Wound Care in the Older Adult

Jodie R. Harper, MD, CWS
May 20, 2009

Objectives

- Describe manifestations of skin aging
- Summarize wounds found commonly in older adults
- Outline prevention and treatments of common wounds in older adults

What is Aging?

- A normal developmental process
- Manifestation of biological events over time
- An inevitable and irreversible process
- Decline in normal function
- Loss of reserve
Epidermis

- Keratinocytes
- Melanocytes
- Langerhans cells
- Basement membrane

Aging Epidermis: Keratinocytes

- ↓ Proliferative potential
- ↓ Response to environment
- ↓ Wound healing
- ↓ Barrier
- ↓ Cytokine production
- ↓ Growth factor production
- ↓ Vitamin D production
**Aging Epidermis: Basement membrane**
- ↓ surface area
- Flattening of rete ridges
  - ↓ Epidermal – dermal adhesions
  - ↑ Blistering / skin tears

**Dermis**
- Fibroblasts
- Blood vessels
- Neural elements

**Aging Dermis: fibroblasts**
- ↓ Collagen / Elastin
- ↓ Tensile strength
- ↓ Elasticity
- ↓ Wound contracture / healing
Aging Dermis: blood vessels
- ↓ Thermoregulation
- ↓ Response to injury
- ↓ Angiogenesis

Aging Dermis: neural elements
- ↓ by 33%
- ↓ sensation
- ↑ risk of injury to skin

Aging Subcutaneous Tissue
- ↓ Fatty tissue
- ↓ Mechanical protection
- ↓ Insulation
Components of Wound Healing

Injury  Hours  Days  Weeks

Coagulation Process
Inflammatory Process
Migratory/Proliferative Process
Remodeling Process

Cell Types Involved

Platelets
Macrophages
Lymphocytes
Fibroblasts
Epithelial cells
Endothelial cells


Acute Tissue Injury

- **Hemostasis**
  - Capillary constriction
  - Clot formation
  - Platelet degranulation  \( \rightarrow \) GF


Acute Tissue Injury

**Inflammation**

Vasodilation with influx of neutrophils and macrophages

- **Neutrophils**  \( \rightarrow \) Proteases  \( \rightarrow \) Debridement
  - Kill bacteria
- **Macrophages**  \( \rightarrow \) Cytokines (TNFα, IL-1β)  \( \rightarrow \) GF

Acute Tissue Injury

Proliferation

- Influx of fibroblasts and endothelial cells
- Collagen synthesis + angiogenesis
- Granulation and contraction


Role of Fibroblasts in Wound Healing

Acute Tissue Injury

Remodeling

- Epithelialization and scar formation
- Collagen fibers
  - Reorganize
  - Remodel
  - Mature
  - Gain tensile strength (80% original)

ECM = extracellular matrix.
Role of Keratinocytes in Wound Healing

ECM production

Growth factor/ cytokine production

Angiogenesis

Matrix synthesis regulation

Migration/ Proliferation

ECM = extracellular matrix

Skin Changes Associated with Intrinsic Aging

<table>
<thead>
<tr>
<th>Component</th>
<th>Competency</th>
<th>Normal</th>
<th>Inflammation</th>
<th>Chronic Ulceration</th>
</tr>
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<tbody>
<tr>
<td>Keratinocytes</td>
<td>proliferative potential/social interaction response to exogenous factors</td>
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<td>Mastocytes</td>
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<td>Monocytes/Macrophages</td>
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CHRONIC WOUNDS

Stagnant in the INFLAMMATORY and PROLIFERATIVE phases of wound healing

Biochemical Differences

**Healing Wounds**
- ↑ Cell mitosis
- ↓ Pro-inflammatory cytokines
- ↓ MMP’s
- ↑ Growth factors
- → Cells capable of rapid response

**Chronic Ulcers**
- ↓ Mitogenic activity
- ↑ Pro-inflammatory cytokines
- ↑ MMP’s
- Varied levels of growth factors (deficiencies)
- → Senescent cells

Multiple Compromising Factors

- Blood flow
- Bacterial Colonization & Infection
- Moisture, Drainage & Exudate
- Pressure, Shear & Mechanical Forces
- Tissue Slough, Fibrin & Necrosis
- Cellular & Growth Factors
- Nutrition & Hydration
- Acute and chronic medical problems and their treatments

