Tissue Inflammation and Repair

Prof. Dr. Myo Thuzar Khin
M.B.,B.S, M.Med.Sc(Rehabilitation Medicine)
Dr.Med.Sc(Rehabilitation Medicine), MBA, Dip.Med.Ed
Pro-rector
Professor/Head(Attached for duties)
Department of Physiotherapy
University of Medical Technology, Yangon

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II. Types of Inflammation
III. Acute inflammation
IV. Chronic inflammation
V. Systemic effects of inflammation
VI. Factors affecting healing
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I. Introduction

Classical clinical signs

'calor'----------heat

(relevant primarily to inflammation of skin)

'rubor'----------redness

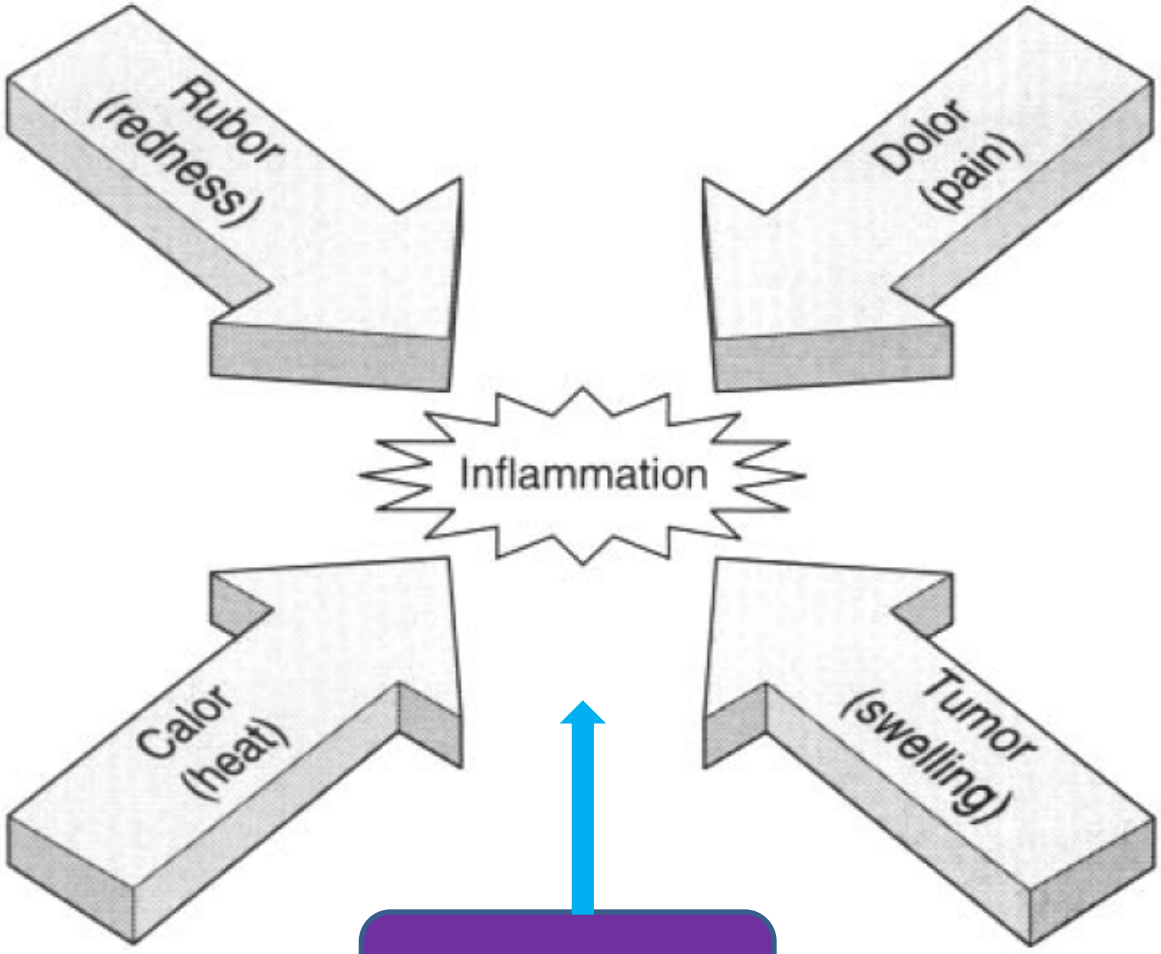
'dolor'----------pain

'tumor'---------swelling

They are indicative of the extravasation of plasma and infiltration of leucocytes at the site of inflammation.

