



Normal Wound Healing

Prepared by : Dr. Bareka Salah

- Wound closure:

- A. Primary closure: Immediate suturing of the wound

- B. Delayed primary closure: Leave stitches in the wound and close it after 3-5 days when wound is clean. We do this method for contaminated wounds.

- C. Secondary closure: By scar formation and epithelisation. *↳ afraid of wound infection*

- D. Tertiary: By graft or flap. *(نقل ظاري)*

- Phase of Wound Healing: Look at the diagram

- A. Inflammatory

- B. Proliferative phase

- C. Remodeling phase

Please refer to these links:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2903966/>

*healing
by
itself*

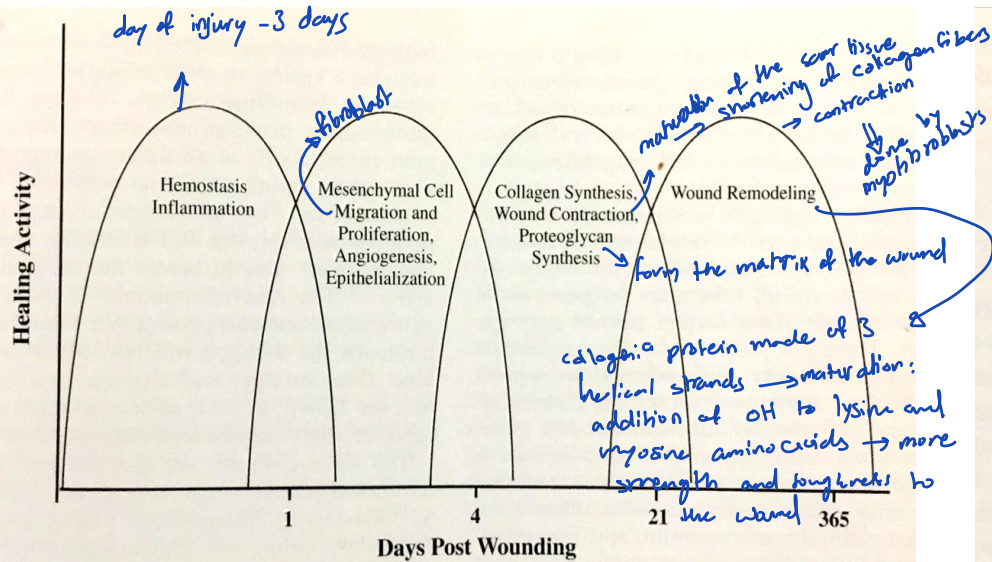


Figure 1. Phases of the healing process.

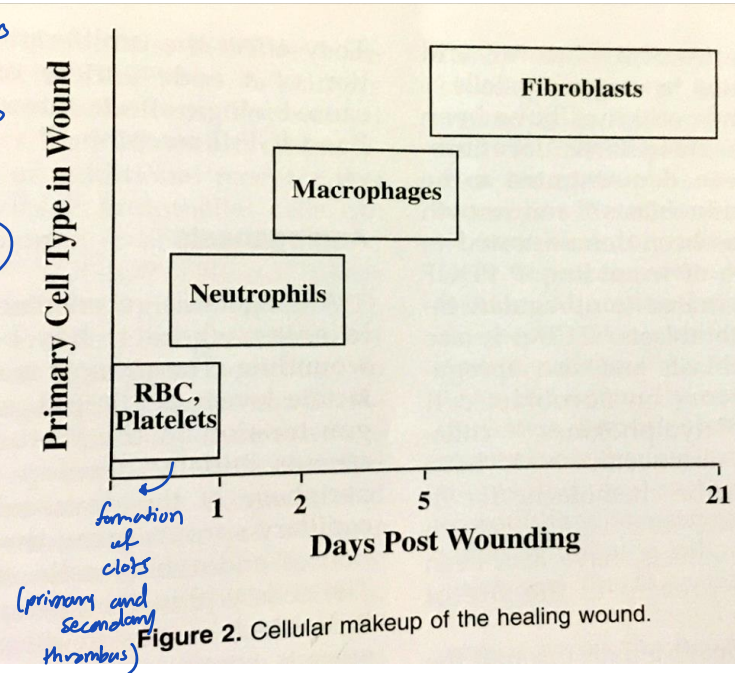


Figure 2. Cellular makeup of the healing wound.

