

Aging Skin and Wound Healing

Cynthia A. Worley

“The whole business of marshaling one’s energies becomes more and more important as one grows older.” – Hume Cronyn

Oh my Gosh! You mean my skin ages? My skin gets old? And this is normal? Yes, Virginia, skin ages, normally. Much as we hate to admit that *anything ages normally* (with the exception of wine, cheese, and other assorted comestibles), the skin structures and normal functions undergo a gradual change as we grow older. And because of these structural and functional changes, tissue repair processes are also altered. Wound contraction and re-epithelialization occur at slower rates, connective tissue deposition is diminished, and ultimate wound tensile strength is decreased. Each layer of the skin has its own characteristic changes that occur with age. It will help to look at this phenomenon from a cellular perspective.

Epidermis

Remember, the epidermis is undergoing a constant changeover of new cells approximately every 28 days. *Keratinocytes* formed in the basement membrane experience chemical and morphological changes during their trip through the epidermis, until they ultimately are shed to make way for a new layer of matured keratinocytes. As we age, the number of keratinocytes available to resurface and replace lost cells decreases. *Langerhans cells* (otherwise known as epidermal macrophages) normally hang around in the epidermis waiting for bacteria to invade their territory (after reaching maturity). In the older person, the normal maturation rate of these macrophages is decreased. Also the number of these cells needed to fight infectious invaders is decreased.

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Table 1.
Skin Aging and Wound Healing

Effect of Aging on Skin	Effect of Aging on Healing
Decreased keratinocyte maturation	Decreased skin repair Decreased wound contraction
Decreased melanocytes	Decreased reaction time to sun exposure
Decreased Merkel cell production	Reduced sensation
Flattening of dermal/epidermal junction	Increased risk of junction rupture (skin tear) Reduced delivery of nutrients to epidermis Increased risk for shearing and blistering Decreased microcirculation
Decreased Langerhans cells	Decreased immune response
Decreased sebaceous and sweat gland activity	Decreased skin hydration Increased skin pH Decreased ability to maintain normal acid mantle Abnormal scaling, fissuring, cracking and itching
Loss of normal barrier properties	Increased susceptibility to irritants and contact allergens Decreased transdermal permeability of lipids Increased transdermal permeability of water
Decreased sensory perception	Decrease in ability to differentiate between
Dermal atrophy	Decrease in protective “padding” Increased risk of damage to underlying structures
Decreased vascularity	Decreased ability to regulate temperature Decreased new capillary growth Decreased granulation tissue formation Decreased nutrient delivery to skin

This decrease in “first responders” results in a diminished immune system response. The normal number of melanocytes present in the epidermis decreases with age and the melanin production within the hair bulb is also altered. Hair loss does not decrease but the hair follicles become less

dense and less active. The dermal papillae flatten with the loss of the rete pegs, resulting in increased slippage between the epidermis and dermis (skin tears). Age also affects the epidermal appendages. Nails become more brittle and thicker. Sweat and sebaceous glands become less dense and less productive, resulting in decreased hydration of the skin.

Dermis

Aged skin is thin, fragile, and inelastic. Fibroblast proliferation rates decrease, which therefore decreases their rate and quality of collagen production. Loss of blood vessels means slower rate of new blood vessel growth (neovascularization). These two characteristics combined mean slower rates of granulation tissue growth and poorer quality granulation tissue. Decreased elastin production results in decreased resilience of the skin and resistance to external friction and shear forces. The lymphatic system is less able to manage and maintain normal interstitial fluid levels.

Subcutaneous Tissue

Although most of us with weight to lose wouldn't mind a decrease in subcutaneous tissue loss, this results in atrophic and fragile skin in the aging patient. Fragmenting of elastin fibers results in networks of fine wrinkles (think crumpled cigarette paper). These wrinkles disappear with stretching of the skin. Sensory perception is


altered, resulting in a decreased ability to discriminate between heat, pain, and itching.

Putting it Together

We all know just how complex the structures and functions are of the skin. Knowledge of normal histology and physiology will help us identify potential problems and, maybe, explain those we encounter in our patients. External factors such as lifetime sun exposure, pre-existing medical conditions, and other factors will ultimately affect the quality of our skin as we age (see Table 1).

So, what does all of this mean to aging patients? It means that their skin doesn't respond to topical medications as readily or may respond in an unusual manner. For example, potent steroids are not cleared from the skin of the elderly as easily as they are in younger patients. Wounds resulting from surgical procedures (major and minor) may not heal in the appropriate or expected manner. And when they do finally heal, the strength of the

healed wound will not be as resistant to re-injury or re-insult as patients with normal skin function.

So, skin ages normally, huh? Yes, Virginia, skin ages normally and the more you protect it now, the better it will protect you later! 

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