Updates on Open Wound Management

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2026 CONTI Symposium

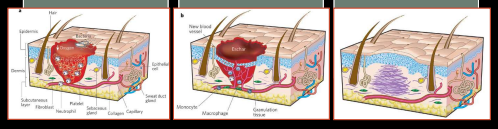
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Wound Healing: A Review

Inflammatory Phase

Proliferative Phase

Remodeling Phase



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Inflammatory Phase

1. Platelet aggregation & clot formation
2. Recruitment of neutrophils and monocytes
3. Wound debridement

- Starts within seconds of injury
- Lasts 3-7 days after injury

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Proliferative Phase

1. **Formation of granulation tissue**
2a. **Epithelial growth over new granulation tissue**
2b. **Contraction of wound edges**

- Starts 3-5 days after injury
- Lasts until wound is closed

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Remodeling Phases

Mature connective tissue replaces granulation tissue to form a scar

- Begins when wound is closed
- Ends when scar is remodeled
- Can last up to 2 years

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Tying It Together

Open Wound Management

- Methods to support/enhance natural wound healing process

Objective

- Convert contaminated wound to clean wound for closure

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What To Do First…

- Stabilize the patient
  - Assess and treat life-threatening injury
  - Cover wound until ready to treat
- Provide pain relief
  - Sedation may not be possible if unstable
    - Opioid for pain may provide adequate sedation
  - Local anesthetics should not penetrate wound bed to avoid bacterial spread

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Six Basic Steps of Wound Care

1. Prevent further wound contamination
2. Clean the wound = Lavage and Debride
3. Probe depth of wounds
4. Provide ideal wound environment
5. Promote a viable vascular bed
6. Select appropriate closure

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Wound Preparation

- Wear exam gloves
- Temporarily close or pack wound
  - Sterile water-soluble lubricant in wound
  - Or tack skin flap over moist sterile gauze
- Clip surrounding area w/ wide margins
- Surgical prep of surrounding skin
  - Do not let soap enter wound bed



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Surgeon Preparation

- Aseptic technique
  - Caps, masks, gowns, gloves
- Place sterile drapes



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Cleanse and Debride

- Lavage – copiously!
  - Lukewarm tap water
  - LRS
  - Saline
  - Occasionally w/ antiseptic

35 or 60 ml syringe
+
18 g needle/catheter
=
7-8 PSI



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Cleanse and Debride



- Povidone-Iodine
  - 1% Povidone Iodine (1:10 or less)
  - Residual activity 4-6 hr
  - Disadvantages
    - Forms inactive complexes with organic matter
    - Systemic absorption

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Cleanse and Debride

- Chlorhexidine
  - 0.05% Solution (1:40 dilution)
  - Activity less affected by organic material
  - Long residual activity
    - Increases with repeated applications
  - Cytotoxic at high concentrations
    - Corneal ulcers/ototoxic

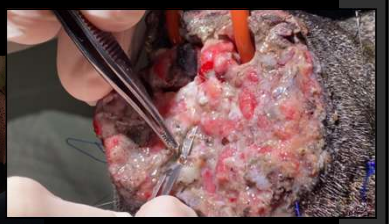


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Cleanse and Debride

- Surgical Debridement
  - Layered
  - En Bloc





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Assessing Tissue Viability

- Color
  - Red/pink – alive
  - Purple/dusky – compromised
  - Black/gray - dead
- Bleeding
  - Bright red, oxygenated blood
- Monitor Daily
  - Can take up to 5 days for tissues to declare
  - Place drain to monitor deep tissues in closed wound

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Cleanse and Debride

- Chemical Debridement
- Indications:
  - Poor surgical risks
  - Minimal debridement of open wound
- Granulex V
  - Trypsin
  - Castor Oil
  - Balsam of Peru



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Cleanse and Debride

- Mechanical Debridement
  - Wet-to-dry or Dry-to-dry dressings
  - Devitalized tissue and foreign material trapped in primary bandage layer
  - Removed when bandage removed
  - Nonselective

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Sampling for Cultures

- AFTER lavage
- Techniques
  - Swab – may miss biofilm bacteria
  - Tissue – collect while debriding, multiple
  - Levine Technique – press culture swab on wound bed to express wound fluid/blood and twirl over 1 cm^2 x 5 s
  - +/- Molecular bacterial identification
- Treating what is left in the wound

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Bandages

- Sterile Primary Layer
  - Maintains moist wound bed
  - Promotes/supports wound healing
    - Choice based on phase of wound healing, amount of exudate, location and depth of wound
  - Functions: protection, debridement, delivery of medications, passage of drainage, or occlusive seal