'Functio laesa'---loss of function

Components of inflammation



Clinical features

(a) Pain

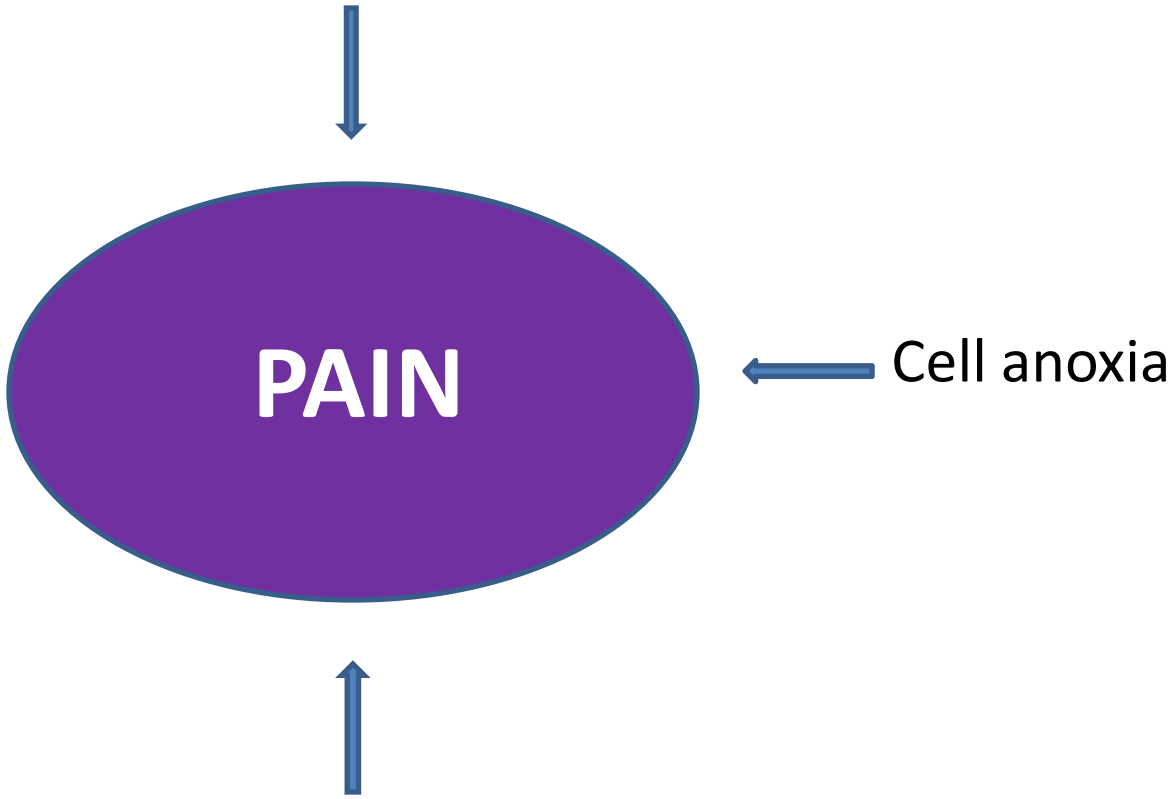
(b) Redness

(c) Heat

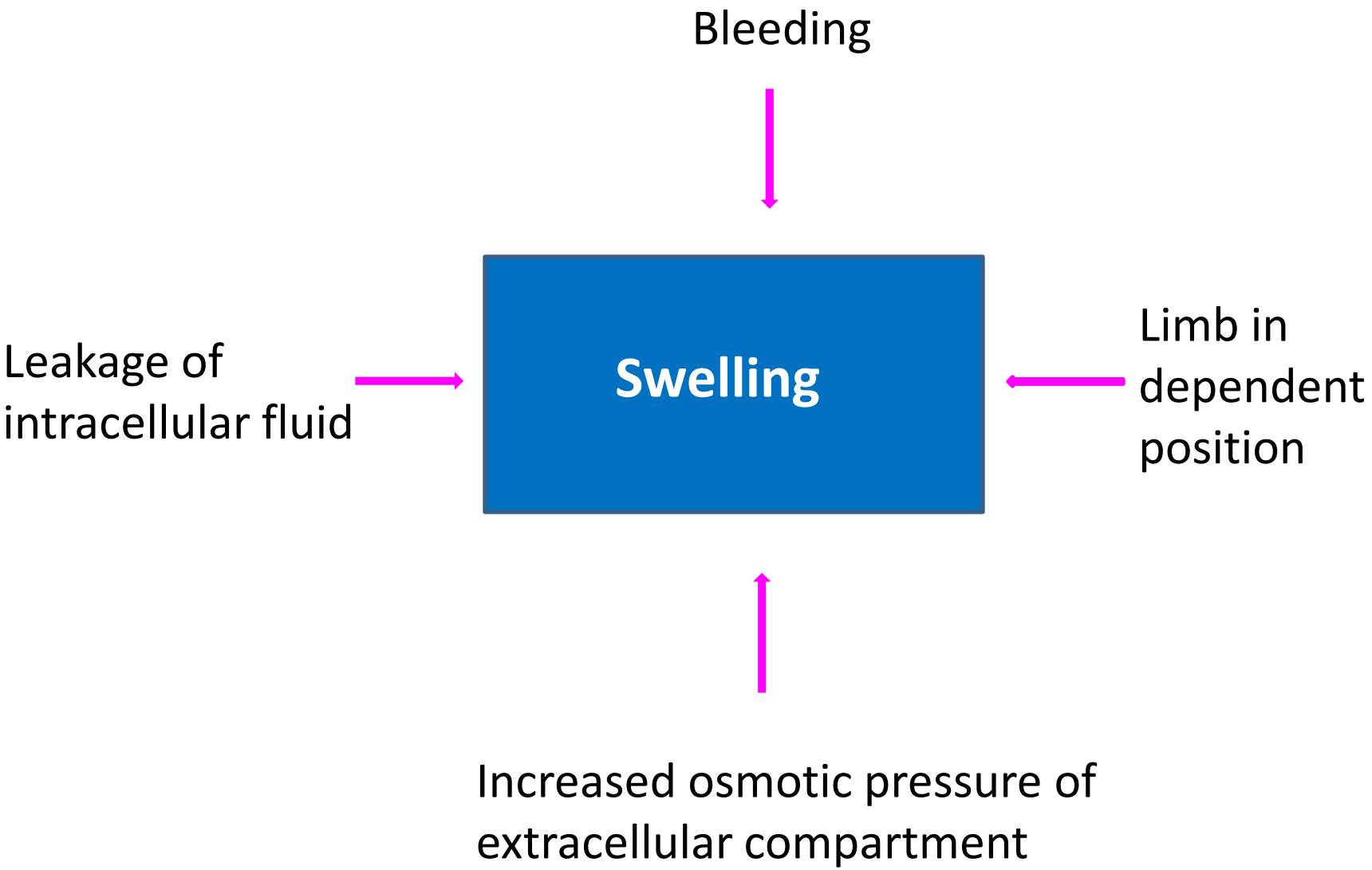
(d) Swelling

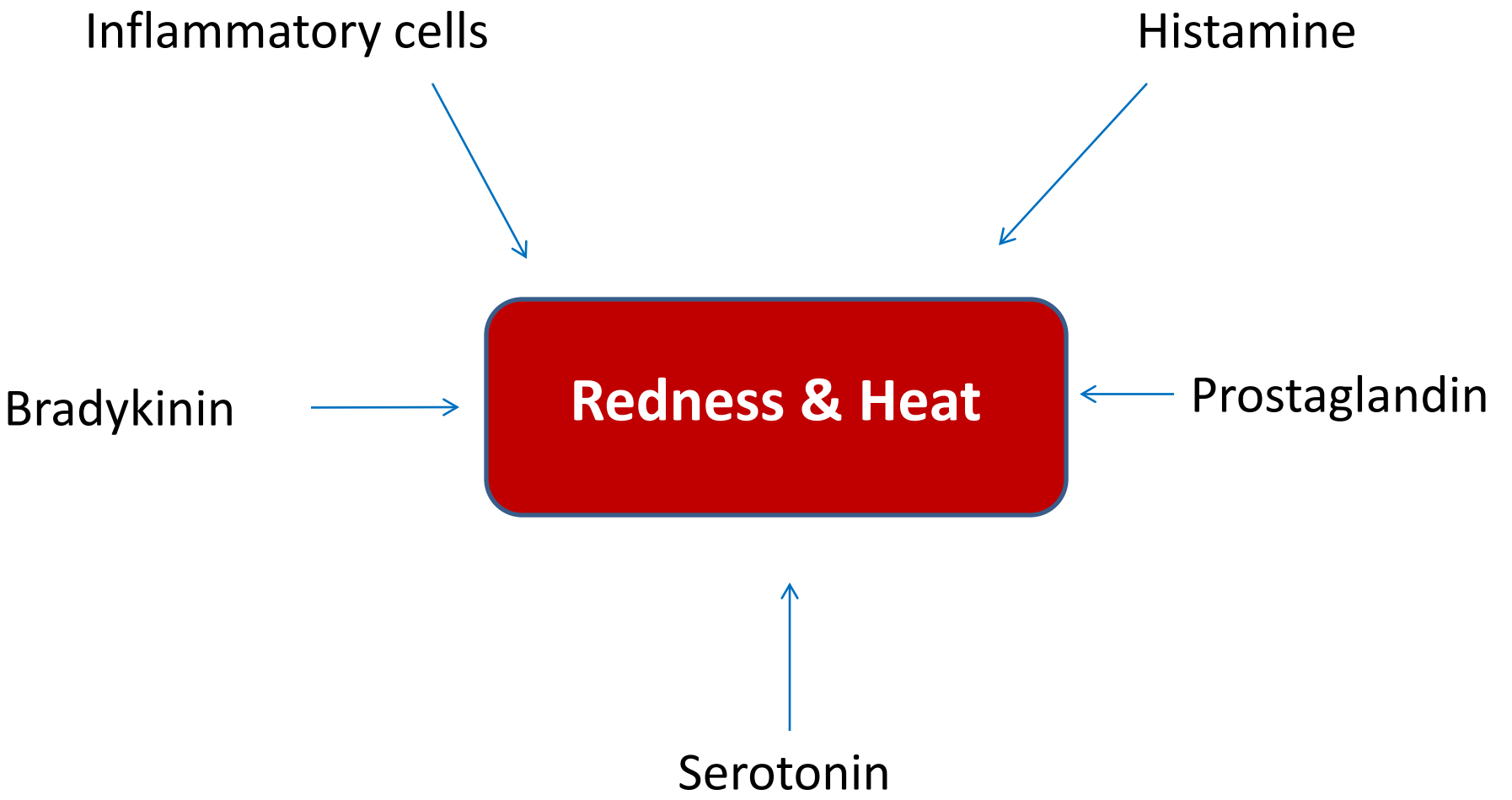
(e) Loss of function

Trauma stimulating pain receptors

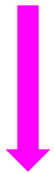


Release of chemical substances (bradykinin, prostaglandin) due to lack of oxygen & nutrients


Bleeding
Leakage of intracellular fluid
Swelling
Limb in dependent position
Increased osmotic pressure of extracellular compartment


Inflammatory cells
Histamine
Bradykinin
Redness & Heat
Prostaglandin
Serotonin

Purpose of inflammatory process



To heal the injured tissues

Inflammation

Complex stereotypical reaction of vascularized living tissue to local trauma

Inflammation ≠ **Infection**

Inflammation is the immune system's response to tissue damage.

Damage is due to an exogenous source (a cut or burn) or to endogenous failures (a bone fracture).

The principal aim behind inflammation is to repair the tissue and bring it back to its original state.

Inflammation

Body's initial reaction to an injury is similar to its reaction to an infection.

This reaction is termed inflammation.

May manifest macroscopically (e.g. after an acute injury)

or

microscopically

Types of Injuries

- Macrotrauma

- Microtrauma

Micro vs. Macro Trauma

- Micro trauma small repetitive traumas resulting in tissue breakdown NSCA

  More Prevalent during Marathon Training

- Macro trauma 1 large event or trauma resulting in injury NSCA

  Training in Boston over the Winter BEWARE!

An inflammatory condition ----- ‘-itis’

