

# Рана ( Vulnus )



# Класификација ране по дубини

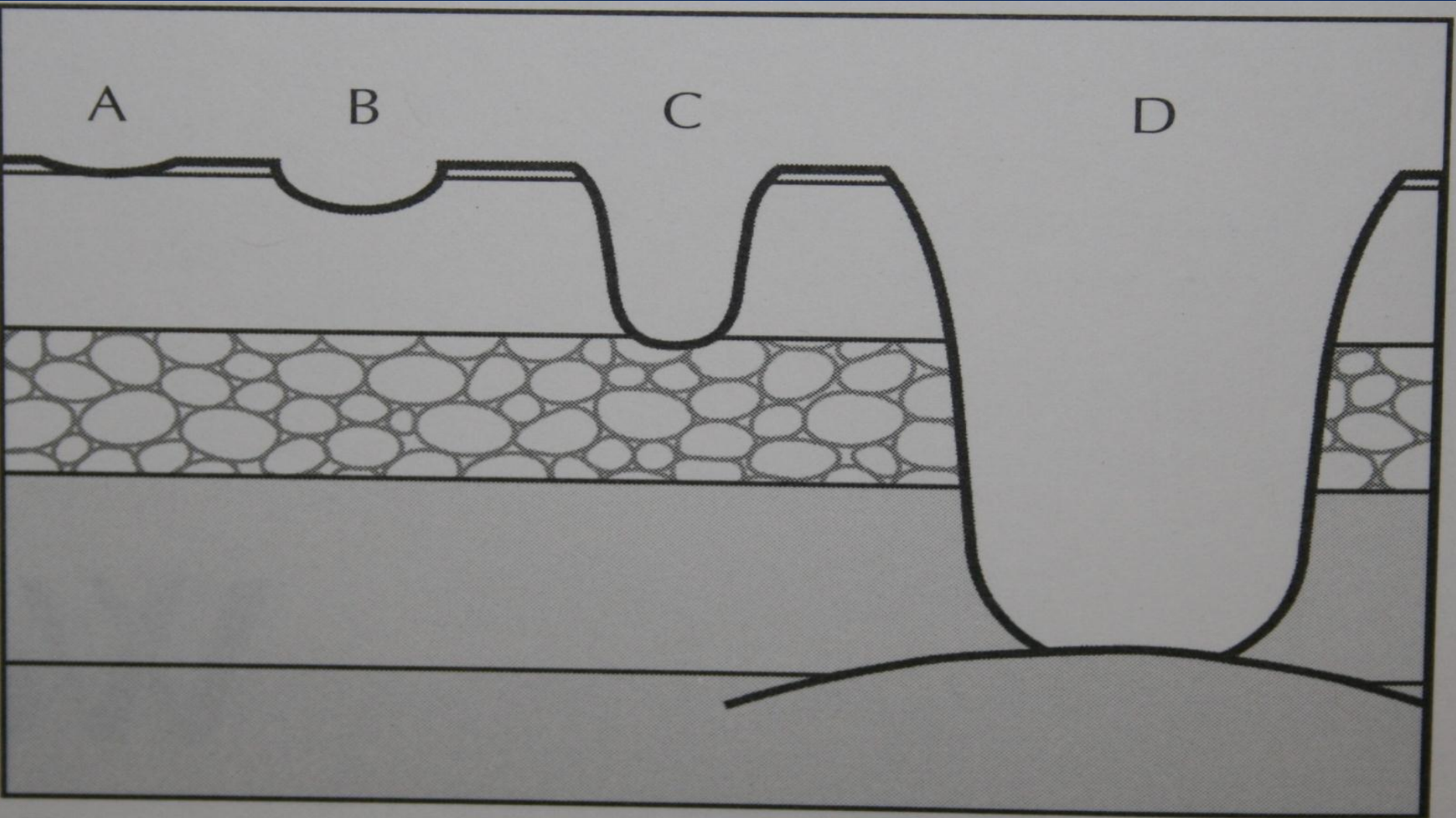


