Challenges in neonatal skin & wound care

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Learner objectives

• Describe the structure and function of neonatal skin

• Describe pathology, assessment and management of wounds and ostomies in the neonatal population.

• Discuss product selection and unique considerations specific to the neonatal population.
Question

What is the 1st rule of wound care in the neonate?

A. Cohesion between the dermis and epidermis is excellent
B. Wet to dry dressings are the standard of care
C. Dressings should always be changed daily
D. Above all, Do No Harm
Functions of Skin

Thermoregulation
  Subcutaneous fat layer - insulation
  Sweating

Fluid and electrolyte balance
  TEWL
  Discharge electrolytes

Protection
  Foreign substances (toxins)
  Microorganisms

Communication/ Sensation

Self-repair after injury
FUNCTION OF SKIN

Perspective: Touch

- Touch is the first sense to develop.
- Touch is a central component of the infant-mother co-regulatory system.
- Therefore, the skin is important in how the infant perceives and reacts to the environment of care and, consequently, in neurodevelopment.

Anatomy and Physiology

Epidermis — Epithelial tissue

Dermis — Connective tissue

Subcutaneous — Fatty tissue
Moist Wound Healing

Epidermal cells migrate only over viable tissues as they require a blood and nutritional supply that is adequate to meet their energy needs. Because the migration tongue of epithelium must burrow between eschar, crust, or a scab and the underlying living tissue,

Advantages of moist wound healing
Physiology: Infantile skin

• Immature Skin:

  - Thin, even gelatinous in very preterm
  - Decreased epidermal-dermal cohesion: Adhesives can attach more securely to epidermis than the epidermis is attached to the dermis.
  - Increased risk of toxicity from topical agents - larger exposed surface area (compared to body weight) and increased permeability due to alkaline skin

• Increased risk of infection

• Premature skin less able to prevent evaporation - fluid loss is more marked
Skin Barrier Function

• Ability of skin to protect and function as a barrier to toxins, pathogenic organisms

• Can be measured by the skin's ability to hold on to water (TEWL), influenced by pH

• Immaturity, alterations in pH, skin injury or disease can result in impaired barrier function
Transepidermal Water Loss

T.E.W.L. (Transepidermal Water Loss)

Hydration is lost by water content evaporating through the epidermis.
Skin pH

- pH > 6.0 at birth, falls to 5.0 in 4 days
- Premature infants pH 5.5 after one week, 5.1 after one month
- Diapered areas pH 6.0
- pH of adult skin 4.7 (24 hours after bathing)
- Acid mantle is protective at pH 4.7 – Transient flora is inhibited (gram negative such as E. Coli, pseudomonas: gram positive staph; Candida.)
Epidermal- Dermal Bond

• Rete ridges: epidermal protrusions of the basal layer that prevent the dermis and epidermis from moving independently from one another.

• Any action that causes friction between layers will create blisters, painful sores or skin tears.
Rete Ridges
Physiology: Infantile Skin

- Infant skin has less total lipids compared to adults

- Soap emulsifies the lipid coating and removes it along with resident and transient bacteria

- Excessive soap can interfere with water holding capacity of the skin and may impair bacterial resistance.
General Skin Care

- Adequate moisture to protect skin barrier:
  - Emollients PRN for cracking skin.
Prevention & Treatment of Common Causes of Skin Breakdown in Neonates & Infants

- Damage due to Skin Disinfectants
- MARSI
- IV Extravasation
- Diaper Dermatitis
ANTISEPTIC SKIN PREPARATIONS

- **Alcohol** preparations can cause skin necrosis.

- **Betadine** carries a high risk for iodine overload. Preterm infants at greatest risk for hypothyroidism and possible neurodevelopmental delays.

- **Chlorhexidine gluconate** can cause skin burns.

- Gentle application with minimal scrubbing.

- Allow to dry completely.

- Do not allow to pool in skin folds.

- Consider removing the antiseptic after the procedure with sterile saline.
Skin Disinfectants

Antiseptic Skin Preparations

- Betadine & Alcohol
- 2% Aqueous CHG
- CHG & Alcohol
- CHG & Alcohol


MARSÍ

• Skin injury results when the skin to adhesive attachment is stronger than skin cell to skin cell attachment

• A Medical Adhesive –Related Skin Injury (MARSÍ): an occurrence in which erythema +/- or other manifestation or cutaneous abnormality (including, but not limited to, vesicle, bulla, erosion, or tear) persists 30 min.
Proper tape removal is critical in reducing the occurrence of traumatic skin injuries:

Remove tape “low and slow” in direction of hair growth, keeping it close to skin surface and pulled back over itself. Removing tape at an angle will pull at the epidermis increasing risk of mechanical trauma.
MARSI Prevention: Medical Adhesives

- A product used to approximate wound edges or to affix an external device (tape, dressing, catheter, electrode, pouch, or patch) to the skin.

