TISSUE TYPES in WOUND BED

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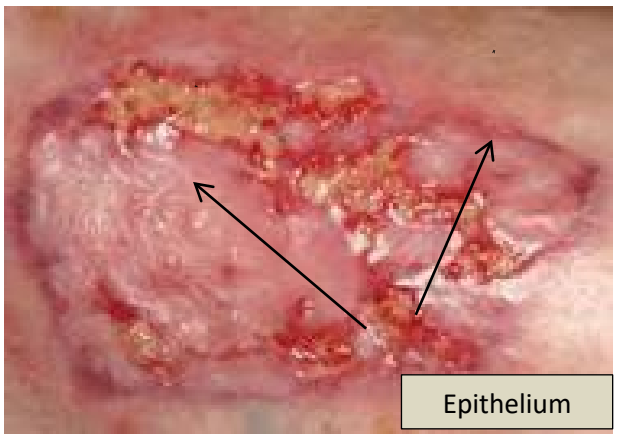
Assessment of the tissue type and examination of the characteristics of the tissue is essential to select the timing and method of debridement, as several tissue types can be identified at different times over the course of a wound's existence.

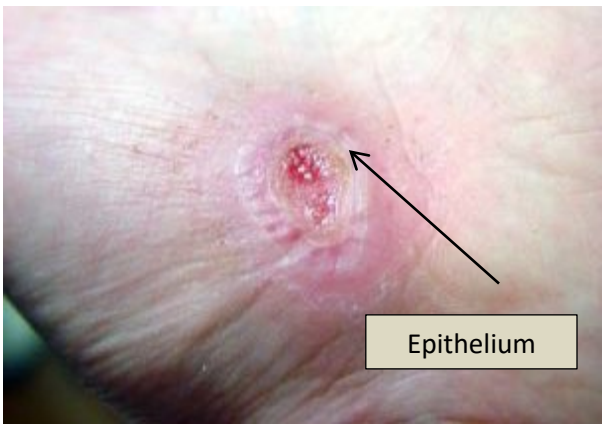
EPITHELIAL TISSUE

Epithelial tissue is a series of tightly-packed epithelial cells that provide one or more layers of epithelial tissue (depending on the part of the body it covers) that slowly cover granulation tissue as the wound heals. Epithelial tissue will not move over the wound until the granulation tissue is on a level with surrounding skin, as new epithelial cells migrate from the wound margins, hair follicles, sebaceous glands or sweat glands across the granulation tissue until the wound is closed.

The process of epidermis regenerating over a partial-thickness wound surface or in scar tissue forming on a full-thickness wound is called epithelialization. Epithelial tissue often appears lighter than surrounding tissue and is light pink with a shiny pearl-like appearance. Epithelialization occurs when the epidermis regenerates over a wound surface. Basal keratinocytes travel from the wound edges, where they multiply until they meet in the middle. The basal lamina is a scaffolding secreted by the epithelial cells as they travel outwards from the wound edges.

When a new epithelial layer is created, this new layer is only a few cell layers in thickness and appears translucent. It is extremely vulnerable to damage from friction, shearing and pressure and it generally takes 2 to 3 weeks for the new cells to become keratinized (i.e. waterproof).





