بسم الله الرحمن الرحيم

Lecture 9

FACTORS THAT IMPAIR TISSUE REPAIR *(IMPORTANT):*

1. Infections
2. Diabetes mellitus
3. Nutritional status
4. Steroids
5. Mechanical factors
6. Poor perfusion
7. Foreign body
8. Type and extent of tissue injury
9. Site of injury

6.Poor perfusion: poor blood supply due to many reasons such as severe ischemia, severe atherosclerosis, hypertension…
Proper blood supply, nutrition and antibiotics will make the healing go faster

7.foreign bodies : The presence of a foreign body in tissues can delay and impair healing, making it essential to remove all foreign materials before closing or cleaning an injury site, sometimes trying to remove the body will cause injury so its better to keep it.

5.Mechanical factors: any mechanical factor that negatively impact the healing. For instance, in an obese patient who is a chronic smoker with chronic obstructive pulmonary disease (COPD), persistent coughing can increase intra-abdominal pressure, leading to complications such as wound separation, known as wound dehiscence.

8.Age and type of injury

1. Infections: enemies, could happen in post surgical wound, if it gets infected then the reparative process will be interrupted and the proper healing process will be delayed and incomplete.
This is why in severe acute injury patients are covered by antibiotic, specially in intra-abdominal surgery.

2.The presence of comorbidities (like diabetes mellitus) require:more time to heal (delayed reparative process specifically angiogenesis)

3.Before exposing Debilitated and malnourished patients to a major surgery, parenteral nutrition through IV is needed in order to build up their immune system

9. The site of an injury significantly influences the healing process. For example, abdominal wounds generally take longer to heal compared to wounds on the face or head, such as those on the tongue, which tend to heal faster due to better blood supply. On the other hand, peripheral lower limb wounds take even longer to heal than abdominal wounds due to reduced circulation and other mechanical factors. The healing duration ultimately depends on both the location and the extent of the injury.

4. Steroids are strong anti-inflammatory drugs that act as phospholipase inhibitors, suppressing the arachidonic acid pathway. While they are critical for managing inflammation, patients on steroids are often immunocompromised due to the suppression of the immune response. This makes them more susceptible to infections, whether an infection is present or not, steriods delay the healing process.

ABNORMAL HEALING

- Deficient scar formation

Weak scar tissue

- Excessive repair

Strong scar tissue

- Contractures

restricted movement and potential joint deformities.

Mainly cutaneous

DEFICIENT HEALING:

- Venous leg ulcers
- Arterial ulcers
- Pressure sores
- Diabetic ulcers
- *** Wound dehiscence

Wound dehiscence:

Wound dehiscence occurs when a surgical wound opens due to factors like increased intra-abdominal pressure, often seen in patients who are obese or have conditions like COPD with chronic coughing. Despite proper suturing, excessive pressure can cause the wound to separate. Once this happens, healing occurs through granulation tissue formation from the bottom up, which can take weeks or even months. To prevent dehiscence, it's important to anticipate such risks and use longer sutures, proper padding, and more extensive dressing.

A:Venous ulcers are often seen in patients with venous insufficiency, typically located on the lower leg's medial side. These ulcers are usually superficial, gray to blue color and are less deep than arterial ulcers.

B,C : Arterial ulcers are usually deep due to severe ischemia.

(C) arterial ulcers are commonly associated with diabetic patients, who often have peripheral neuropathy and arterial complications, leading to diabetic foot ulcers, gangrene, and infection.

D: Pressure sores (or bedsores) occur in bedridden patients. Prolonged pressure on skin causes ischemia, leading to deep ulcers. Prevention is necessary for these conditions, patients should be repositioned frequently, and specialized mattresses may help distribute pressure. Failure to prevent pressure sores can be considered malpractice, as proper care protocols exist to avoid them.

E: In all these ulcer types, the histology of the wound's base contains granulation tissue, which forms in response to injury.