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Bandages

- Moist Wound Healing
  - Wound fluid contains WBCs, enzymes, cytokines, growth factors needed for healing
    - Work best in moist environment
  - Goal: keep surface of wound moist with wound fluid while removing exudate
    - Promotes optimal function of all wound components
    - Fewer bandage changes
    - Decreased cost

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Primary Layer

- Non-Adherent Dressings
  - Purpose: Protection, Maintain moist wound environment
  - Nonadherent (e.g., Telfa®) pad)
    - No necrotic debris (proliferative phase)
    - No effusion
    - Protect sutured incisions
    - Protect mature granulation tissue and migrating epithelium



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Primary Layer

- Non-Adherent Dressings
  - Purpose: Protection, Maintain moist wound environment
  - Hydrogels
    - Promote debridement, granulation, and epithelialization
    - Minimal to no wound effusion
    - All phases



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Primary Layer

- Non-Adherent Dressings
  - Purpose: Protection, Maintain moist wound environment
  - Vaseline-Impregnated Gauze
    - Adaptic®
    - Maintain moist wound bed
      - Granulation tissue
    - All phases



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Primary Layer

- Adherent Dressings
  - Purpose: Debridement, Removal of Exudate
    - Saline-moistened gauze or dry gauze on wound surface
    - Stack of dry gauze or lap pads overlying
    - Wound fluid absorbed into dry layers
    - Gauze sticks to wound surface as it dries
    - Peels off wound surface at removal
  - STOP USING once healthy granulation tissue is present



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Primary Layer

- Adherent Dressings
  - Wet-to-dry
    - For removal of necrotic tissue and/or viscous exudate
    - Moistened gauze on wound
  - Dry-to-dry
    - Loose necrotic debris and low-viscosity, high volume exudate
    - Dry gauze on wound



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Primary Layer

- Osmotics – for infected, necrotic, or heavily exudative wounds
  - Hypertonic saline, sugar, manuka honey
  - Stop once wound is clean and covered by healthy, robust granulation bed with minimal exudate





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Primary Layer

- Hydrocolloids, Foams, Alginates – highly absorptive, adhere to surface
  - For clean wounds only with large amount of drainage
  - Can absorb large amounts of fluid, decreases bandage changes







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Primary Layer

- Nitric oxide releasing wound dressings (Noxsano®)
  - Hydrocolloids and hydrogels
  - Chemoattractant: PMNs and Monocytes
    - Promotes debridement
  - Stimulates angiogenesis and fibroplasia
    - Earlier granulation tissue formation
  - Faster wound healing
  - Impact on resistant infections
- All stages/low to moderate exudate



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Primary Layer

- Negative Pressure Wound Therapy
- Benefits
  - Removes excessive exudate
  - Reduces edema
  - Increases vascularity and perfusion
  - Decreases inflammatory response
  - Improves skin elasticity



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Primary Layer - NPWT



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Primary Layer

- Fish Xenograft
  - Decellularized Codfish (Kerecis®)
  - Tilapia Skin
- Provides matrix for cellular ingrowth
  - Fibroblasts and keratinocytes
  - Retains omega-3 Fas
- Pain control
- Barrier



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Beyond the First Day

- Bandage changes
  - Type of bandage
  - Amount of exudate
- Monitor tissue viability
  - Debride as needed
- Monitor for signs of infection
- Monitor progress of healing
  - Adjust primary layer accordingly

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Beyond the First Day

- Inflammatory
  - Support wound debridement
  - Absorb or allow exudate to pass through
- Proliferative
  - Support granulation tissue formation
  - Support wound contraction and epithelialization
  - Maintain moist wound environment

    Remove excess exudate -or- add fluid back

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Beyond the First Day

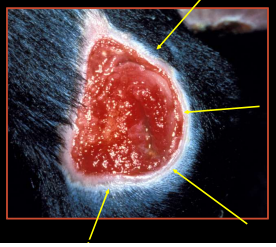
- Evaluating Wound Health
- Appearance of healthy granulation tissue




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Beyond the First Day

- Evaluating Wound Health
- Epithelialization
  - 1 mm/day



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Beyond the First Day

- Evaluating Wound Health
- Unhealthy Wound




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Beyond the First Day

- Evaluating Wound Health
- Contracture
  - When wound contraction distorts and adjacent orifice or affects joint function



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Beyond the First Day

- Reassess non-progressive wounds
  - Infection
  - Pressure point
  - Excessive movement
  - Repetitive trauma
  - Equalized forces
- Treat accordingly

