Chronic Inflammation

- **Definition:**
  - Inflammation of prolonged duration in which active inflammation, tissue injury and the healing proceed simultaneously
- **Causes:**
- Persistent Infections
  - Ex. *Treponema palladium* (causative organism of syphilis)
  - Organism of low toxicity and evoke an immune reaction = **delayed hypersensitivity**
- Prolonged Exposure to toxic Agents
- Autoimmunity
  - Ex. Autoimmune diseases

Chronic Inflammation

- **Morphologic Features:**
  - Infiltration with mononuclear cells (macrophages, lymphocytes & plasma cells)
    - indicates persistent reaction to injury
  - Tissue destruction
    - Done by way of Inflammatory cells
  - Repair involving angiogenesis and fibrosis
    - Attempt to replace lost tissue

Other Cells of Chronic Inflammation

- ***Infiltration with mast cells, lymphocytes and plasma cells***
- **Lymphocytes**
  - Mobilization in antibody – mediated response
- **Mast Cells**
  - Widely distributed in connective tissues and participate in both acute and persistent inflammatory reactions
  - Binds the Fc portion of the IgE antibody
- **Plasma Cells**
  - Produce antibody directed either against **persistent antigen** in the inflammatory site or **against altered tissue components**
- **Eosinophils**
  - parasitic infections
  - Mediated by IgE
  - Eotaxin – a chemokine that has the ability to prime eosinophils for chemotaxis

HEALING & REPAIR

Dr athmer mohamed

Cell types according to healing ability

1. LABILE	2. STABLE	3. PERMINANET
• Continuously dividing cells • skin epidermis • GIT epithelium • Bone marrow cells	• Quiescent cells • liver, • kidney • pancreas • Smooth muscle	• Non dividing cells • Cardiac muscle • Skeletal muscle • CNS

TISSUE REPAIR

- **Healing:** Replacement of dead cells & damaged ECM by healthy tissue.

extra cellular matrix

- 2 processes
  - ***Regeneration*** of specialized cells (same cells)
  - ***Repair***: Replacement by connective tissue (fibrosis)