EXCESSIVE SCARRING:

1. Hypertrophic scar
2. Keloid
3. Exuberant granulation tissue (proud flesh)
4. Aggressive fibromatosis (desmoid tumor)
5. Contractures

(1–4)occurs mostly cutaneously

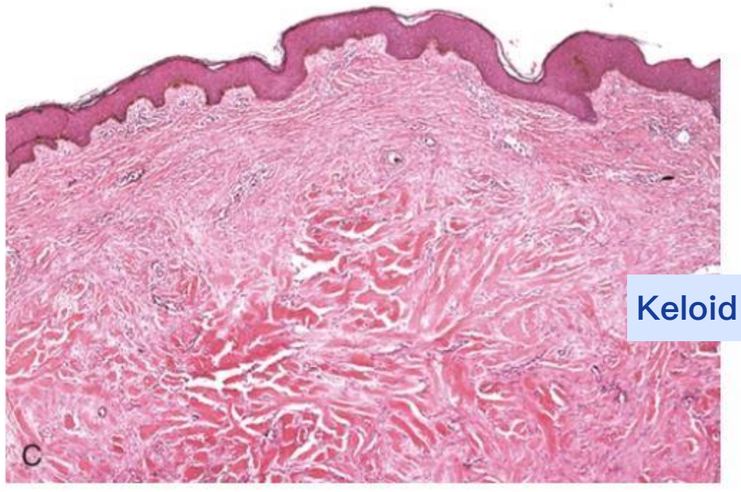
(4) can also occur inside the abdomen or other sites

Keloid: a special type of hypertrophic scar that appears more in dark pigmented people where any small surgery can induce big scar tissue

Mainly affects hand, feet, and penile area

Hypertrophic scar

Keloid with a simple cutaneous injury



Keloid

FIG. 3.28 Clinical examples of excessive scarring and collagen deposition. (A) Hypertro…

FIBROSIS OF ORGANS:

- Scar and fibrosis: excessive deposition of collagen and ECM.
- Continuous infections and immunologic injuries cause organ fibrosis and loss of function
- TGF-ß is the most common cytokine of fibrosis
- Examples: liver cirrhosis, Idiopathic lung fibrosis, ESKD

Scarring and fibrosis, which involve excessive collagen and extracellular matrix deposition, can occur in vital organs due to chronic injury.

Continuous cycles of inflammation and repair, often from infections or immunologic injuries, lead to the progressive formation of scar tissue. Over time, this fibrosis can impair the organ's vital functions, leading to increased morbidity and mortality.

transforming growth factor–beta (TGF–β), the most potent and common cytokine for fibrosis that plays a central role in fibroblast migration and differentiation into myofibroblasts that have contractile ability. This fibrotic process can severely affect organ function if not halted.

Examples of fibrosis:

1. Liver Cirrhosis: Chronic liver inflammation, often from hepatitis c or alcohol use, leads to severe fibrosis, replacing much of the liver tissue with non–functional scar tissue. Liver cirrhosis results in liver failure, which is fatal without a transplant.

2. Interstitial Lung Disease (Lung Fibrosis): This condition leads to progressive scarring of lung tissue, reducing lung function. It may be idiopathic, meaning the cause is unknown, but factors like occupational hazards (e.g., silica exposure) can contribute. Lung transplantation is often required as the fibrosis advances.

3. End–Stage Kidney Disease: Chronic kidney conditions, such as diabetic nephropathy or hypertensive nephropathy, can lead to fibrosis in kidney tissue, impairing function. In severe cases, the kidney tissue becomes largely replaced by scar tissue(nodular fibrosis) , making the kidneys unable to perform their essential functions. Early detection and management of underlying conditions like diabetes and hypertension are crucial to delay the progression.