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Beyond the First Day

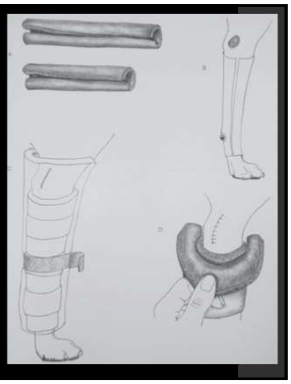
- Reassess non-progressive wounds
  - Infection → culture, treat
  - Pressure point → offload*
  - Excessive movement → stabilize, +/- drain
  - Repetitive trauma → protect
  - Equalized forces → reconstruction

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Beyond the First Day

- Foam pipe insulation bandages
  - Offloads elbows
  - Hocks too!

- Pavletic M. *J Am Vet Med Assoc* 2011;239:1225–1231



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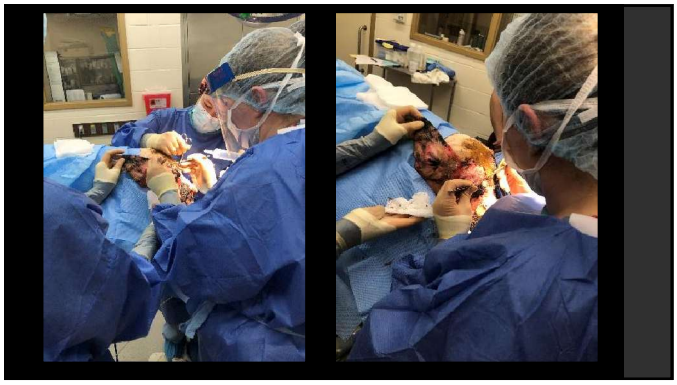
Buddy

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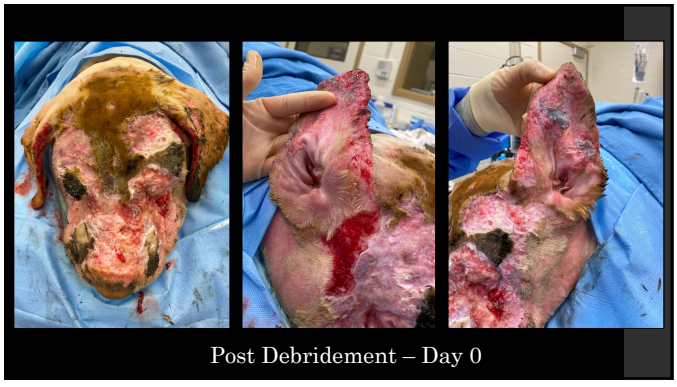
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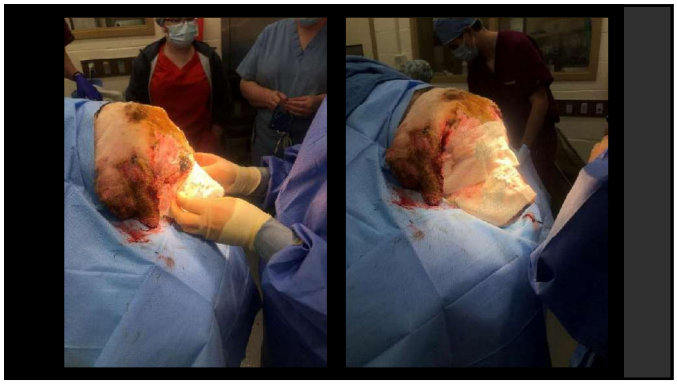
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Day 4

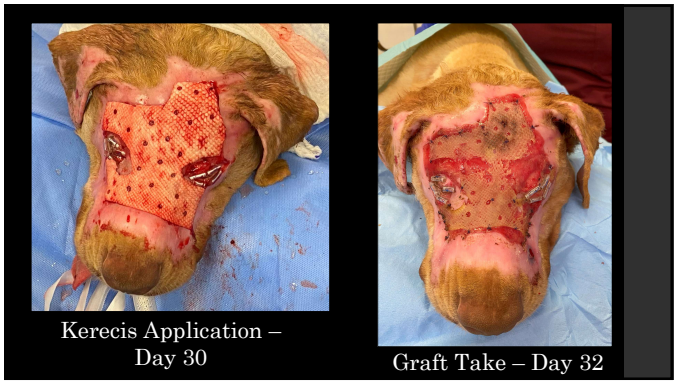
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Day 9

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Kerecis (decellularized codfish skin) Application #2 – Day 9

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Kerecis Application – Day 30

Graft Take – Day 32

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Day 59



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Healed!

Day 114

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