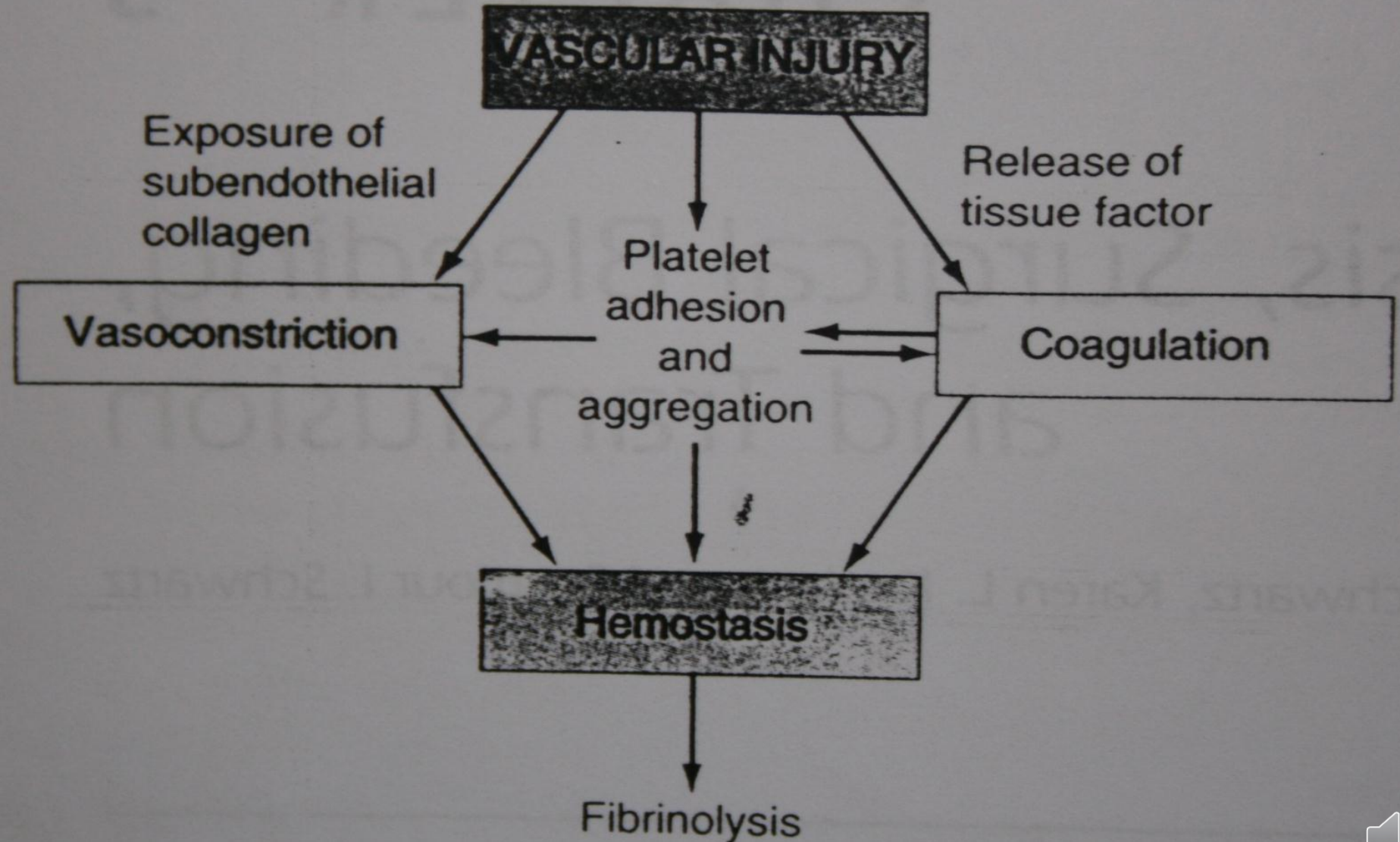
Figure 2-2. Skin structures involved in different depths of wounds.