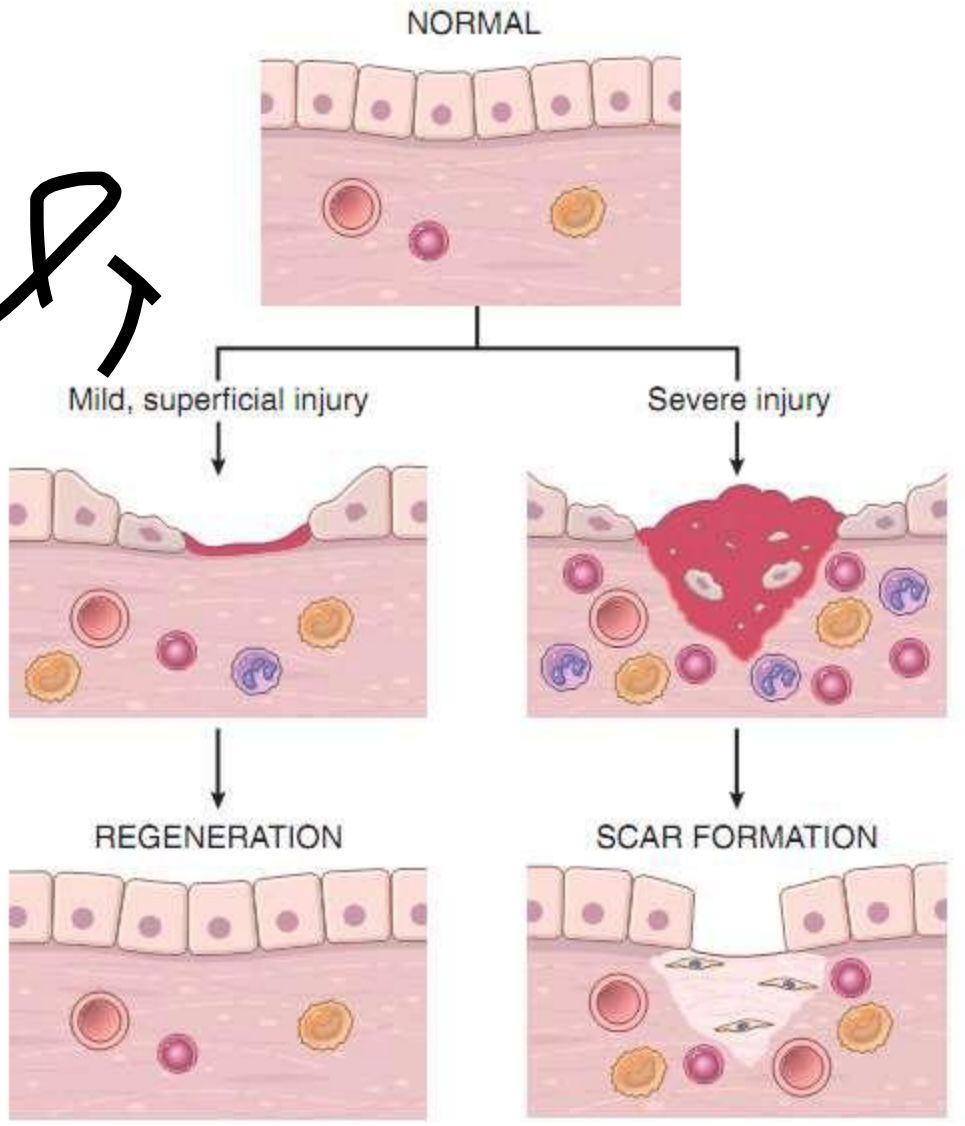


Fig. 3.23 Mechanisms of tissue repair: regeneration and scar formation. Following mild injury, which damages the epithelium but not the underlying tissue, resolution occurs by regeneration, but after more severe injury with damage to the connective tissue, repair is by scar formation.

TISSUE REPAIR

- The healing process involves the production of chemical mediators that affect cell growth by binding to specific receptors.They are called growth factors
- Causing:
  - cellular proliferation
  - influence cell migration & differentiation
  - influence tissue remolding

TISSUE REPAIR

1. Repair by Regeneration

- Replacement injured tissue by same type of original tissue cells
- Labile & stable cells
- involve 2 tissue components
  - Cellular proliferation
  - ECM deposition