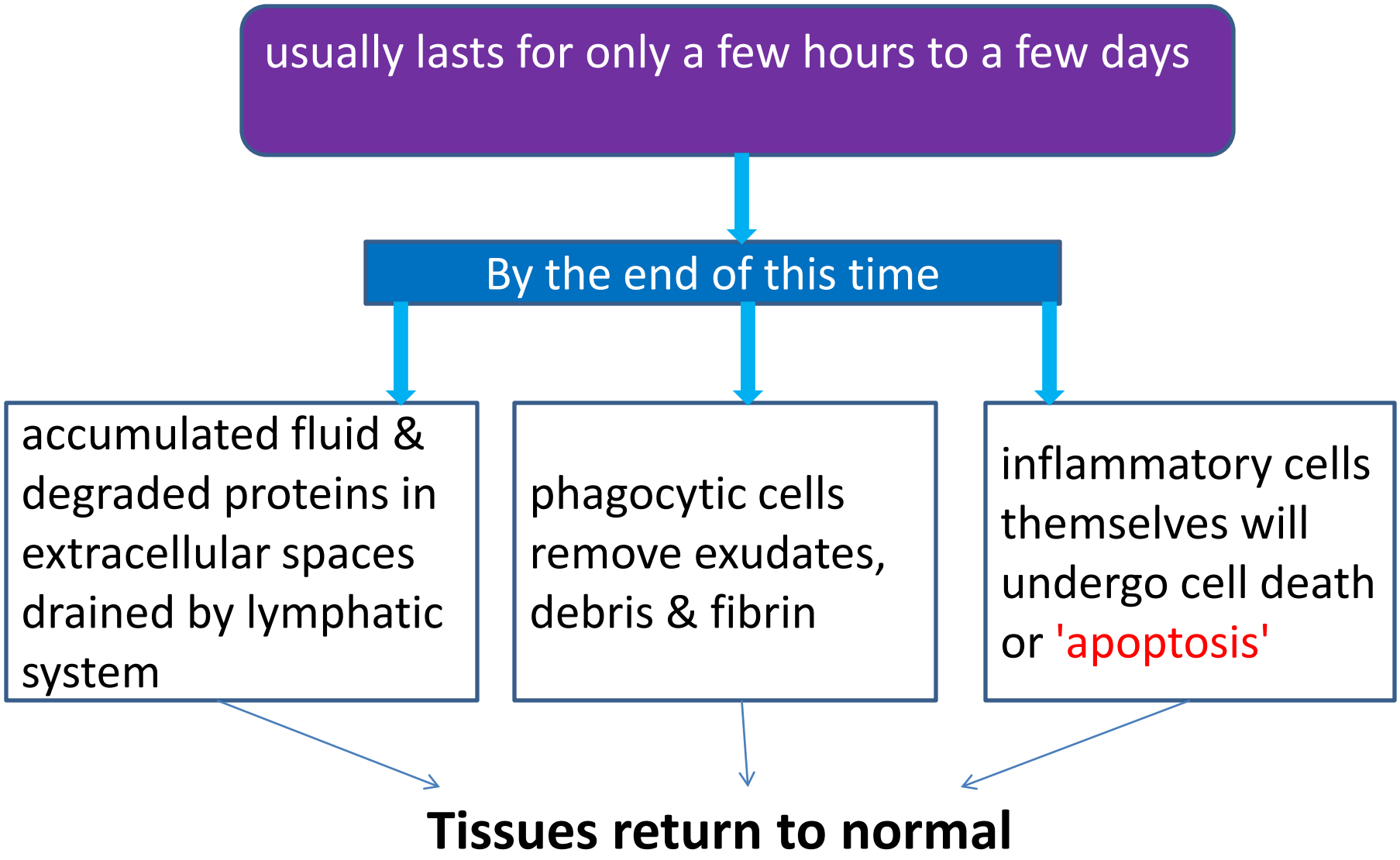
e.g. Tonsillitis

Bronchitis

Appendicitis

II. Types of Inflammation

Acute inflammation



Chronic inflammation

- Persistence of inflammation usually beyond 10-14 days
- accompanied by fibrosis (accumulation of synthesised collagen in the tissue)

Chronic inflammation(Contd.)

- can occur when the resolution to acute inflammatory process is not achieved, possibly