# Фаза хемостазе и инфламације

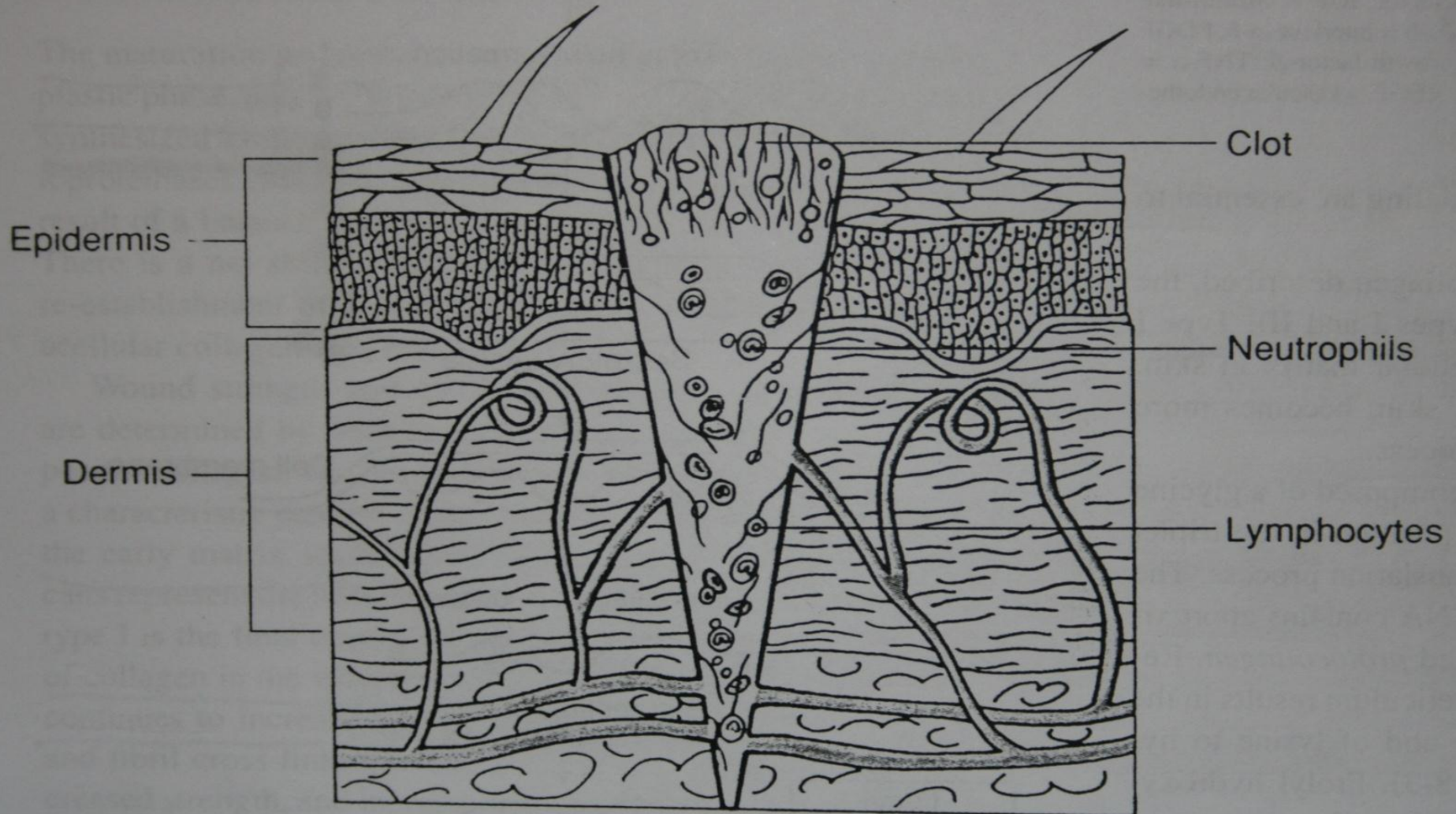


# Процеси који започињу васкуларном повредом



# Зарастање ране

## Фаза хемостазе и инфламације

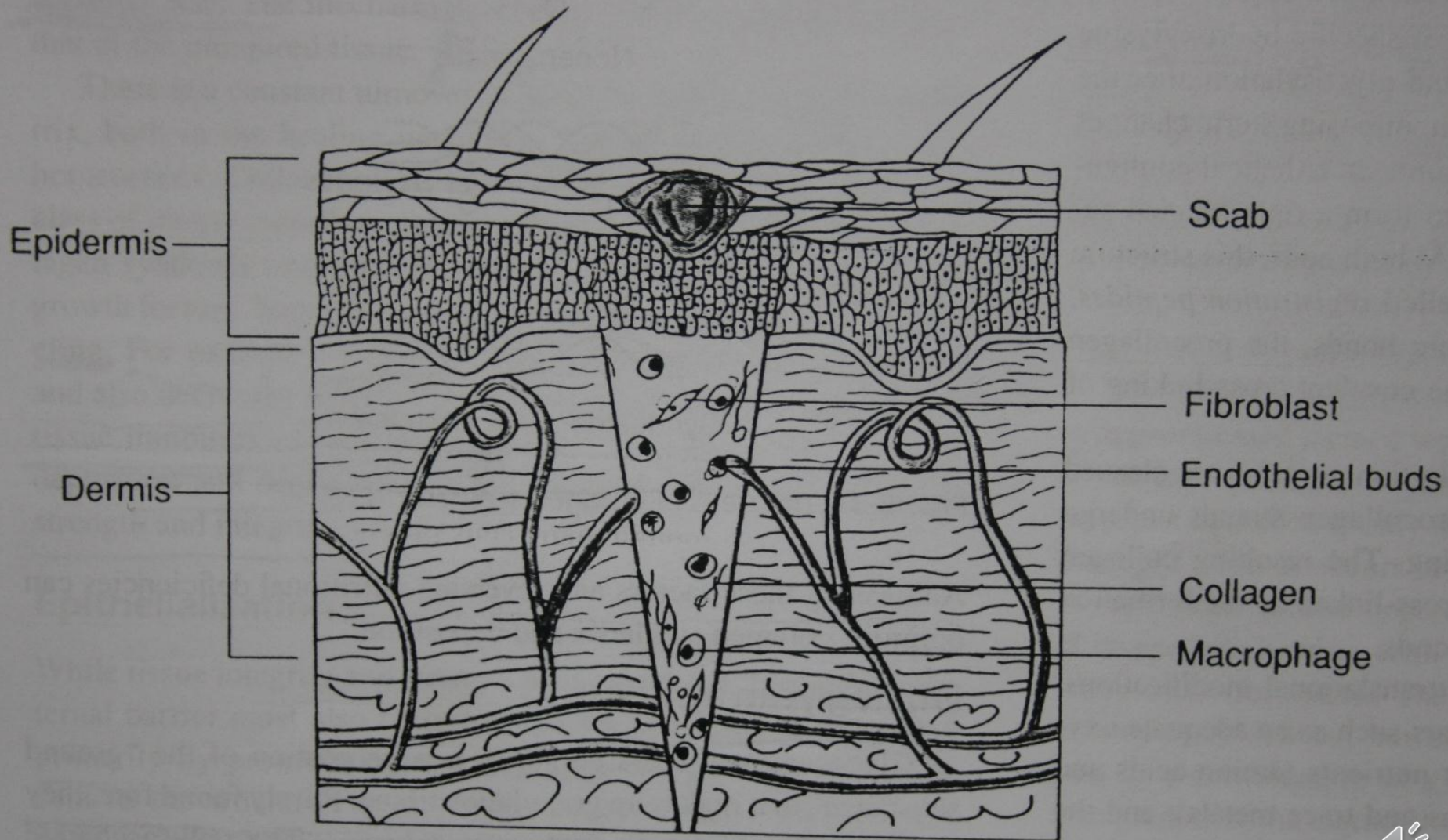


B



# Зарастање ране

## Фаза пролиферације



# АКТИВНОСТИ макрофага ТОКОМ зарастања ране

Table 8-1

Macrophage Activities During Wound Healing

<i>Activity</i>	<i>Mediators</i>
Phagocytosis	Reactive oxygen species Nitric oxide
Débridement	Collagenase, elastase
Cell recruitment and activation	Growth factors: PDGF, TGF- $\beta$ , EGF, IGF Cytokines: TNF- $\alpha$ , IL-1, IL-6 Fibronectin
Matrix synthesis	Growth factors: TGF- $\beta$ , EGF, PDGF Cytokines: TNF- $\alpha$ , IL-1, IFN- $\gamma$ Enzymes: arginase, collagenase Prostaglandins Nitric oxide
Angiogenesis	Growth factors: FGF, VEGF Cytokines: TNF- $\alpha$ Nitric oxide



# Фактори раста који учествују у зарастању ране

Table 8-2

## Growth Factors Participating in Wound Healing

<i>Growth Factor</i>	<i>Wound Cell Origin</i>	<i>Cellular and Biological Effects</i>
<b>Platelet-derived growth factor (PDGF)</b>	Platelets, macrophages, monocytes, smooth muscle cells, endothelial cells	Chemotaxis: fibroblasts, smooth muscle, monocytes, neutrophils Mitogenesis: fibroblasts, smooth muscle cells Stimulation of angiogenesis Stimulation of collagen synthesis
<b>Fibroblast growth factor (FGF)</b>	Fibroblasts, endothelial cells, smooth muscle cells, chondrocytes	Stimulation of angiogenesis (by stimulation of endothelial cell proliferation and migration) Mitogenesis: mesoderm and neuroectoderm Stimulates fibroblasts, keratinocytes, chondrocytes, myoblasts