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GRANULATION TISSUE

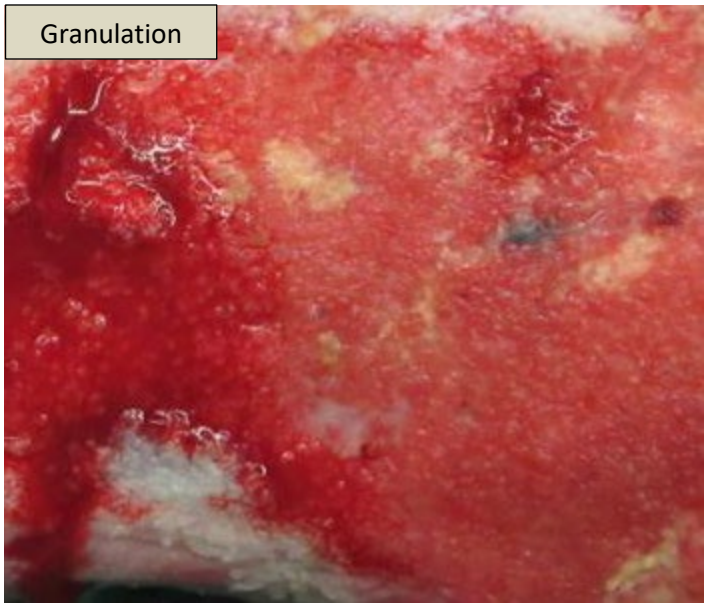
Granulation tissue is new connective tissue comprised of collagen and tiny blood vessels that form during the proliferative stage of the healing process. It grows from the base of a wound and can fill wounds of almost any size. Healthy granulation tissue is moist, granular, and uneven in texture and is pink /red in colour. The colour and texture of the granulation tissue is often an indicator of how well the wound is healing. Healthy granulation tissue is shiny red and granular in appearance when it and is a good indicator of healing. Dark, dusky granulation is a sign of ischemia, poor perfusion, and/or infection; when inadequate blood flow exists, granulation tissue may pale in color

Healthy granulation tissue is pink or red, with an uneven, mounded texture. These mounds are capillary loops or granulation buds. The formation of granulation tissue is thought to be an intermediate step in the healing process of full-thickness wounds. The proliferative phase will reach completion when myofibroblasts help contract the wound and epithelial cells start resurfacing across the wound bed. Granulation tissue is also very fragile and prone to easy injury.

Granulation tissue is subject to injury by outside forces, including dry/adherent dressings, pressure, high-intensity irrigation of the wound and overzealous wound packing. Impaired blood flow and excessive pressure can also damage granulation tissue and may cause clients to complain of new-onset pain when dressings are changed. Wound healing may stall in the granulation phase when nutrients are inadequate, infection is present or blood flow is impaired.

The process of granulation provides the early scaffolding necessary to promote healing from the edges of the wound. Granulation tissue does not mature into epithelium; instead, granulation tissue is eventually covered by a layer of epidermal tissue.

Granulation



Granulation

HYPERGRANULATION TISSUE

Hypergranulation tissue often referred to as overgranulation or proud flesh. It occurs when the formation of granulation tissue continues after the wound defect has been filled. Too much granulation tissue actually deters epithelialization because the epithelial cells have difficulty climbing up the mountain of granular tissue resulting in a rolled wound edge which is quite easily identified.

Photograph courtesy of gettyimages.com

Note for venous leg ulcers: Screening for malignant transformation with biopsy of a wound not healing after 3 months of appropriate treatment. The literature points to 10% of chronic leg ulcers which will transform to skin cancer malignancy particularly those with abnormal excessive granulation tissue at the wound edges.

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SLOUGH

Slough is a by-product of inflammation and not a physical tissue. It is a mixture of serum proteins (fibrin, albumin, immunoglobulin) and denatured matrix proteins (collagen). These extracellular fluids form during inflammation and leak into interstitial spaces due to capillary dilation, therefore slough is an indicator of wound inflammation. If the wound is healable, healing will not begin until the slough is removed and the cause of the inflammation controlled

Slough can be identified as a stringy mass that may or may not be firmly attached to surrounding tissue. Slough can range in colour from white (scant bacterial colonization) to yellow or green (larger bacterial counts) to brown (hemoglobin is present). Slough may become thicker and harder to remove the longer it is present.