through the causative agent not being removed leading to prolonged inflammation
- Chronic inflammation can arise as a low-grade inflammatory process without a preceding acute phase. (e.g. Rheumatoid arthritis)

III. Acute inflammation

Acute inflammation: The Mechanisms

Phases of acute inflammation

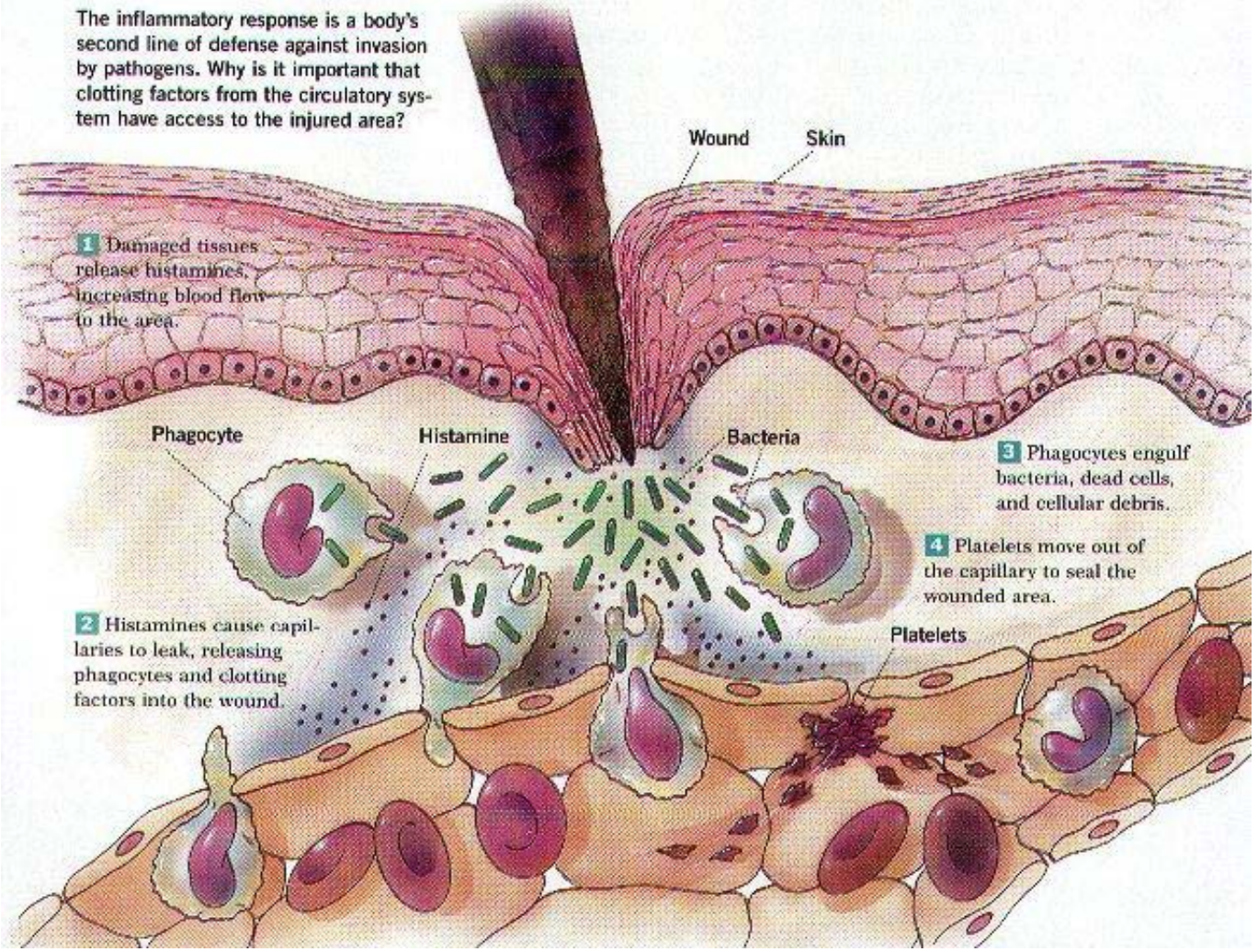
1. Vascular
2. Extravasation of plasma(Fluid exudate)
3. Cellular exudate