# Фактори раста који учествују у зарастању ране

Keratinocyte growth factor (KGF)	Keratinocytes, fibroblasts	Significant homology with FGF; stimulates keratinocytes
Epidermal growth factor (EGF)	Platelets, macrophages, monocytes (also identified in salivary glands, duodenal glands, kidney, and lacrimal glands)	Stimulates proliferation and migration of all epithelial cell types
Transforming growth factor- $\alpha$ (TGF- $\alpha$ )	Keratinocytes, platelets, macrophages	Homology with EGF; binds to EGF receptor Mitogenic and chemotactic for epidermal and endothelial cells
Transforming growth factor- $\beta$ (TGF- $\beta$ ) (3 isoforms: $\beta_1$ , $\beta_2$ , $\beta_3$ )	Platelets, T lymphocytes, macrophages, monocytes, neutrophils	Stimulates angiogenesis TGF- $\beta_1$ stimulates wound matrix production (fibronectin, collagen glycosaminoglycans); regulation of inflammation TGF- $\beta_3$ inhibits scar formation
Insulin-like growth factors (IGF-1, IGF-2)	Platelets (IGF-1 in high concentrations in liver; IGF-2 in high concentrations in fetal growth)	Likely the effector of growth hormone action Promotes protein/extracellular matrix synthesis Increase membrane glucose transport



# Фактори раста који учествују у зарастању ране

Vascular endothelial growth  
factor (VEGF)

Macrophages, fibroblasts,  
keratinocytes

Similar to PDGF

Mitogen for endothelial cells (not  
fibroblasts)

Stimulates angiogenesis

Granulocyte-macrophage  
colony-stimulating factor  
(GM-CSF)