Multiple Compromising Factors

- Lifestyle factors
  - Activity
  - Financial status
  - Cultural/religious beliefs
- Psychological Factors
  - Stress
  - Depression
  - Compliance issues
Aging Dependent Diseases

- Alzheimer's disease
- Cerebrovascular disease
- Cardiovascular disease
- Vision and hearing loss
- Type II Diabetes Mellitus
- Hip fractures
- Depression
- Osteoporosis
- Urinary incontinence

Wound Etiology: Types of Chronic Wounds

- Pressure Ulcers
- Venous Stasis
- Arterial
- Diabetic Foot Ulcers / Neuropathic
- Mechanical
  - Burns, surgical, skin tears, bites, trauma
- Malignancy
- Vasculitic

Pressure Ulcers Epidemiology

- 70% in patients over 70
- Prevalence:
  - 2.2-25% in nursing home residents
  - 0.4-38% in acute care
  - 0.17% in home care
- 2-6 times greater mortality risk
- 2.5 million patients yearly (acute)
- Single ulcer > $70,000
- 2000: $200 billion

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Pressure Ulcers Controversies

- All pressure ulcers are preventable. False.
- All pressure ulcers can heal with appropriate treatment. False.
- The presence of a pressure ulcer implicates negligence. False.
- High pressure ulcer rates indicate poor care. False.

Pressure Ulcers Definition

- A localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated.
- Staging system based on degree of tissue damage observed (NPUAP)
- Stage I, II, III, IV, Unstageable, DTI
**Pressure Ulcers Stages**

**Stage I:**
- Nonblanchable erythema of intact skin. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.
- Area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue.
- May be difficult to detect in dark skin tones.

**Stage II:**
- Partial thickness loss of dermis presenting as a shallow open ulcer with a red or pink wound bed, without slough or bruising.
- Intact or open / ruptured serum-filled blister.
- Should NOT be used to describe skin tears, tape burns, perineal dermatitis, maceration or excoriation.

**Stage III:**
- Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed.
- Slough may be present but does not obscure depth of tissue loss.
- May include undermining or tunneling.
- Depth varies on anatomical location.
Pressure Ulcers Stages

**Stage IV:**
- Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound
- Depth varies depending on anatomical location
- Often include undermining and tunneling
- Exposed bone / tendon is visible or directly palpable
Pressure Ulcers: Stages

Unstageable

- Full thickness tissue loss in which the base of the ulcer is covered by slough and/or eschar in the wound bed.
- Until enough slough and/or eschar is removed to expose the base of the wound, the true depth and therefore stage cannot be determined.
- Almost all cases, after debridement, will be Stage III or Stage IV.
Pressure Ulcer Stages

Suspected Deep Tissue Injury
- Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear.
- Area may be preceded by tissue that is **painful**, **firm**, **mushy**, **boggy**, **warmer** or **cooler** as compared to adjacent tissue.

Suspected Deep Tissue Injury
- Deep tissue injury may be difficult to detect in individuals with dark skin tones.
- Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar.
- Evolution may be rapid exposing additional layers of tissue even with optimal treatment.

Pressure Ulcer Sites
- >80%
  - Pelvic girdle
    - Ischium
    - Sacrum
    - Coccyx
    - Trochanters
  - Heels
**Pressure Ulcers**

### Risk Factors: Intrinsic
- Advanced age
- Immobility / Inactivity
- Incontinence
- Malnutrition / weight changes
- Altered level of consciousness
- Sensory Impairments
- Chronic illnesses/ diseases

### Risk Factors: Extrinsic
- Pressure
- Friction
- Shear
- Moisture
- Chemical / toxic irritants

### Important Points
- Pressure ulcers do NOT always progress from Stage I to Stage IV in that order
- Pressure ulcers are NOT staged backwards when healing (once a Stage IV, always a Stage IV, appropriate to say “healing Stage IV”)
New ICD-9 Codes

- Decubitus → Pressure Ulcers
  - 707.00 – 707.09
- New codes: Stage
  - 707.20: Unspecified
  - 707.21: Stage I
  - 707.22: Stage II
  - 707.23: Stage III
  - 707.24: Stage IV
  - 707.25: Unstageable

Management of Pressure Ulcers

- Pressure Ulcer Identification
- Initial Assessment → Develop Treatment Plan
- Nutritional Assessment
- Management of Tissue Loads
- Local Ulcer Care