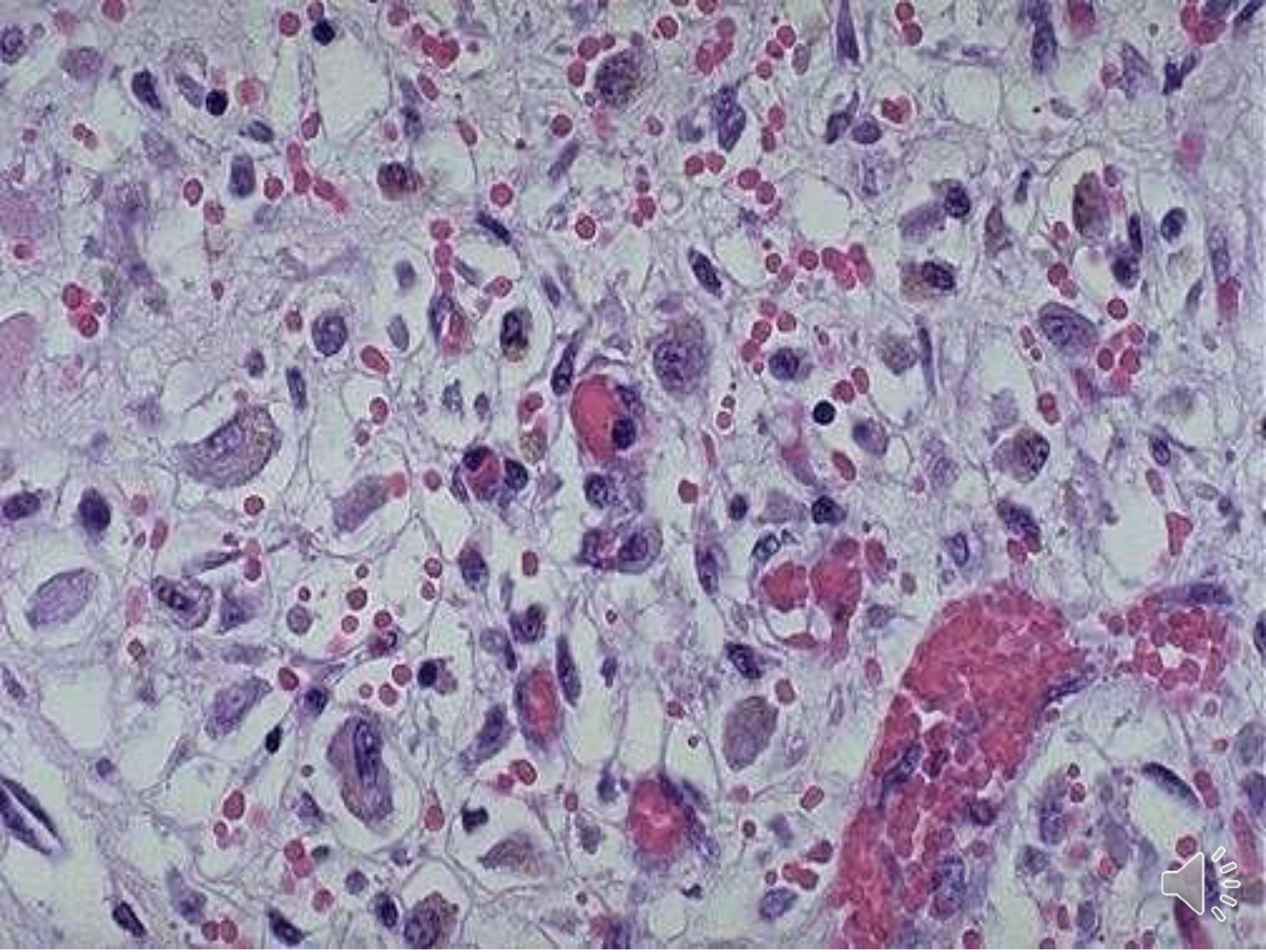
TISSUE REPAIR

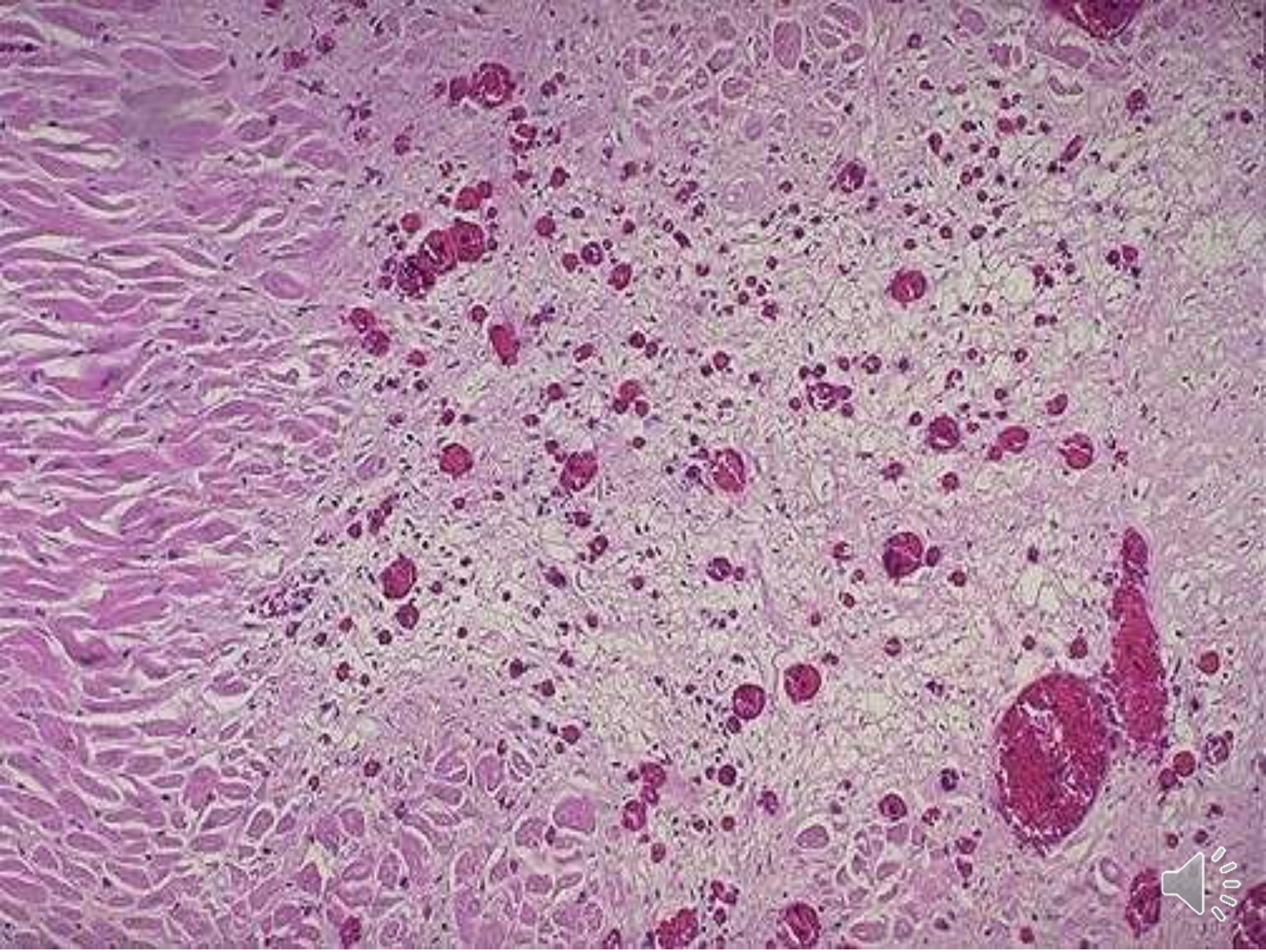
11. Repair by connective tissue, fibrosis, scar formation

