
New Nutrition Prescription: Action Plan

1. Address each problem:
2. Small appetite: use fortified foods
3. Insufficient protein intake: 30 gm protein meal, supplements
4. Chewing/swallowing problems: consistency modified diet
5. Fatigue: mealtime assistant

References

References


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