*wound healing requires:

1-iron

2-zinc

3- vitamin C

4- other trace elements

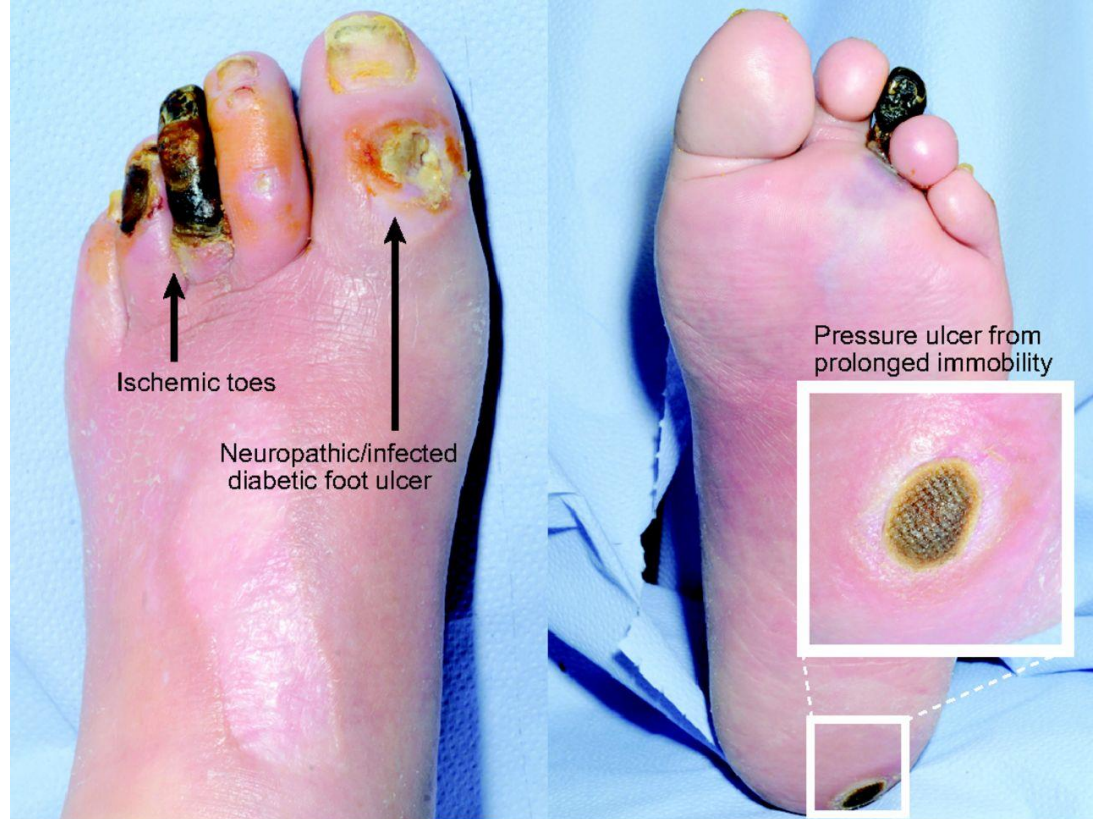
Table 1. CYTOKINE INVOLVEMENT IN WOUND HEALING FUNCTIONS

Healing Function	Cytokines Involved
Inflammatory Cell Migration	PDGF TGF- β TNF- α
Fibroblast Migration	PDGF TGF- β EGF
Fibroblast Proliferation	PDGF TGF- β EGF IGF TNF- α
Angiogenesis	IL-1 bFGF (FGF2) aFGF (FGF1) TGF- β TGF- α EGF TNF- α VEGF IL-8
Epithelialization	PD-ECGF EGF TGF- α KGF (FGF7) bFGF (FGF2) IGF HB-EGF
Collagen Synthesis	PDGF TGF- β bFGF (FGF2) EGF

PDGF = platelet-derived growth factor; TGF- β = transforming growth factor- β ; TNF- α = tumor necrosis factor- α ; EGF = epidermal growth factor; IGF = insulin-like growth factor; IL-1 = interleukin-1; bFGF = basic fibroblast growth factor; aFGF = acidic fibroblast growth factor; TGF- α = transforming growth factor- α ; VEGF = vascular endothelial growth factor; IL-8 = interleukin-8; PD-ECGF = platelet-derived-endothelial cell growth factor; KGF = keratinocyte growth factor; and HB-EGF = heparin binding epidermal growth factor.

Chronic Wound

(> 3-6 week and improper wound healing)



Dorsal surface

Plantar surface

Chronic Wound



bed sore



vasculitis

Factors contributing to impaired wound healing

A. Local factors	B. Systemic factors
<ul style="list-style-type: none">❖ Arterial insufficiency❖ Venous insufficiency❖ Edema❖ Infection❖ Pressure❖ Radiation❖ Foreign material❖ Necrotic tissue	<ul style="list-style-type: none">❖ DM❖ Malnutrition❖ Vitamin deficiency❖ Chemotherapy❖ Smoking❖ Aging❖ Steroids

