



Round : Major surgery

Group no : B8

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Wound healing

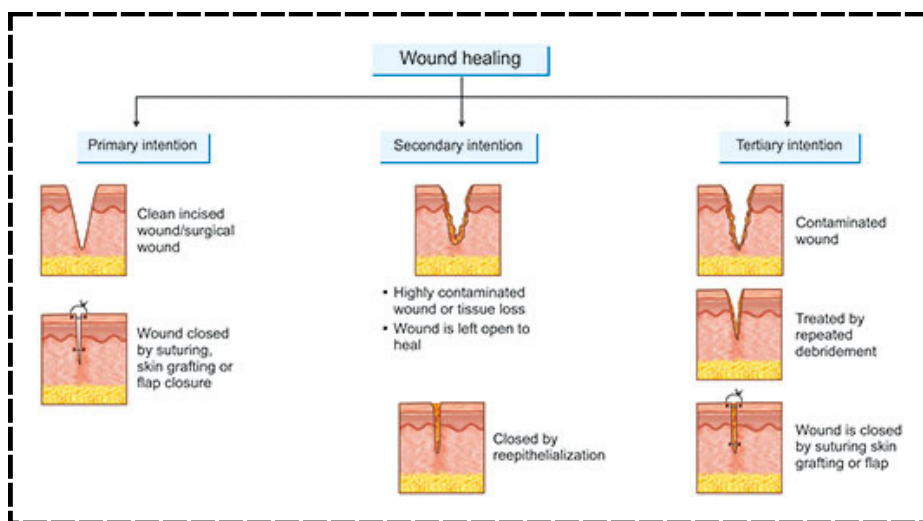
INTRO:

Wound healing is the process our body uses to repair damaged tissue.

- Acute wounds heal quickly (days to weeks)
- Chronic wounds heal slowly over months.

Tissue regeneration capacities determines how each tissue will regenerate. In general, we have three different types of tissues:

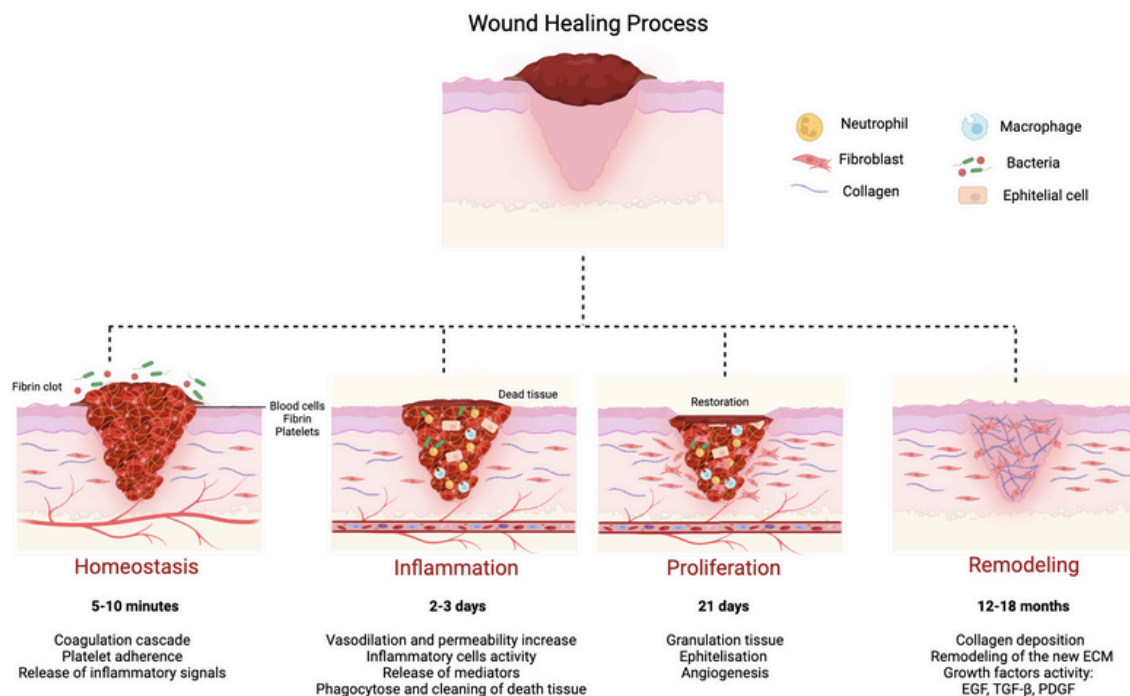
- Labile tissues which contain stem cells that allows them to heal very well. Like: skin, connective tissue and small/large intestines.
- Stable tissues which contain mature differentiated cells that have the ability to divide and regenerate through hyperplasia, like the liver.
- Permanent tissues that have weak regeneration capacity and heal with fibrosis and scars. Like skeletal, cardiac, cartilage and neuronal tissue.



HEALING INTENTION:

1. Primary: where wound edges are close to each other so regeneration leads to a minimal scar. (it could be supported with a suture)
2. Secondary: where wound edges are too far away and can't be approximated with a suture, thus stem cells can't approximate and bridge in between so instead the wound is replaced with connective tissue growing from the base or the wound upward.
3. Tertiary (delayed closure): the wound is cleaned and left open due to increased risk of infection so we keep it open to be able to clean it every now and then and prevent the entrapment of the bacteria inside the wound resulting in abscess. so we keep it open for few days then lead it to heal with secondary intention, or suture it to allow primary intention healing to occur.

