



15



# Pathology

Doctor 2018 | Medicine | JU

● Sheet

○ Slides

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# Tissue Repair

## ❖ Factors That Impair Tissue Repair

*Tissue repair may be impaired by a variety of factors that reduce the quality or adequacy of the reparative process. These factors include:*

- 1) **Infections:** infection is the enemy of healing and repair; it prolongs inflammation, delays healing & scar formation, and might even cause further complications. Postoperative wound infection is considered to be the “nightmare” of every surgeon. The frequency of postoperative wound infections occurrence is variable. For instance, the excision of the **parotid gland** wouldn't be suspected to cause an infection. On the other hand, the possibility of an infection arising from **colon surgeries** would be much higher (**dirty surgery**).
- 2) **Diabetes mellitus:** is a metabolic disease that compromises tissue repair causing different complications. One of the major complications of diabetes is diabetic vasculopathy, which means that in one way or another every blood vessel in the body of a diabetic patient will be affected by diabetes and may get blocked. We have previously said that normal blood supply is needed for proper healing. That is why patients with multiple comorbidities (patients with multiple underlying diseases. For example, hypertension with diabetes with ... etc.) will have higher incidence of abnormal healing. Moreover, diabetic patients may suffer from neuropathies, where they keep getting traumas -or even massive myocardial infarction- without even feeling it.
- 3) **Nutritional status:** It has profound effects on repair; protein malnutrition and vitamin C deficiency, for example, inhibit collagen synthesis and delay healing. So, if you have a malnourished patient, you have to build up his nutritional status before doing surgery.
- 4) **Steroids:** Any anti-inflammatory drug (including steroids) taken by allergic patients will impair & delay tissue repair by decreasing the production of inflammatory mediators (prostaglandins and leukotrienes) involved.

- 5) **Mechanical factors:** if you have a regularly smoking patient, then he'll probably be suffering from chronic obstructive pulmonary disease. One of the disruptive symptoms associated with COPD is coughing. What happens now is that whenever he coughs, his intra-abdominal pressure increases, so his abdominal pressure is continuously high. As a consequence, after a surgery you put a belt around his abdomen to make sure that his wound will not open (causing what is called "**wound dehiscence**") due to abdominal pressure.
- 6) **Poor perfusion:** results in slower repair. If a patient has a peripheral vascular disease, then you wouldn't expect that an adequate supply of blood will reach his lower limb, for example, requiring more time to completely heal.  
**{Extra}:** Peripheral vascular disease is a blood circulation disorder that causes the blood vessels outside of your heart and brain to narrow, block, or spasm.
- 7) **Foreign bodies:** wounds don't like foreign bodies (such as fragments of steel or glass) since they impede healing. So, do not to forget a scissor, for example, inside your patient's abdominal cavity after a surgery. 😊
- 8) **The type and extent of tissue injury:** affect the subsequent repair. Complete restoration can occur only in tissues composed of cells capable of proliferating; even then, extensive injury will probably result in an incomplete tissue regeneration and at least partial loss of function. Injury to tissues composed of nondividing cells must inevitably result in scarring; such is the case with healing of a myocardial infarct.
- 9) **Site of injury:** For example, injuries in the face heal faster than injuries to the lower limbs (they are distal so blood needs more time to reach them). That is why the location of injury is also taken into consideration.

## ❖ Abnormal Healing

*Complications in tissue repair can arise from abnormalities in any of the basic components of the process, including deficient scar formation, excessive formation of the repair components, and formation of contracture. This can be due to one or more of the risk factors discussed above.*

- 1) **Deficient scar formation:** Protein deficiency, by its contribution to poor healing rates with reduced collagen synthesis, leads to the formation of a deficient scar.

*Examples include:*

**A) Venous leg ulcer:** mainly due to chronic venous congestion, where valves in the legs lose their function, and patients may develop **varicose veins**.

**\*Shallow ulcer in the leg + dusky discoloration around → venous ulcer.**

**\*If the ulcer itself is black, this is necrotic tissue, it doesn't indicate a venous ulcer**



**B) Arterial ulcers:** mainly due to chronic obstruction in arteries. They are deeper and more serious than venous ulcers.

**\*Deep red ulcer → arterial ulcer.**



**C) Pressure sores (pressure ulcers):** due to chronic pressure and eventually ischemia to the skin. This is common among paralyzed patients who stay on the same posture for several hours. However, good nursing and repositioning patients every two hours can prevent it.

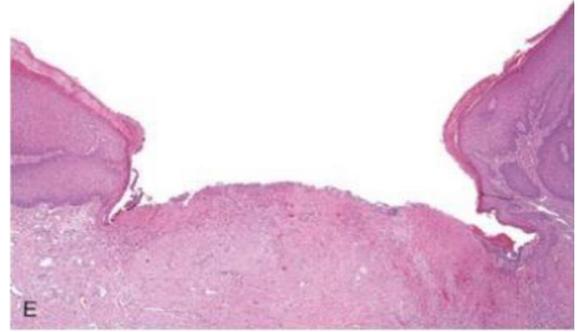
**Pressure ulcer in the lower back →**



**D) Diabetic ulcers:** as we said earlier, vasculopathy leads to chronic ischemia.

**E) Wound dehiscence.**

**\*This is how all ulcers look under the microscope (discontinuation of skin squamous epithelium) →**

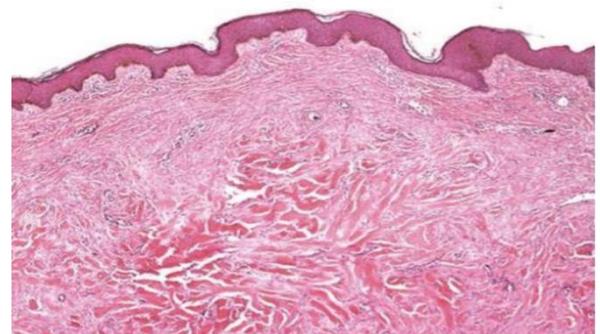


- 2) **Excessive repair (scarring)**: Excessive formation of components of the repair process can give rise to:
- A) **Hypertrophic scars**: a small increase in scar tissue.
  - B) **Keloid**: a bad, severe, and abnormal increase in scar tissue. More common among people with dark skin.
  - C) **Exuberant granulation tissue (proud flesh)**.
  - D) **Aggressive fibromatosis (desmoid tumor)**.



- 3) **Contractures**: Wound contraction is an important part of the normal healing process. An exaggeration of this process gives rise to contractures and results in deformities of the wound and the surrounding tissue (skin contracts and several functions are limited). **NOTE**: This topic will be discussed in the MSS next semester.

**\*This is how excessive scarring looks under the microscope →**



## ❖ Fibrosis of organs:

- Scar and fibrosis mean excessive deposition of collagen and ECM.
- Continuous infections and immunologic injuries cause chronic organ fibrosis and loss of function. This happens on the long run. For example, the liver would stop Working after 90% was damaged and converted into scar tissue
- **TGF- $\beta$**  is the most common cytokine of fibrosis
- Examples: liver cirrhosis, Idiopathic lung fibrosis, ESKD (End Stage Kidney Disease)

*Good Luck!!*