Macrophage/monocytes,  
endothelial cells, fibroblasts

Stimulates macrophage  
differentiation/proliferation



# Фактори који утичу на зарастање ране

## Factors Affecting Wound Healing

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### *Systemic*

Age

Nutrition

Trauma

Metabolic diseases

Immunosuppression

Connective tissue disorders

Smoking

### *Local*

Mechanical injury

Infection

Edema

Ischemia/necrotic tissue

Topical agents

Ionizing radiation

Low oxygen tension

Foreign bodies

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# Хипертрофични ожиљак



# Келоид



**КЕЛОИД.** Phot. X.



# Типови зарастања ране

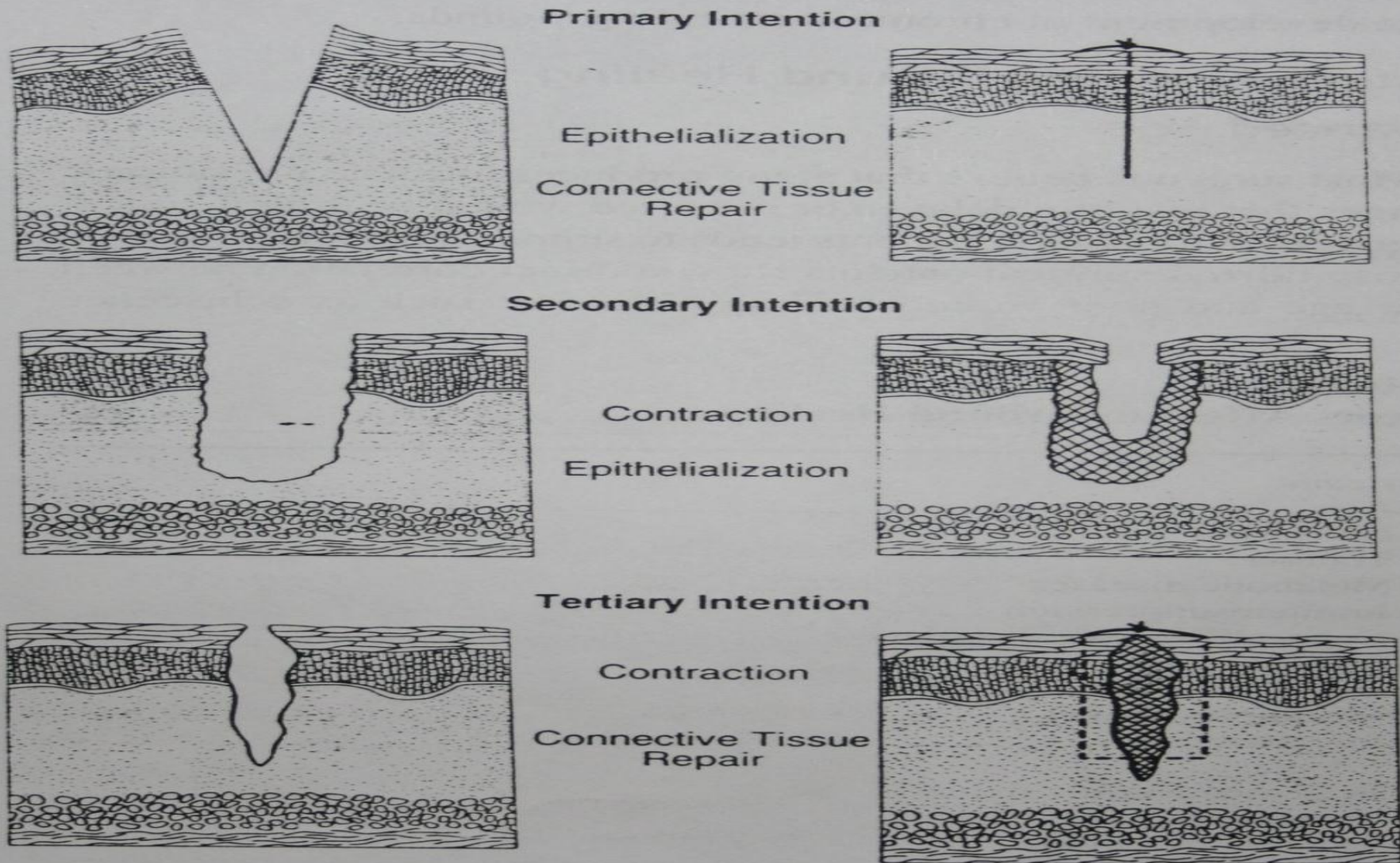
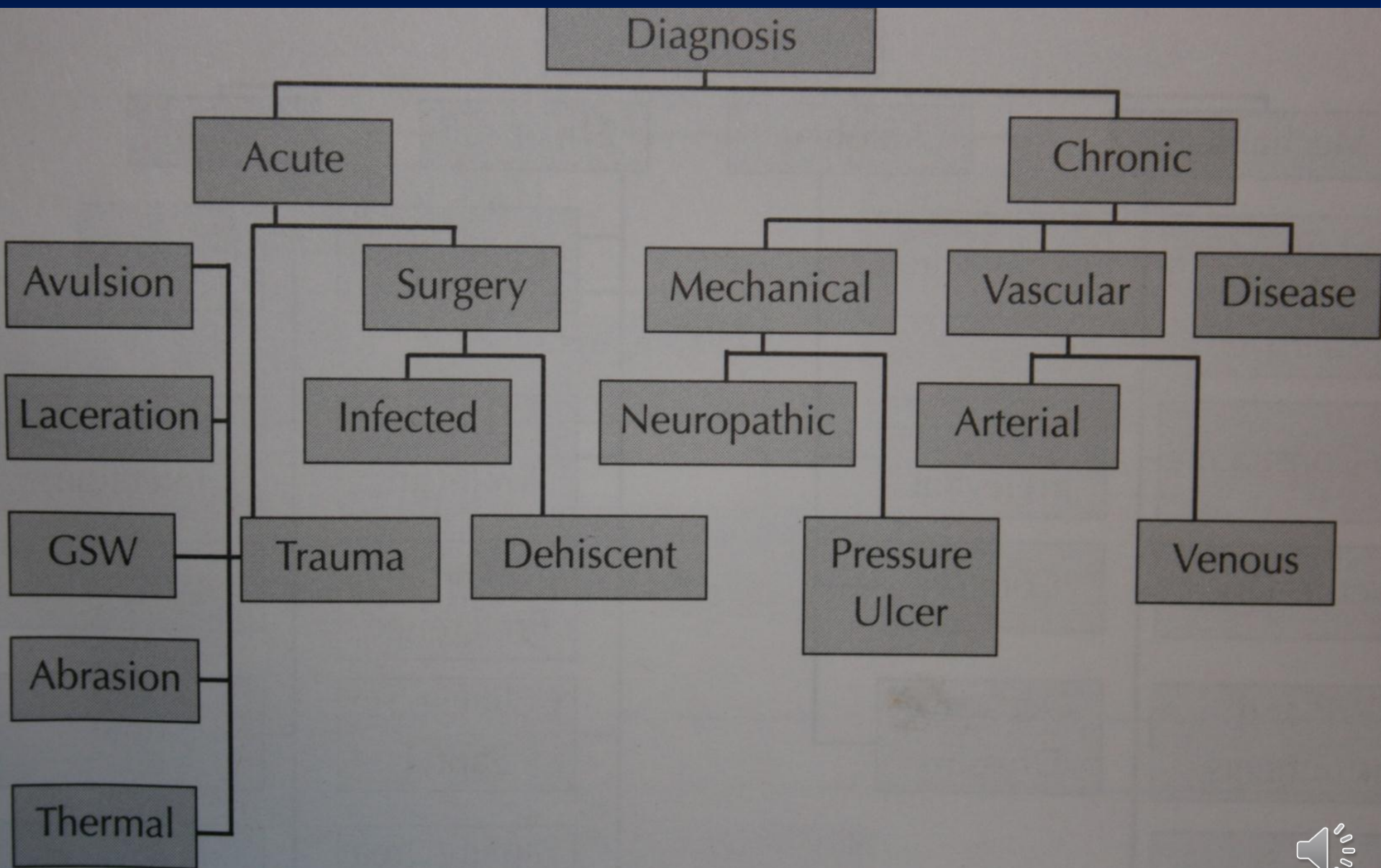