Wound healing



STAGES OF WOUND HEALING:

1. Hemostasis: blood clots form at the site of injury when affected blood vessels constrict, which is associated with platelets forming a plug with fibrin mesh.

2. Inflammatory phase: (1-6 days)

It's composed of three important stages that have different immune cells predominating the stage. Within the first two days, the wound is filled with neutrophils as a result of the chemotaxis and dilated blood vessels. Then the following three days, macrophages dominate and start cleaning off foreign debris, bacteria, dead cells and form a scab. During the last two days, lymphocytes are the most abundant.

3. Fibroplasia and epithelization: (4 day to 3 weeks)

Here, stem cells in the epidermal layer proliferate replacing dead cells, and fibroblasts proliferate next and secrete collagen and glycoproteins to make the wound stronger and more damage-resistant (matrix formation). Here, fibroblasts also stimulate angiogenesis to provide the perfect environment for healing to occur.

- in DM patients, blood perfusion needs to be assessed to measure the likelihood of this stage to become unsuccessful and for the wound to become chronic.

4. Maturation and remodeling: (week 3 to 1 year)

Collagen bundles here cross link to form bundles. Myofibroblasts contract to allow healing by secondary intention to occur. Excess collagen disposition leads to hypertrophic scar or keloid formation which's related to genetic factors.

Wound healing

FACTORS AFFECTING HEALING

- Systemic /chronic disease; like cardiovascular disease or DM that leads to impaired blood supply and thus increased risk of progression to chronic wounds.
- Vitamins and drugs.
- Edema which disrupts collagen disposition and fibroblasts activity.
- Infections that result in inflammation and pathogens competing for O₂ preventing adequate oxygenation needed for healing.
- Radiation which interferes with cellular responses.

WOUND EVALUATION:

Wound evaluation includes taking proper history as well as physical examination.

Physical examination of wounds is very similar to ulcers. Ask about medications that were given, how has it been treated so far.

Laboratory tests include CBC and c- reactive protein to evaluate for any infections - elevated CRP and WBC-.

Imaging studies mainly if ulcers are present. We perform a CT scan with contrast to see the extent of the ulcer and evaluate the presence of any fistulas.

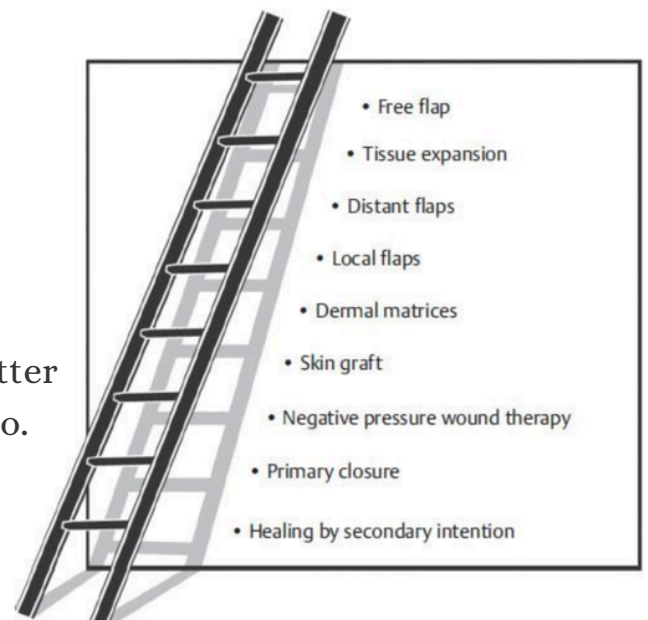
Diagnostic tests mainly involve taking tissue biopsy. (non-healing ulcers are suspicious for malignancy — squamous cell carcinoma). Sometimes a high bacterial load will prevent appropriate healing and leads to recurrent graft failures.

RECONSTRUCTIVE LADDER:

Main treatment options include:

- healing by primary intention (suturing helps)
- healing by secondary intention (left as it is)
- grafting (full thickness or partial)
- flaps (with all its types, distal/local/ free)

Flaps are better than grafting as they promote better healing and better protection against infection too.



Wound healing

RECONSTRUCTIVE LADDER:

Other options include:

- Negative pressure wound therapy in which we apply a vacuum to the wound which acts as a suctioning machine to remove dead tissue and promotes blood supply.
- Tissue expansion: a balloon that's implanted under the skin for a year, then it's removed and used as a flap at the site of the wound.

ADJUNCTS

1. Oxygenation: hyperbaric oxygen helps to prevent superimposed infection from establishing, as well as promoting quicker healing.
2. Platelet-rich plasma: helps to form platelet plugs and supports healing.
3. Stem cells: they're undifferentiated cells that have the ability to divide and give out different types of cells and differentiate into desired cells.
4. Honey: has anti-oxidant, anti-bacterial and anti-inflammatory properties. It can be used as a wound dressing to promote rapid and improved healing. These effects are due to honey's anti-bacterial action, secondary to its high acidity, osmotic effect, anti-oxidant content and hydrogen peroxide content.
5. Biological dressings: to protect it from infections and promote healing.
6. Vacuum assisted closure: it removes debris and increases blood perfusion to the damaged tissue which allows more immune cells to reach the target tissue thus, promoting a clean environment.

CONSIDERATIONS

When treating wounds, we need to make sure that the solution isn't more complicated than the problem. Keep the psychological health of the patient in mind, especially how appearance would affect their social life and their confidence.

The main goal should include offering treatment options that could restore the functionality as much as possible, is durable and suitable for the patient meeting their expectations and desires.