- Three components
  - **Granulation tissue** (Angiogenesis)
  - **Fibrosis** (Migration & proliferation of fibroblast)
  - **Remodeling** (fibrous tissue maturation & organization)

TISSUE REPAIR

- **Granulation tissue:**
  - "the hallmark of healing"
  - Highly vascular tissue composed of newly formed blood vessels (i.e., angiogenesis) and activated fibroblasts
    - Essential for normal wound healing
    - Converted into scar tissue
  - Growth factors: FGF & VEGF
- **Fibrosis:**
  - Fibroblast migration & proliferation
  - ECM deposition
  - Growth factors: PDGF, FGF, TGF-Beta, IL-1 & TNF
- **Remodeling:**
  - Remodeling increases the tensile strength of scar tissue.
  - Fibrous tissue maturation & organization
  - Metalloproteinases (collagenases) replace type III collagen with type I collagen, increasing tensile strength to approximately 80% of the original.





Types of skin wound healing

- **1. Healing by primary intention (primary union):**
  - Wound edges are closely opposed by sutures
  - Used for clean surgical wounds
  - Heals in short duration

- **2. Healing by secondary intention (secondary union):**
  - Wound is left open
  - Used for gaping (edges are widely separated) or infected & contaminated wounds
  - Wound takes longer to heal