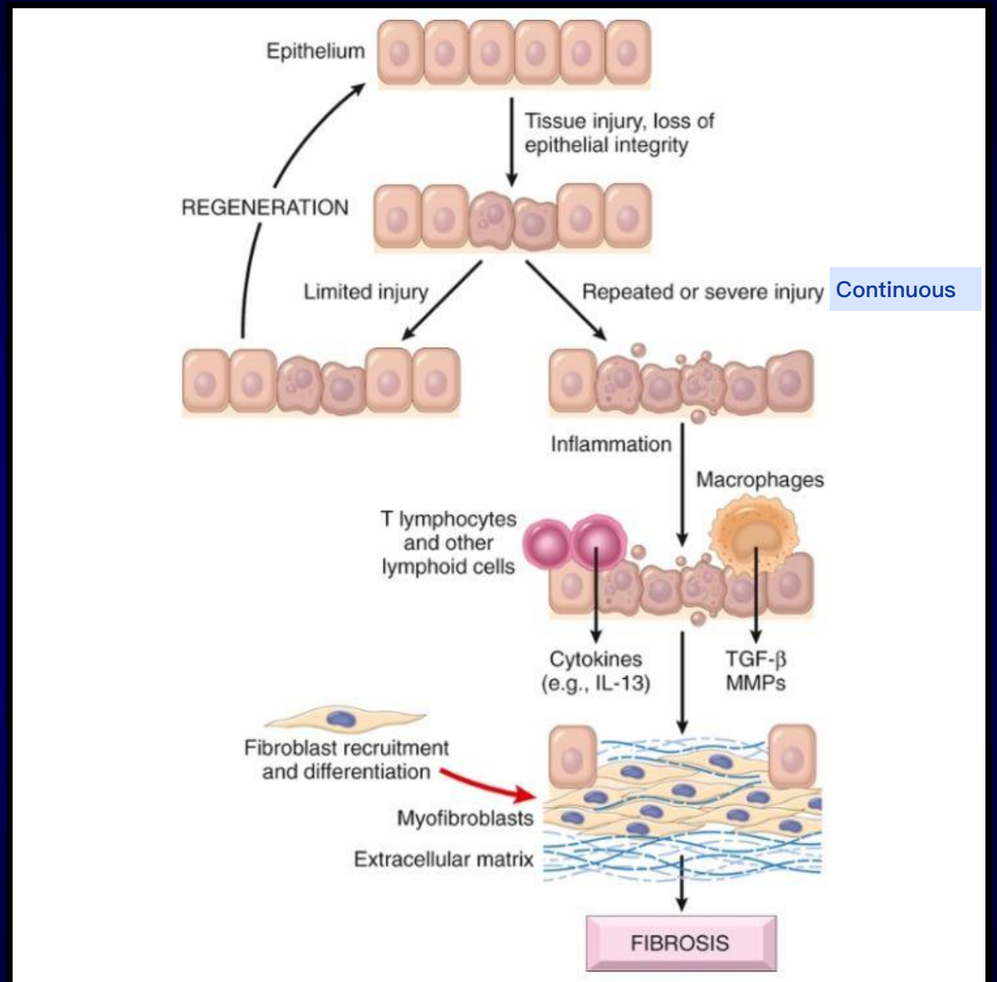


FIG. 3.29 Mechanisms of fibrosis. Persistent tissue injury leads to chronic inflammatio…

Summary

Cutaneous Wound Healing and Pathologic Aspects of Repair

- The main phases of cutaneous wound healing are inflammation, formation of granulation tissue, and ECM remodeling.
- Cutaneous wounds can heal by primary union (first intention) or secondary union (secondary intention); secondary healing involves more extensive scarring and wound contraction.
- Wound healing can be altered by many conditions, particularly infection and diabetes; the type, volume, and location of the injury are important factors that influence the healing process.
- Excessive production of ECM can cause keloids in the skin.
- Persistent stimulation of collagen synthesis in chronic inflammatory diseases leads to tissue fibrosis, often with extensive loss of the tissue and functional impairment.

Lecture 10
REVIEW


GOOD
LUCK