Pressure sensitive: Adhesive is activated by applied pressure (surface contact area ↑)

- Types:
  
  **Acrylate**: Adhesive warms and flows to fill in gaps in skin. Adherence can ↑over time

  **Hydrocolloid**: Adhesion varies over time according to water content

  **Silicone**: Newest class of adhesive; maintains same level of adherence over time
Adhesive remover

Mechanism of action:

- Silicone-based (non alcohol) solution that minimizes pressure required to remove adhesive by dissolving the adhesive.

- Evaporates: Does not leave residual or cause dry skin.
PERIPHERAL INTRAVENOUS INFILTRATION & EXTRAVASATION (PIVIE)

• Prevention
  • Place appropriate line upon admission
  • Consider CVC for: calcium, TPN & IL, low/high PH medications

• Treatment: P&P # 766
  • Leave catheter in place to remove medication before removing IV
  • Elevate
  • No hot or cold packs unless directed by pharmacy
  • May consult Plastic Surgery
  • Moist wound healing
  • Debridement if needed
IV Infiltrates
Question?

• The NICU nurse is teaching the parents of a neonate how to prevent and treat diaper rash. What teaching point is a recommended intervention?

   A. Avoid using topical treatments containing zinc and petrolatum

   B. Once denudation occurs, keep the skin open to air

   C. Do not remove skin barrier ointment completely with each diaper change

   D. Use baby powder on damaged skin to keep the area moisture free.
INCONTINENCE ASSOCIATED DERMATITIS (IDD)

Safe Products:

• Zinc Oxide
• Petrolatum
• Dimethicone
• Calamine
• Nystatin

Cleansing Products:

• Warm cloths with water
• Hospital approved diaper wipes
• Over the counter water cloths
DIAPER DERMATITIS TREATMENT

- Severe IDD EBP Guideline #2149:
  - Cleanse
  - Stoma powder or antifungal
  - Protective skin barrier film
  - Zinc or petrolatum based cream or ointment
IDD WITH CANDIDIASIS

• Brightly erythematous, sharply marinated dermatitis that may involve inguinal folds, buttocks, thighs.

• Characteristic “satellite” lesions

• Treatment: Antifungal ointment or cream (Mycostatin, Miconazole, Clotrimazole, Ketoconazole)
CASE STUDY

- K.S. 4 day old former 24 week preemie with:
  - Respiratory failure
  - Leukocytosis
  - Thrombocytopenia
  - New rash to both shoulders, back, extending to upper arms, most prominent over right thigh and buttock. Skin breakdown on abdomen.

- Skin was dry and cracked with white patches consistent with fungal infection. Other skin areas open with exposed dermis.

  - **Congenital Cutaneous Candidiasis suspected.**

  - Infant stared on Ampicillin, Gentamicin, Fluconazole (Amphotericin B later started after suspected fungal endocarditis.)

  - Skin initially treated with Nystatin Cream.
Case Study - Congenital Cutaneous Candidiasis
G Tube Dermatitis

PREVENTION & TREATMENT OF G TUBE DERMATITIS

- Goal is to keep skin clean, dry and protected
  - Assess: skin, stoma, causes of intra-abdominal pressure (constipation, venting), tube size, adaptor size and stabilization
  - Cleanse skin with soap and water
  - Avoid hydrogen peroxide, alcohol and povidone - iodine and lotions/ointments
  - No sting barrier or barrier cream/ointment
  - Use foam dressing. Do NOT apply an occlusive gauze dressing
  - Treat for fungal rash (2% miconazole ointment or Nystatin powder)
Question?

• Wound products considered safe in neonates include all but

  A. Medical Grade Honey
  B. Iodine
  C. Petrolatum
  D. Silicone dressings
Wound Care Product Selection

Dressings:

Dry: add moisture
Wet: remove moisture

Maintain a moisture balance!

- Amorphous Hydrogels
- Manuka honey dressings
- Antimicrobial gauze
- Alginate
- Hydrofibers

When applying, fill to the skin level
Protect and insulate the wound

- Soft silicone dressings are the best choice
- Keep the wound at body temperature
- No need for daily dressing changes
- Less pain and decrease potential for MARSI
- Protects the wound from friction and shear
- Gentle removal
Medical Grade Honey

• Acts as an osmotic engine to draw fluid from deeper tissues to the wound surface to promote removal of devitalized tissue.

• Acts as inflammatory mediator: enhances macrophage production for tissue debridement and proliferation of angiogenesis.

• Has a low pH of 3.5 - 4.5 that helps provide antibacterial and antimicrobial effects.