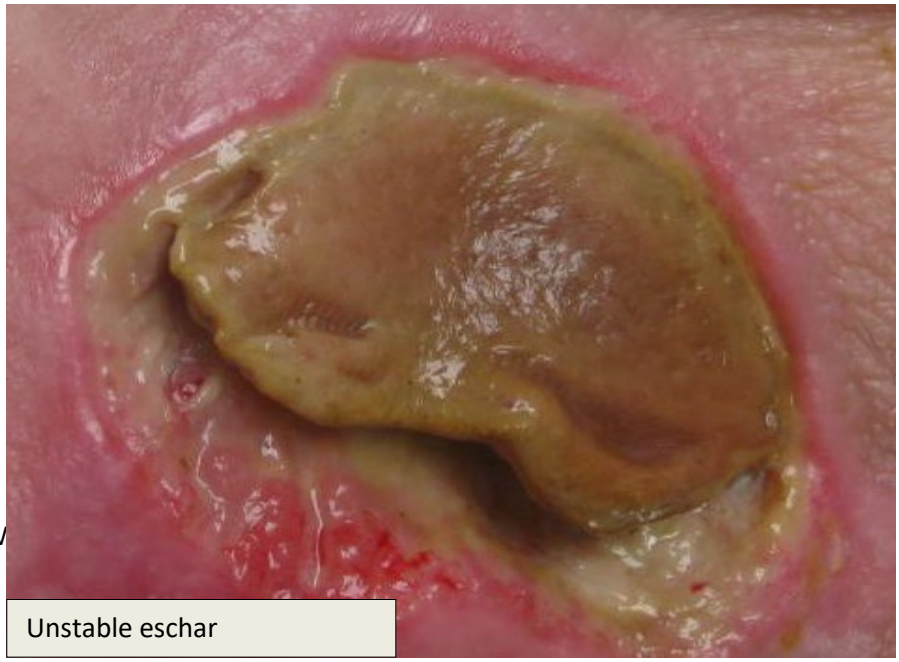
ESCHAR

Eschar is composed of necrotic granulation tissue, muscle, fat, tendon or skin. The term stable eschar is used to describe leathery, dry hard eschar tissue, such as the eschar that commonly forms on the heels or other bony prominences of the lower leg of clients with ischemic limbs.

Stable eschar: This term is used to describe leathery, dry hard eschar tissue, such as the eschar that commonly forms on the heels or other bony prominences of the lower leg of patients with ischemic limbs. Dry stable eschar is firm, dry necrotic tissue with an absence of drainage, edema, erythema or fluctuance. It can be black or brown and is attached to the wound edges and wound base. It can be present in any type of wound. Current standard of care guidelines recommend that stable intact (dry, adherent, intact without erythema or fluctuance) eschar on the heels should not be removed. Blood flow in the tissue under the eschar is poor and the wound is susceptible to infection. The eschar acts as a natural barrier to infection by keeping the bacteria from entering the wound. If the eschar becomes unstable (wet, draining, loose, boggy, edematous, red) debridement may be considered.

Unstable eschar: This term is used to describe tissue that is undergoing a softening process caused by proteolytic enzyme production from bacteria present in the tissues. It may be black, brown or gray and firmly or loosely attached to the wound edge. Fluctuance (movable and compressible) and drainage may be present. This type of eschar is characterized by pain, redness, purulent discharge, warmth and edema. Eschar tissue may be described as spongy, boggy or slimy. The presence of unstable eschar raises the risk of sepsis, amputation and systemic infection.

Gangrene – Death or decay of body tissue which may involve bacterial infection, is usually due to loss of blood supply to the affected area and can be wet or dry. Wet gangrene should be ruled out when fluctuance, crepitus or purulent drainage is present. Sometimes, autolytic debridement or topical enzymes are used on eschar tissue, and this deliberate softening should not be confused with unstable eschar.



Unstable eschar

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Stable eschar on heel

Eschar on sacrum/coccyx

Hyperkeratosis (Callus) - Diabetic Foot Ulcer

Hyperkeratosis involves a thickening of the stratum corneum (the outer layer of the skin); this skin thickening is often part of the skin's normal protection against rubbing, pressure and other forms of local irritation.

In diabetes callus develops due to peripheral neuropathy. Motor neuropathy leads to deformity and sensory neuropathy causes lack of sensation, which results in persistent abnormal pressure on the foot. The cells of skin react to it by increasing keratinization and turns into a callus, which predisposes to foot ulceration.

Hyperkeratosis: Venous Insufficiency and Venous Leg Ulcers

Hyperkeratosis presents as an abnormal thickening of the stratum corneum, which is the outer layer of the skin. It is generally confined to the lower leg and foot, is characterized by an over-proliferation of keratin . Hyperkeratotic skin can be red and dry with brown or grey scaly patches with increasing severity of the hyperkeratotic plaques. It may be localized to a small area of the skin or, in its more advanced stage, cover the entire circumference of the lower limb, as deep plaques and crevices.