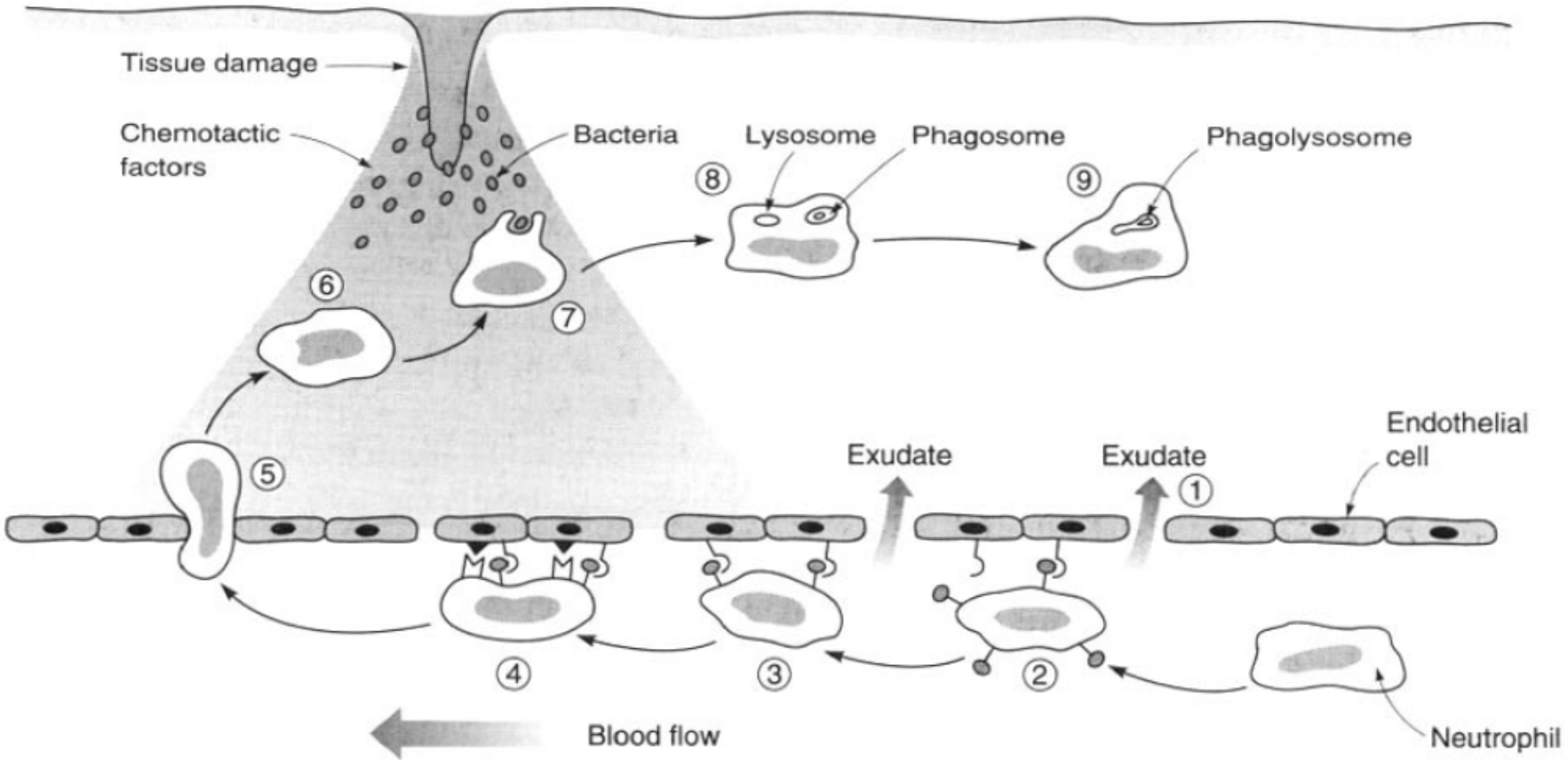
Acute inflammation: Detailed Consideration