• Provides moist wound healing environment
Medical Grade Honey
Silver Dressings

Systemic antibiotics may not penetrate the soft tissue
- Ionic silver dressings provide anti-inflammatory and bacterial effects
- Nanocrystalline technology has lower levels of silver and a decrease risk of toxicity
- Rigorous evaluation has not been performed in pediatrics
- Soft silicone dressing with Ag Hydrofiber or alginate dressings with Ag
Use of Silver Product

• Consider use in infected wounds

• Limit use to 2 weeks

• Normal renal function needed

• No antidote for silver therapy available

• No pediatric prospective studies R/T silver absorption
Case Study: Silver Dressing
3 Weeks, 75% Wound Reduction

[Image of wound before and after silver dressing treatment]

[Citation]

Case Study: Use of Silver Dressings with Negative Pressure Wound Therapy
Michael, Shannon RN, CRNP, CWS, CWOCN, WOC Nurse Practitioner; Kim, Linda RN, CRN, CWOCN; Tacy McLees, Keith RN, MS, CRNP, COCN, CWOCN, TC; Helen Smith, Michael M

Journal of Wound Ostomy & Continence Nursing
Mar 2008; 34(3) 125-130, 132-135, 139-140
Question?

• Neonates in the NICU are at greatest risk for pressure injury development related to??

  A. Shear forces
  B. Device-related pressure
  C. Adhesive related products
  D. Ischemic pressure
Hospital Acquired Conditions

Declines in Hospital-Acquired Conditions

National efforts to reduce hospital-acquired conditions such as adverse drug events and injuries from falls helped prevent 20,500 deaths and saved $7.7 billion between 2014 and 2017.

- CAUTI - Catheter-Associated Urinary Tract Infections
- CLABSI - Central Line-Associated Bloodstream Infections

**The percent change numbers are compared to the 2014 measured baseline for HACs.**

Source: AHRQ National Scorecard on Hospital-Acquired Conditions Updated Baseline Rates and Preliminary Results 2014-2017
Pediatric Pressure Ulcer/Injury Prevalence

- **Location** in children – occipital, sacral, heels
  - Hospitalized pediatric patients:
    - 50% pressure ulcers are device related
    - Non-critical 0.47%-13%
    - Critical 20-27%
    - Critical care & rehabilitation units
      - 3.36 and 4.41 X more likely to acquire HAPI
  - Complex care patients: up to 43%
  - Adults: 9.2%-15%

- HAPI Risk: JWOCN Mar/Apr 2018
Medical Device Related Pressure Injury

- Localized injury to the skin or underlying tissue as a result of sustained pressure from a device

- Incidence rates as high as 50%
  - Tissue injury typically mimics device shape
  - Often seen in areas without adipose tissue
Mucosal Membrane Related Pressure Injury

- History of a medical device in use at the location of the injury.
- These ulcers are not staged.
Pediatric Ostomies - Indications

• Hirschsprung’s

• Imperforate Anus

• Bladder Extrophy

• Necrotizing Enterocolitis (NEC)

• Inflammatory Bowel Disease (Colitis, Crohn’s)
Ostomy Care

Goals - Same as adults

Protect Surrounding Skin

Control Drainage

Patient Comfort
Types of Stomas

• **End** (Flush, budded, recessed)

• **Loop**

• **Double Barrel** (proximal poops, distal doesn’t)

• Stomas have no nerve endings: should not hurt
OSTOMY CARE: POUCH CHANGE

• Cut Wafer

• Cut exact size or 1/8” larger than stoma

• If peristomal skin is weepy, apply stoma powder and seal into place with Barrier film (crusting technique)

• Apply paste or barrier ring as needed. (Not glue.. used as caulking)
Question

• Is Negative Pressure Wound Therapy safe for children under 8 years old?
Negative Pressure Wound Therapy

- Controlled, negative sub-atmospheric pressure applied to open wound beds
- Removes excess wound fluid
- Removes exudate
- Increases wound vascularity
- Promotes granulation tissue
- **Limited data on use in children**
- No randomized, pediatric prospective studies to determine the amount of pressure that is effective in reduction of wound volume

What NPWT pressure should be used in infants & Children?

• Comparison: Group 1: 50 mmHg or Group 2: high pressure of 100 mmHg (sternal wounds) or 125 mmHg.

• NPWT administered at 50 mmHg was just as effective as 100 or 125 mmHg in the treatment of pediatric wounds.

• The lower pressure (50 mmHg) can be administered in infants and children without any loss of efficacy although there were very few complications with either pressure.
VAC Dressing Application

• Cleanse wound with N/S or wound wash

• Apply No sting barrier™ to periwound
Sponges

- To avoid adherence to exposed organs:
  - White sponges (impregnated with saline, smaller pores)
  - Black sponges with non-adherent contact dressing layer
  - Frequent sponge changes
- Attach tubing to suction -50 to -125 mmHg
- Continuous mode for open sternum
Case Study- TCH The Woodlands NICU
Thank You!

Questions?
References