FIG. 8-6. Different clinical approaches to the closure and healing of acute wounds.



# Класификација рана



# Абразивна рана

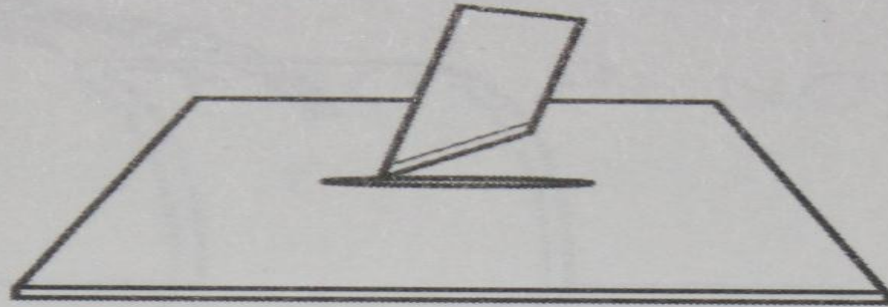
## excoriatio



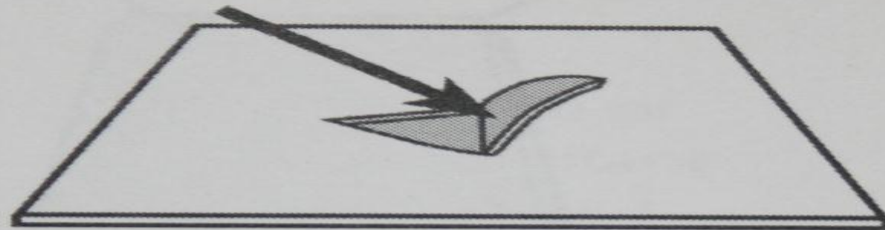
# Раздерина

## vulnus lacerum

shearing



tension



compression

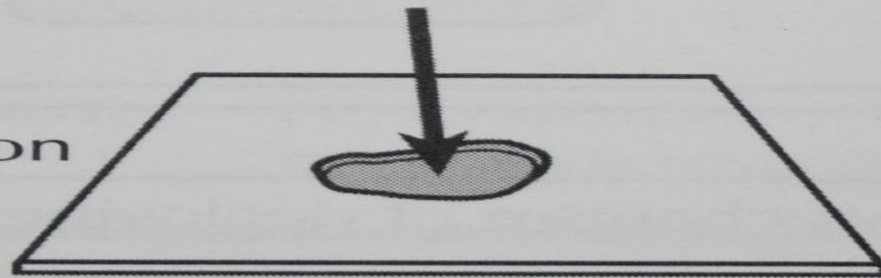


Figure 7-2. Mechanisms of lacerations.



# Авулзија

## vulnus avulsivum

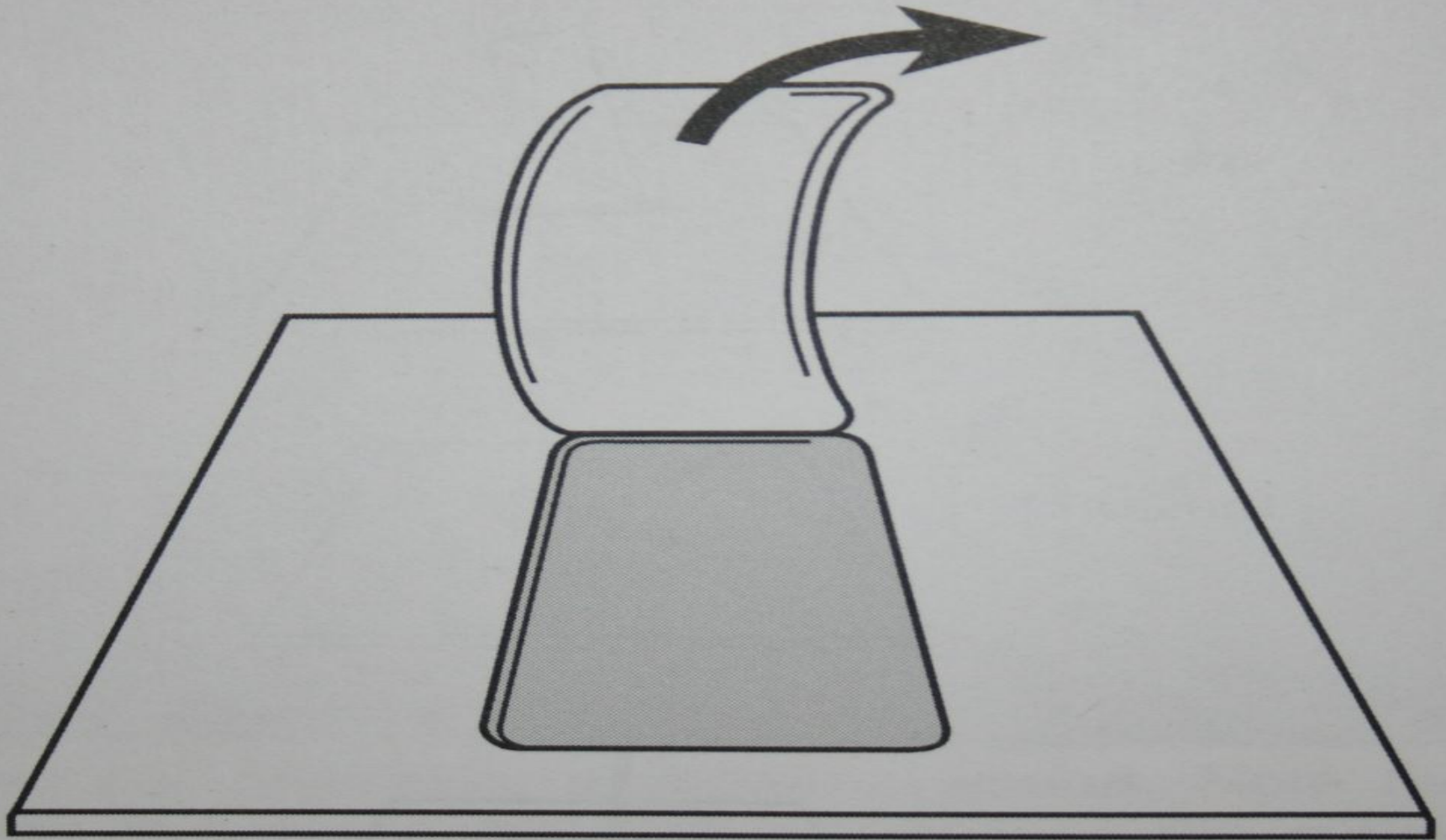


Figure 7-4. Mechanism of degloving (avulsion).




