What’s in that wound bed? Slough, Eschar, or Biofilm?

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Disclaimers

• Speaker does not endorse any one particular company’s products, is not employed by industry, has no financial interest in the listed commercial companies.

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Participants will describe:

• Key characteristics of chronic non-healing wounds
• Impediments to wound healing
• Characteristics of slough, eschar, and biofilm in open wounds
• Evidence-based approaches to address or remove slough, eschar, and biofilm from open wounds
• Potential antibiofilm treatment strategies
Chronic Wounds vs. Acute Wounds

• All chronic wounds begin as acute wounds

• Common chronic wounds
  – Venous ulcers of the lower extremities
  – Diabetic foot ulcers
  – Pressure ulcers
  – Complex trauma and surgical wounds

Key characteristics of chronic wounds

• Imbalanced at microcellular level
• Stuck in inflammatory phase\(^1\)\(^-\)\(^4\)
  – High MMPs / Low TIMPs (inverse correlation)
  – High inflammatory cytokines
  – Low growth factors
  – Fibroblast inhibition\(^5\)

• Does not follow expected pathway to healing (less than 50% improvement in 4 weeks)\(^6\)
Percent Wound healing in 4 weeks

58% of pts who had >50% reduction in wound size at 4 weeks, healed at 12 weeks

Only 9% of pts with <50% reduction in wound size at 4 weeks, healed at 12 weeks

Internal Impediments to wound healing

- Physiological can be changed:
  - Nutrition
  - Smoking/nicotine
  - Blood sugar control
  - Medications
  - Necrotic Tissue

- Physiological cannot be changed:
  - Advanced age
  - Certain comorbid conditions
External impediments to wound healing

- Can be changed:
  - Repetitive trauma - due to self or due to caregiver/clinicians (failure to off-load; inappropriate shoes/mobility devices; wet-to-dry dressings)
  - Exposure – toxic chemicals, environmental hygiene, temperature
  - Physical barriers – rolled wound edges, non-viable tissue (slough, fibrin, eschar)
  - Invasion – virulent pathogens (biofilm)

T-I-M-E-(s) Principle for WBP\(^1,8,9\)

- T - Address non-viable tissue in wound
- I - Address infection
- M – Manage moisture
- E – Address wound edges
- S – Address surround periwound skin
Documenting wound assessments

- Location
- Suspected etiology, contributing factors
- Size (W X L X D in cm)
- Undermining, tunneling (clock method)
- Exudate (color, amount, odor)
- Wound bed tissue (color, amount viable)
- Wound edges and surrounding tissue
- Last treatments used, compliance, wound response, patient/CG education

Describing wound tissue

- Color of wound bed (in percentages)
- Viable (living tissue with good perfusion)
- Non-viable (not living)
- Boggy (wet spongy consistency)
- Fluctuant (moving in waves, movable & compressible, variable/unstable)
- Friable (bleeds easily with light touch)
- Hypergranulating (overgrowing baseline)
- Pale (anemic looking)
Characteristics of slough in wounds

- What it is
- What it is not
- Slough vs. Fibrin

Slough

- Best ways to remove
Characteristics of eschar in wounds

- What it is
- What it is not
- When not to remove

Eschar

- When to remove
- Best ways to remove
Characteristics of biofilm in open wounds

- Unable to see it with naked eye
- Polymicrobial
  - Aerobic + non-aerobic bacteria
  - gram pos + gram neg
  - Fungus + virus
- Hydrophilic polymeric protective coating
- Quorum sensing
- Attached 2mm below wound bed surface
- Grows back in 48 hours

Distribution of Aerotolerance of Bacterial Populations in Chronic Wounds

Figure 1
Distribution of Bacterial Populations in Chronic Wounds in Relation to Aerotolerance. Diabetic, venous, or pressure ulcer types were analyzed separately using pyrosequencing and the resulting populations grouped into 3 categories based upon their suggested aerotolerance. This figure graphically illustrates the relative distribution of these functional categories among the wound types.

Prevalence of biofilm

- More than 60% of all chronic wounds with biofilm
- More likely more prevalent than we think

Malone et al., 2017.

Problems of biofilm

- Impairs wound healing
- Host often lacking common signs and symptoms of infection
- Difficult to detect, identify, eradicate
- Normal presumptive antibiotic treatment may actually encourage biofilm growth
Biofilm

- When to remove
- Best ways to remove

Potential antibiofilm strategies

- Prevention
- Debridement
- Topical products
- Systemic products
- Combined approaches
  - “one-two” punch: removal and preventive
Evidence for debridement methods

- Autolytic (exudate/MMPs)
  - Pros/Cons
- Enzymatic (collagenase)
- Mechanical (debriding gauze, wet-to-dry)
- Sharp
  - Scalpel, scissors, curette
- Ultrasonic (low and high frequency)
  - With and without forced water
- Larval/biological

Evidence for Larval Debridement

Questions?

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References


References