will not return to the baseline

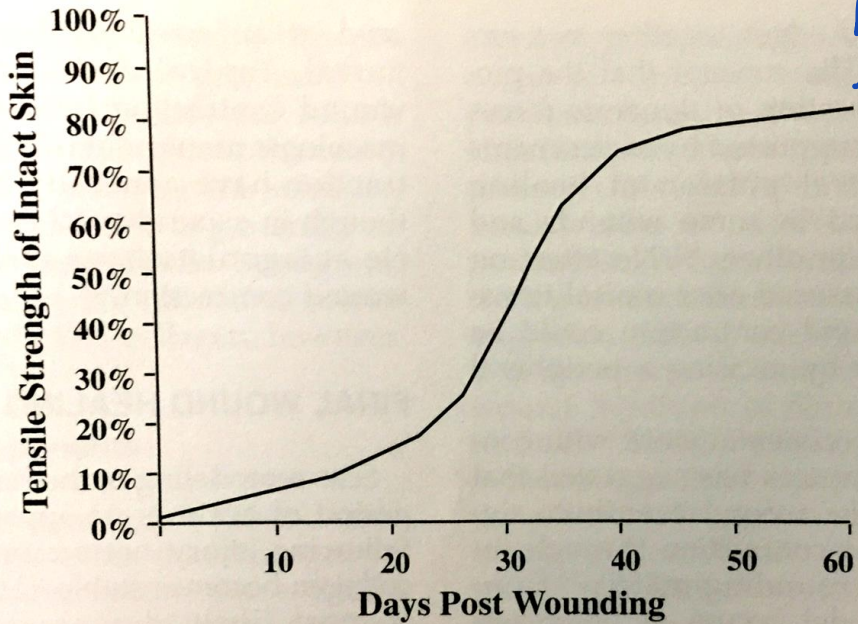


Figure 3. Tensile strength of the healing wound.

Table 1. THE ESTIMATED PREVALENCE AND HEALTH CARE COSTS OF CHRONIC WOUNDS.

Wound Type	Total Prevalence	Estimated Annual Cost
Pressure Ulcer ¹	0.04–0.08%	\$1.3 billion
Venous Ulcer ²	1–2%	\$1 billion
Diabetic Ulcer ³	Total 0.15–0.3% (Diabetics 5–10%)	\$1 billion

* Don't apply pressure to the wound to avoid opening or herniation of it

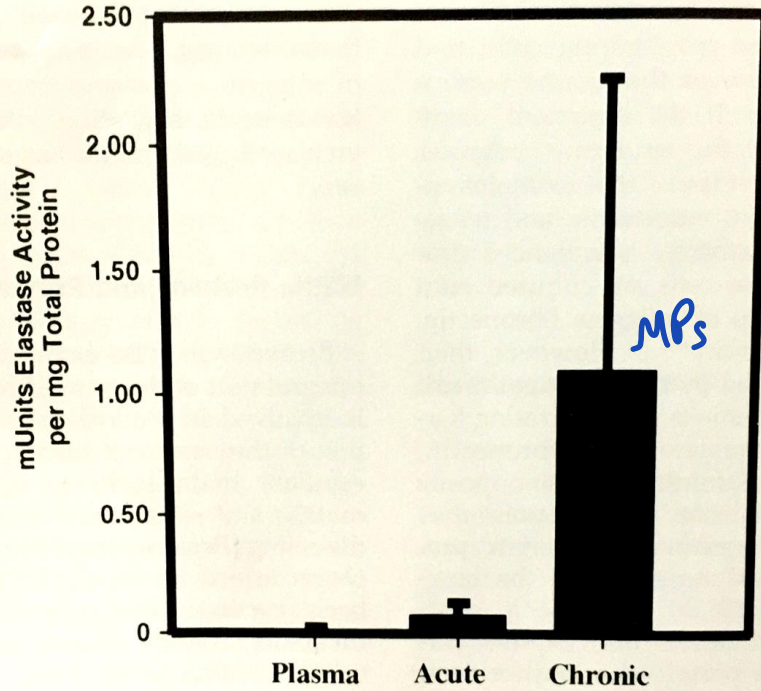


Figure 2. Levels of elastase activity are significantly higher in chronic wound fluid compared with acute wound fluid. Elastase activity was determined by a colorimetric assay using methoxysuccinyl-ala-ala-proval-p-nitroanilide substrate. (From Yager DR, Chen SM, Ward BS, et al: Ability of chronic wound fluid to degrade peptide growth factors is associated with increased levels of elastase activity and diminished levels of proteinase inhibitors. Wound Repair and Regeneration 5:23, 1997; with permission.)