# Убодна рана

## vulnus punctum

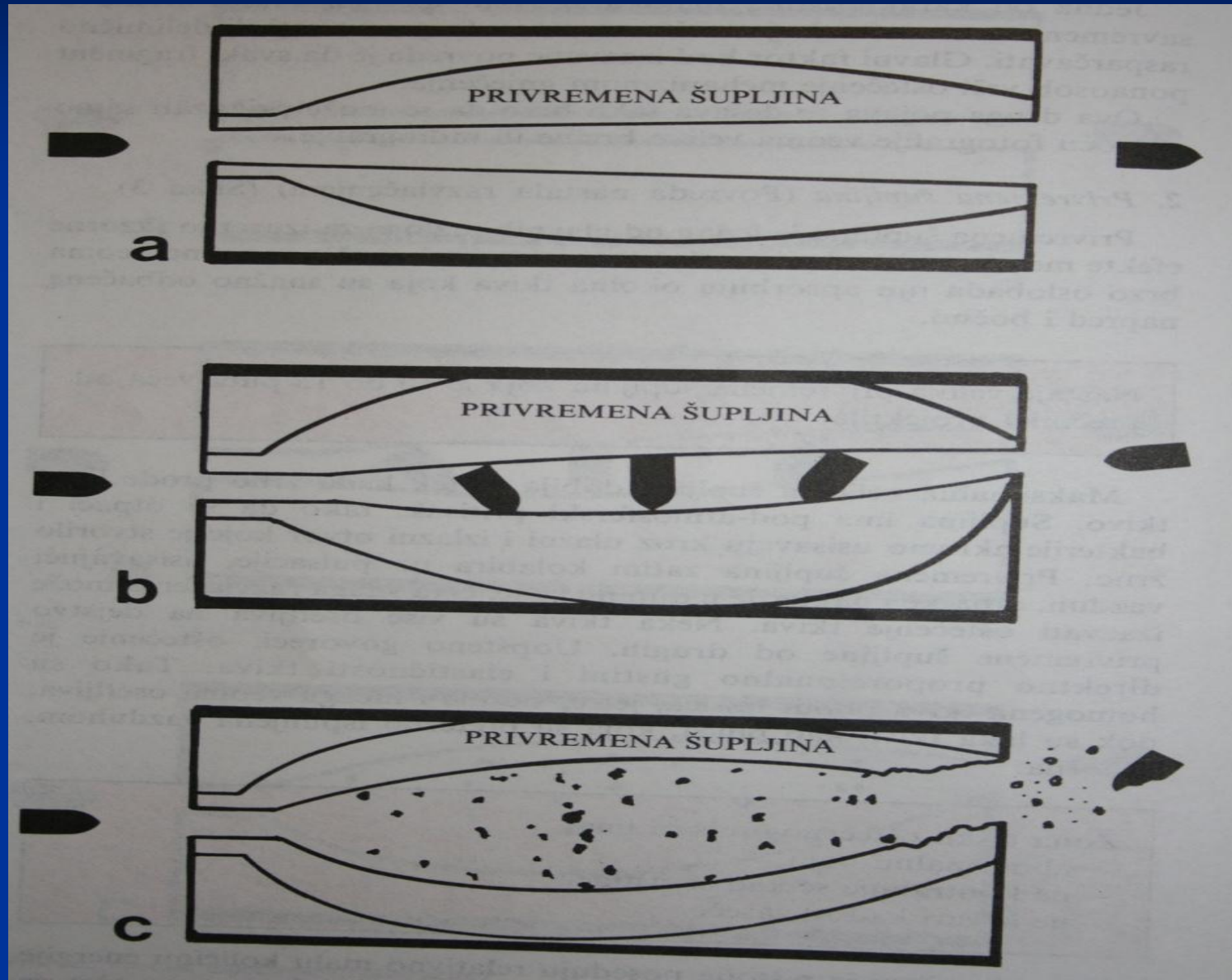
Table 7-1

### FOOT PUNCTURE WOUND SCORING SYSTEM

Category	0	1	2	3	9
Age		< 6 hrs	6 to 24 hrs	> 24 hrs	
Classification		Small, sharp, clean edges; superficial	Ragged, irregular margins; moderate depth	Irregular edges, necrotic tissue, foreign body and drainage	
Depth	Presence of concomitant disease = 1 additional point	Only epidermis and dermis	Through dermis with no structural involvement	Through dermis with structural involvement	
Footwear		None	Stockings	Stockings and shoes	
Radiographic Exam	No evidence of osseous involvement				Osseous involvement 

# Устрелина

## vulnus sclopetarium



# Дехисценција оперативне ране



# Хронична рана као последица инфламације



# Хронична рана ( *ulcus* ) као последица неуропатије стопала



# Третман ране