wound healing

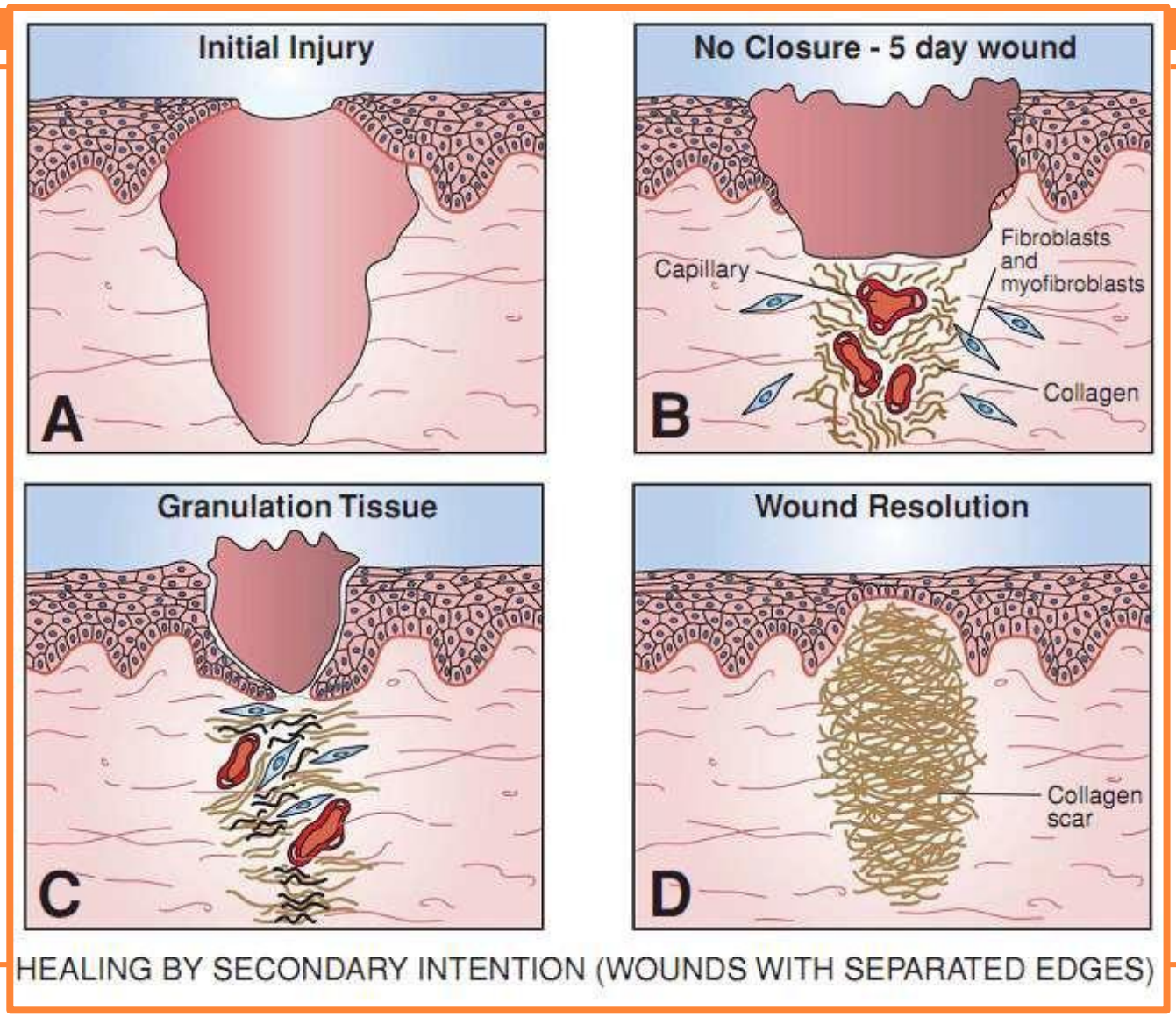
Primary Union
(Healing by 1st intention)

- E.g, surgical wound
- Narrow incisional space resulting in a limited inflammatory reaction
- Small amount of granulation tissue in incisional space
- Limited amount of wound contraction
- Healing in short time

Secondary Union
(Healing by 2ry intention)

- E.g. traumatic wound
- Large tissue defect resulting in a more intense inflammatory reaction
- Large amount of granulation tissue
- More amount of wound contraction
- Healing take long time

TISSUE REPAIR



HEALING BY SECONDARY INTENTION (WOUNDS WITH SEPARATED EDGES)

Healing of bone fractures

- I. Healing by primary union: rare e.g. in compression fractures
- II. Healing by formation of callus. Similar to healing by secondary union which includes:
  - Injury----> Fracture----> formation of blood clot
  - Inflammation start-----> removal of blood clot
  - Replacement by granulation tissue consisting of capillary and mesenchymal cells (Osteoblast) (procallus)
  - Formation of collagen fibers and Osteomucin (Osteoid tissue) (callus)
  - Calcification----------> Woven bone
  - Removal of woven bone and replacement by lamellar bone

Complication of healing

1. Infections (*S aureus*)
2. Wound dehiscence
3. Implantation dermoid
4. Keloid & hypertrophic scars
5. Painful scar.
6. Pigmented scar.
7. Weak scar. (incisional hernia)
8. Cicatrisation
9. Neoplastic changes (marjolin ulcer)
10. Exuberant granulation tissue

Factors That Adversely Affect Wound Healing.

Local

1. Infection
    1. Most common cause of impaired wound healing
    2. *Staphylococcus aureus* most common.
2. Poor blood supply (ischemia)
3. Presence of foreign material
4. Presence of necrotic tissue
5. Movement in injured area
6. Irradiation
7. Tension in injured area

Systemic

1. Advanced age
2. Protein malnutrition
3. Vitamin C deficiency :decreased cross-linking in collagen.
4. Zinc deficiency :
1. Corticosteroid :Interfere with collagen formation and decrease tensile strength
2. Diabetes mellitus :increases susceptibility to infection by decreasing blood flow to tissue and increasing tissue levels of glucose.
5. Cytotoxic (anticancer) drugs
6. Severe anemia


A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Thanks