Indiana Pressure Ulcer Quality Improvement Initiative

- 100 nursing homes
- Over 70 hospitals / home care / hospice agencies
- Statewide
- Working together
- Implement processes to identify at risk patients and prevent pressure ulcers
Indiana Pressure Ulcer Quality Improvement Initiative

Partners:
- Health Care Excel
- Indiana Health Care Association
- Indiana Hospital Association
- Indiana University School of Medicine
- United Senior Action Foundation
- Pathway Health Services
- Indiana State Long Term Care Ombudsman
- Bottom Line Performance
- Cabello Associates
- Hoosier Owners & Providers for the Elderly
- Indiana Association of Homes & Services for the Aging
- Indiana Association for Home & Hospice Care
- Indiana Patient Safety Center
- Pathway Health Services, Inc.

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Venous Insufficiency
- Afflict 1% of the population and 3.5% of persons over 65 years of age
- Venous ulcers account for 90% of all chronic wounds on the lower leg with recurrence rate of 70%
- Result from disorders of the superficial and deep venous systems
Venous Ulcers

- Predisposing factors:
  - Deep Vein Thrombophlebitis and Thrombosis (DVT)
  - Prior pregnancy
  - Leg trauma
  - Cardiac disease
  - Poor nutrition
  - Absence of/or poor calf muscle pumps

Venous Hemosiderin Staining
Venous Stasis Ulcer Treatment

- TREAT THE EDEMA!
  - Compression / Elevation / Sodium restriction
  - Diuretics
  - Vascular Surgery referral
- Moisture control
  - Calcium alginites
  - ABD pads
  - Multilayer compression garments

Lymphedema
Before / after compression

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### Arterial Insufficiency/Ulceration

- Predisposing factor/cause:
  - Peripheral Vascular Disease (PVD)
  - Diabetes Mellitus
  - Advanced Age
  - Smoking
  - Hypertension

### Arterial Ulcers

- Image of a foot with an ulcer and a bypass graft.

### Arterial Ulcers S/p bypass

- Image of a foot with healed ulcers after bypass surgery.
Emboli post CABG

Arterial Ulcers Treatment

Decision: Conservative vs. Aggressive
- Aggressive
  - Evaluate extent of insufficiency
  - Arterial Dopplers / Angiogram
  - Referral to Vascular Surgery: PTA / bypass
- Conservative
  - Prevent infection and trauma
  - Conventional wound care
  - Augmentation:
    - HBO

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Diabetic Wound Statistics

- Prevalence of Diabetes
  - 18.2 million people
  - 50% > 65
  - 6.3% of the population
- Direct medical costs: $92 billion
- Indirect costs: $40 billion
- Disability, work loss, premature mortality

NIDDK - National Institute of Diabetes and Digestive & Kidney Diseases

Diabetic Foot Disease

- 82,000 nontraumatic lower-limb amputations
  - Data for 2000-2001
  - 54,000 diabetic amputations reported in 1992
- $43,000 for minor amputation
- $65,000 for major amputation
  - Apelqvist, et al. 1995
- $22,000 to $36,000 per diabetic foot ulcer
  - Bentkover & Champion, 1993

NIDDK - National Institute of Diabetes and Digestive & Kidney Diseases

Diabetic Ulcer

- Predisposing Factors
  - Peripheral vascular disease
  - Peripheral neuropathy
    - Autonomic
    - Motor
    - Sensory
Diabetic Ulcer
Plantar Surface of Foot

Diabetic Foot Ulcers
Treatment

- Off-loading is key to wound healing!
- Diabetes control
- Moist, wound environment
- Control of bioburden
- Debride necrotic tissue & hyperkeratotic rim
- Replacement of growth factors

Normal Aging Changes

- Hearing ↓
- Vision ↓
- Kidney function ↓
- Blood pressure ↓
- Glucose intolerance ↓
- Immune function ↓
- Bone density ↓
- Nervous system ↓
- Muscle function ↓
- Cognitive function ↓
- Lung function ↓
- Sexual function ↓

NB. Absence of disease
Average values from within a population
Normal Aging Changes: Sarcopenia

Sarcopenia: decline in lean body mass
- ↓ energy requirements (100 kcal/decade)
- ↓ energy intake
- ↑ difficulty ingesting diet meeting all micronutrient requirements

Special Senses: Taste and Smell

- Olfaction decreases by 50% by age 80
  - Recognition of familiar smells is reduced by 15%
- Numbers of papillae on the tongue is unchanged but responsiveness is altered
- May be decreased enjoyment of food and difficulty sorting out differences in taste