- Initiating events
- Events at the site of damage
- Vasodilation
- Increased capillary permeability
- Cell migration
- Phagocytosis

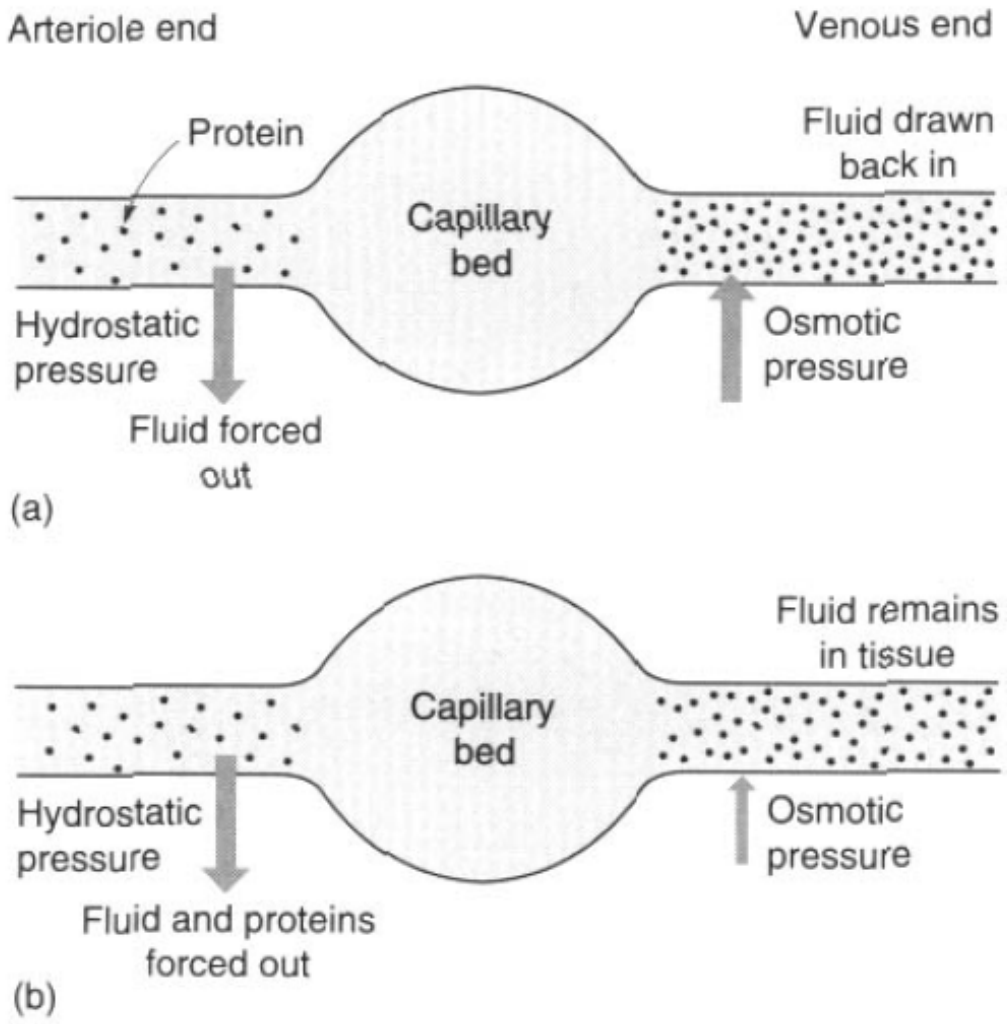
Steps of the Inflammatory Response

The inflammatory response is a body's second line of defense against invasion by pathogens. Why is it important that clotting factors from the circulatory system have access to the injured area?





Schematic illustrating neutrophil margination, emigration, chemotactic attraction and phagocytosis in an inflammatory response