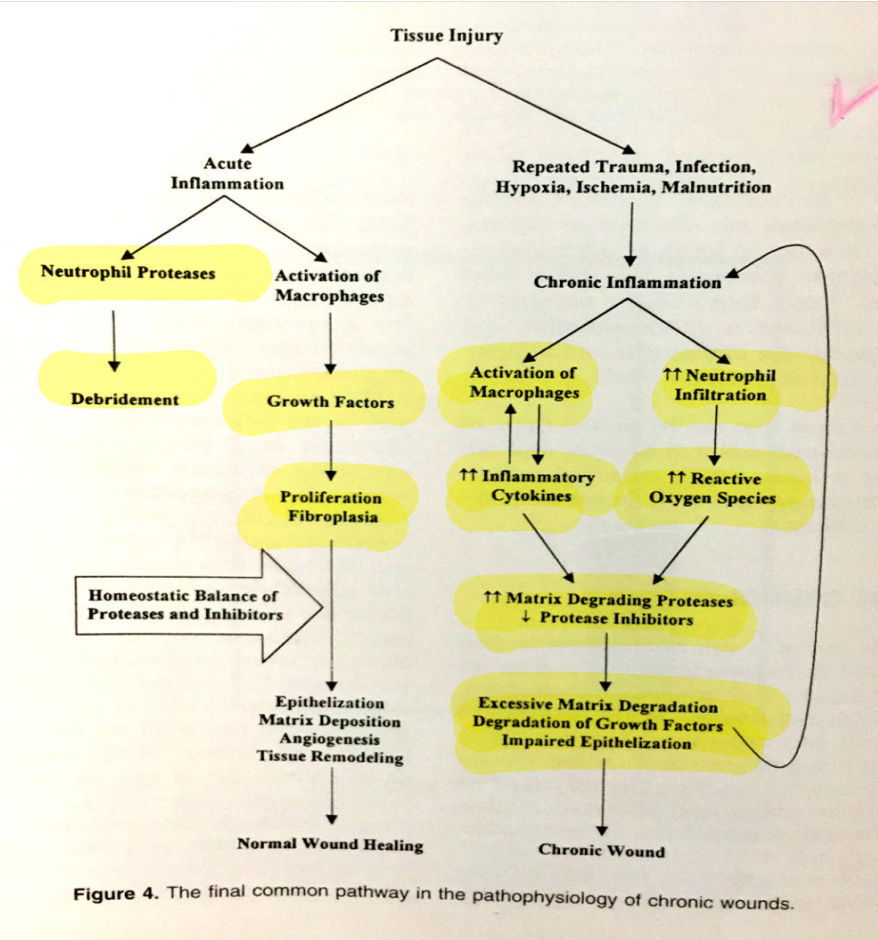


Figure 4. The final common pathway in the pathophysiology of chronic wounds.

Excessive Wound Healing

1. Keloids → usually occur in black people + genetic background
2. Hypertrophic scars

Please refer to this link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4129552/>





complicated
hypertrophic scar



- Etiology
- Histology
- Treatment

- ❖ Surgical excision

- ❖ Z-Plasty

- ❖ W-Plasty

- ❖ Steroids

- ❖ Silicon

- ❖ Pressure garment

- ❖ Laser

- ❖ Interferon

hypertrophic scar: less collagen than keloids but the arrangement of collagen parallel to the wounds in hypertrophic while keloid: circular

↳ hypertrophic → hypertrophic: surgical excision | keloid: z-plasty, steroids

↳ keloids

Pressure Ulcers Bed sores

- ① nutritional status
- ② bone biopsy / MRI / bone scan
for osteomyelitis
- ③ antibiotics for osteomyelitis

- Definition
- Etiology
- Pre-disposing factors
- Locations
- Prevention
- Work up
- Treatment : Medical surgical
- Complications of surgery

→ pressure over bony prominence, insufficient blood supply

→ malnourished patients
very obese patients
incontinence
excessive sweating
quad paresis, para paresis
wheel chair
→ skin flap

insufficient blood supply
→ 200 mmHg
↓
necrosis

→ muscle tolerate
only for 4
hours → signs
of ischemia
after

Please refer to the following links:

<https://www.researchgate.net/publication/257777910> Bedsore Top to bottom and bottom to top

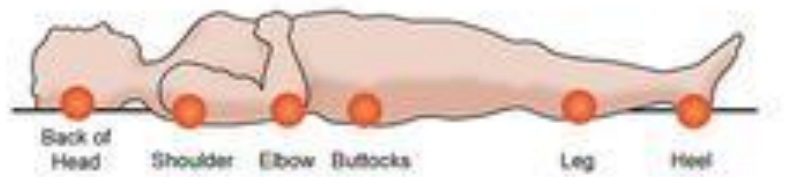
while more in the
skin because of higher
metabolic
dem

①

②

* Treatment: high protein diet, continuous mobilization every 2 hours for 15 minutes

③ take care of their incontinence (humidity)



especially when the skin and the sheet below skin is wet

shearing forces and frictions between blood supply and skin

- ① non blanchable
- ② break down of the skin
- ③ muscle and Fascia
- ④ bone



blood supply that's perpendicular on the skin from fascia → strangulation

لا يجبريل
ما يجزل ←