Gastrointestinal Function

- Chewing is not as efficient
- Salivary secretion is mildly reduced
- Gums recede predisposing to dental caries
- Swallowing takes 50-100% longer
- Small aspiration common in frail elderly
Normal Aging Changes: Body composition

- Fat mass increases
- Obesity increasing problem
- **Protein calorie malnutrition CAN occur in face of obesity!**
- So, screen even obese patients for nutritional deficits

Normal Aging Changes: Immune Function

- Healthy immune function depends on adequate macro/micronutrition
  - Vitamin E
  - Vitamin C
  - Copper
  - Vitamin B6
  - Zinc
  - Vitamin D
  - Magnesium
  - Calcium

***START MVI with minerals***

Relevance of Nutrition in Wound Healing

- Patient with muscle wasting at greater risk for wound/pressure damage
- Decreased collagen synthesis by fibroblasts
- Decreased wound contraction
- Increased risk for infection
Normal Aging Changes: Nutrition

- Screen EVERY patient for nutritional deficits
- In the elderly, if malnourished...
  ...think
  **DEPRESSION**
- Anorexia and weight loss are hallmarks of depression in the elderly
- Very common in elderly ≈ 15%
- And, it's remarkably treatable!

Wound Bed Preparation

**Prepare Patient for Wound Healing**

- Wound management priorities
  - Reduce/eliminate the cause
  - Provide systemic support
  - Appropriate topical therapy
Moisture, Drainage & Exudate

The Perfect Wound Dressing

- Relieves pain
- Provides moist wound-healing environment
- Protects from further damage
- Removes drainage and necrotic debris
- Promotes granulation tissue
- Protects from bacterial contamination
- Packs dead space


Wound Dressings

- Hydrocolloids (occlusive)
- Hydrogels
- Alginates
- Collagens
- Foams
- Hydrofibers
- Wound fillers
- Silver
- Transparent films
- Contact layers

“Hanging Wet-to-Dry Dressings Out to Dry”

Liza G. Ovington, PhD, CWS
Advances in Skin & Wound Care
vol. 15, no. 2, March/April 2002
“Hanging Wet-to-Dry…”

- 1960’s: both animal and human studies documented that wounds in which the tissue remained moist healed 2 x faster than those allowed to dry out\textsuperscript{14}
- Moist wound healing = Standard of Care\textsuperscript{15}
- Now available polymeric materials
  - Moisture-retentive / semi-occlusive
  - >50 manufacturers, >10,000 products

“Hanging Wet-to-Dry…”

- Despite progress… gauze is still the most widely used wound dressing and may be erroneously considered “standard of care”
- 1999 (Pieper, et al\textsuperscript{16})
  - 40% - dry gauze
  - 15% - saline moistened gauze
  - 25% - no dressings
  - < 25 % - “moisture – retentive dressings”

“Hanging Wet-to-Dry…”

- Wet-to-Dry
  - Intended for debridement of devitalized tissue
  - Nonselective – removes healthy tissue
  - Painful
- Wet-to-Moist
  - Intended to remain moist, but often dries
“Hanging Wet-to-Dry…”

- Increases Infection Rates
- Released bacteria into air
- Bacteria can penetrate through 64 layers of gauze
- Local tissue cooling
- Labor intensive (BID → TID)
- More expensive
- More painful

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Case Presentations

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**JG**

8/3/2005

- 101 y/o female
- History of trauma to leg 16 weeks prior to visit. Failed to heal with topical antibiotics, oral antibiotics, hydrogen peroxide cleansing.
- PMH:
  - Venous insufficiency, uncontrolled
  - CHF
  - Cuteness
- SH: Nonsmoker, widowed, lived independently, needed assistance with basic ADL’s and wound dressings
Clinic Visit 8/3/2005
- Sharp debridement
- Apligraf application (Iodoflex)
- Profore dressing
- Educated:
  - Leg elevation 6 inches above heart
  - Sodium limited to 2000 mg daily

- Weekly dressing changes x 3 weeks
  - Iodoflex + ACE wraps
- Tri-weekly dressing changes
  - Fibracol + compression
- 102nd birthday
- 1 day short of 12 weeks…
Conclusions

- People get old
- Old people get wounds
- We can heal old people's wounds!
Questions??

It was getting too long!