Aging Skin

Common Changes and Clinical Consequences

In 2055, retirement village residents play a game of “Guess what the tattoo used to be!”
Overview

- Aging of the population
- Changes to the histology and physiology of the skin seen with age
- Wound healing in older persons
- Xerosis
- Skin tears
- Pressure ulcers
Population Demographics

- Increase in the number of people over 65
  - increased lifespan
  - baby boomers
- Double the population of persons 65 or older during the next 25 years
- By 2030 persons 65 or over will account for 20% of the American Population

Department of Health and Human Services; Administration on Aging 2014
Skin Changes with Age

- **Intrinsic:** due to the normal maturity that occurs in all individuals because of genetics and physiology.

- **Extrinsic:** due to environmental factors such as UV light and smoking.
Intrinsic Skin Changes Associated with Advancing Age

- **Epidermis**
  - thins-particularly on neck and extensor surface
  - becomes drier due to decreased sebum production
  - receives less nutrients from blood vessels in dermis
  - decreased acidification of the stratum corneum
  - decreased interdigitation with the dermis
  - decreased number of melanocytes
  - decreased number of langerhans cells
  - decreased aquaporin 3 gene expression
Intrinsic Skin Changes Associated with Advancing Age

- **Dermis**
  - decrease in dermal thickness by up to 20%
  - decrease in fibroblasts leading to:
    - decrease in collagen turnover
    - disorganized collagen bundles
    - decreased elastin
  - decrease in nerve endings
  - decrease in blood vessels along with increase in fragility of the vessel wall
  - decrease in the number of mast cells
Skin Changes with Age

- Hypodermis
  - decrease in thickness in limbs, face
  - concomitant increase in truncal areas
  - increase blood vessel fragility


**Young skin**

- **Epidemis**
- **Dermis**
- **Hypodermis**
  - Organised collagen fibres
  - Vascular tissue

**Elderly skin**

- **Epidemis**
- **Dermis**
- **Hypodermis**
  - Epidermal atrophy
  - Dermal atrophy
  - Disorganisation and loss of collagen fibres

**Smoothing of Epidermal/dermal junction**

**Reduced vascular tissue**
Overview: Intrinsic Changes With Age

- Drier, thinner, less elastic
- Increased callous formation
- More vulnerable to infection
- Increase risk for shearing injury
- Increase bruising
- Decreased thermoregulation
- Decreased sensation
- Decreased response to injury
Wound Healing Stages

**Hemostasis**

- Collagen exposed during wounding activates the clotting cascade and vasoconstriction
- Platlets arrive and release PDGF and other cytokines which then attract neutrophils, macrophages, fibroblasts
- Platlet and collagen form fibrinous clot which serves as a matrix within the wound
- Cells migrate into the matrix
Wound Healing

**Inflammation** within hours to 1 week

- Blood vessels dilate to allow for increased number of cells into the damaged area
- Neutrophils and macrophages predominate
- Neutrophils reach peak number within 24 hours and are responsible for bacterial destruction
- Macrophages follow neutrophils and also work to destroy bacteria and direct wound healing process
Wound Healing Stages

**Proliferation**  3 days up to 3 weeks
- during this phase there is angiogenesis, granulation, epithelialization, and contraction
- fibroblasts lay down an extracellular matrix consisting of collagen type 3 and elastin
- cells from the basal layer of the epithelium on the wound edge migrate across the wound
- influx of Matrix Metalloproteinases (MMP’s)
- contraction of the wound size via myofibroblasts and fibroblasts
Wound Healing Stages

**Maturation**  7 days to one year

- collagen remodeling
- replace collagen type 3 with collagen type 1
- further cross linking of the collagen
- eventually tissue can be 80% of its original strength
The phases of cutaneous wound healing

Expert Reviews in Molecular Medicine © 2003 Cambridge University Press
Wound Healing In Older Persons

Hemostasis in the Aged

- Decreased vascular responsiveness
- Slowed cellular influx

Normal Hemostasis

- Clot formation
- Vasoconstriction
- Cellular influx
# Wound Healing in Older Persons

<table>
<thead>
<tr>
<th>Inflammation in the aged</th>
<th>Normal inflammation</th>
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<tr>
<td>• Decrease vasodilation</td>
<td>• Vasodilation</td>
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<td>• Decrease in macrophage function</td>
<td>• Influx of neutrophils</td>
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<td>• Influx of macrophages</td>
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Wound Healing in older Persons

**Proliferation in the Aged**
- Decrease in fibroblasts
- Decrease in capillary ingrowth
- Increase time for keratinocytes to migrate
- Diminished collagen remodeling

**Normal Proliferation**
- Fibroblast influx
- Epithelialization
- Collagen remodeling
Wound Healing In Older Patients

.....both age and constitution and mode of life and the season have some influence....for a young adult heals more readily than an old man, one who is stronger than a weak man, a man who is not too thin or too fat than one who is either....

Cornelius Celsus
*Book V De Medicina*
1*st* century AD
Clinical Applicability

- Asteatosis, senile pruritis, winter’s itch, xerosis cutis
- Skin tears
- Pressure ulcers
Clinical Applicability

Xerosis
Clinical Applicability

Xerosis

- Affects more than 58% of nursing home patients
- Most common on extremities and trunk
- Due to age related changes to the epidermis as well as comorbid conditions and drugs
- Dry skin tends to have microabrasions and cracks that then lead elderly to have increased risk for contact dermatitis or infections.

White-Chu and Reddy; Clinical Dermatol 2011; 29:37-42
Xerosis

Paucity of Evidence Based Recommendations for Treatment
Clinical Applicability

Xerosis

- Goals: 1. minimize irritation
  2. moisturize
  3. treat any underlying conditions

- To minimize irritation:
  - minimize bathing: every other day; short time
  - avoid hot water
  - use mild soaps in hair bearing areas only
  - pat skin dry do not rub
  - avoid irritating materials next to the skin
Clinical Applicability

Xerosis

To moisturize:

- ointments > oils > creams/lotions
- Avoid compounds with common allergens: parabens, lanolin, fragrances, propylene glycol, vitamin E
- No benefit of creams and lotions with collagen or elastin
- Alpha hydroxy acids ?
- Urea ?
- Ceramides?
- Petrolatum/Vaseline ?
- READ LABELS
Clinical Applicability
Skin Tears
Clinical Applicability
Skin Tears

- 1.5 million skin tears in US annually
- More common than pressure ulcers
- Prevalence in Australian nursing homes may be as high as 40%
- In large part due to the age related changes between the epidermis and the dermis

LeBlanc et al Advances in Skin and Wound Mgmt 2011; 24(9) 2-15
Skin Tears

Older people have:

- Decreased epidermal lubrication-increased friction
- Flattened epidermal dermal junction-decreased shear resistance
- Decreased sensation
- Increased need for handling due to immobility
- Previous history of healed skin tears with resultant decreased tensile strength of the scar tissue
Skin Tears
Payne Martin Classification

**Category I.** Without tissue loss either linear, or with a flap that closes the tear to within an approximation of 1mm of the wound edges.

**Category II.** Partial tissue loss, considered scant when the loss is 25% or less and moderate or large when the tissue loss is more than 25%.

**Category III.** Complete tissue loss or no epidermal flap covering the injury.

**STAR skin classification**

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Figure 3. Payne-Martin Method of Skin Tear Classification. Images provided courtesy of Franz Moulleneux, RN, and the Journal of Wound Care. Reproduced with permission.
Skin Tears
Treatment

- Use a consistent classification system
- Follow “STAR”
  
  - S-stop bleeding and clean
  - T-tissue alignment
  - A-assess and dress
  - R-review and reassess

- Choose products that:
  
  - Maintain moisture
  - Manage any exudate
  - Manage any infection
  - Cost effective
  - Optimize caregiver time
  - Don’t use transparent dressings or hydrocolloids
Clinical Applicability
Pressure Ulcers
Clinical Applicability
Pressure Ulcers

- 2.5 million people in US are diagnosed with pressure ulcer
- Incidence in acute care 0.4-38%
- Incidence in long term care 2.2-24%
- Cost of healing one pressure ulcer is debatable:
  - studies are not consistent in what costs are included
  - HCUP study: $38,000
  - Stage 4: $124,000-$129,000


Brem et al American Journal of Surgery 2010 200 (4) 473-477
Clinical Applicability
Pressure Ulcers

- Intrinsic skin changes of age that increase risk:
  - epidermal and dermal thinning
  - decrease interdigitation of the epidermis and dermis
  - decreased merkel cells
  - decrease in nerve endings in the dermis
  - decreased vascularity with diminished vasodilation in response to pressure
  - decreased strength due to disorganized collagen
  - decreased elasticity due to decrease in elastin
  - increased dryness that leads to increase friction
  - decreased subcutaneous fat leading to less padding
“if he has a bedsore it is generally not the fault of the disease but of the nurse”

Florence Nightingale
Notes on Nursing (1860)
Pressure ulcers-Avoidable?

Charcot 1870’s

Neurotrophic Theory
Prognostic indicator: Decubitus Ominosus
Not avoidable

Brown-Sequard 1850’s

“on guinea pigs with destroyed spinal cords, I have found no ulceration appeared when I took care to prevent any part of their bodies from being in a state of compression”
Pressure Ulcers

- CMS definition of unavoidable:

“the patient developed a pressure ulcer or worsening of the ulcer even though the facility/provider evaluated the patient’s clinical condition and pressure ulcer risk factors; defined and implemented interventions that are consistent with the patient’s needs, goals, and recognized standards of practice; monitored and evaluated the impact of the interventions; and revised the approaches as appropriate”
Skin Changes at the End of Life

- Kennedy Terminal Ulcer 1989
  55% of patients with KTU in 6 weeks

- Hanson:
  62% of PU in hospice occur w/in 14 days of death

- SCALE: consensus statement 10/2009
Skin Changes at the End of Life

- Physiologic Changes that occur as a result of the dying process may affect the skin and soft tissue despite optimal care
  - increasing weakness: decreased mobility
  - hypoperfusion: blood shunted to vital organs
  - diminished nutrition
  - decreased immune function
- Because of the above changes even minor insults can result in significant breakdown in skin integrity
Summary

- Increasing Number of People over 65
- Significant intrinsic changes that occur in the skin as we age
- Intrinsic changes lead to an increase vulnerability to a number of skin conditions including dry skin, skin tears/senile purpura, and pressure ulcers
- Intrinsic changes lead to a diminished capacity to heal each of these conditions and as such, providers need to have a keen awareness of how to approach these patients and their problems
Aging Skin

Questions?

"And should there be a sudden loss of consciousness during this meeting, oxygen masks will drop from the ceiling."