Generation of oedema in inflamed tissue

Benefits and Drawbacks of the Inflammatory Response

- Benefits
- Drawbacks

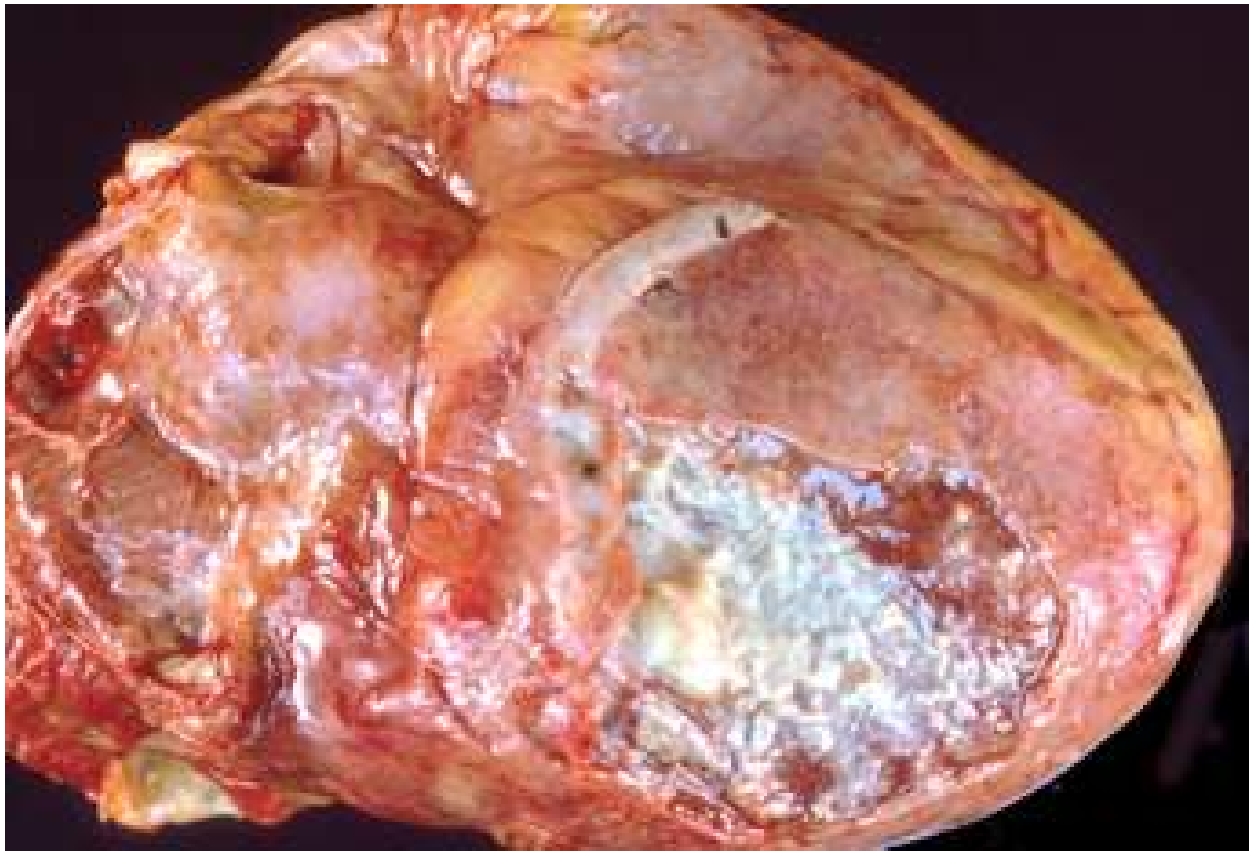
Forms of acute inflammation

- Serous inflammation
- Catarrhal inflammation
- Fibrinous inflammation
- Haemorrhagic inflammation
- Suppurative inflammation
- Pseudomembranous inflammation
- Gangrenous or necrotising inflammation

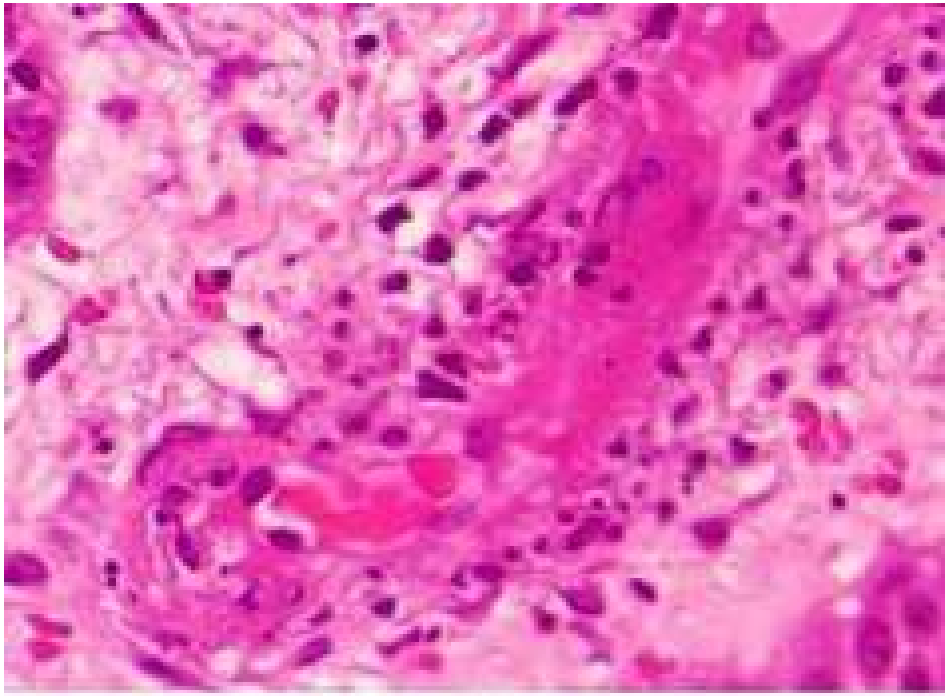
Serous inflammation

Catarrhal inflammation

Fibrinous inflammation
(Bread & Butter pericarditis)

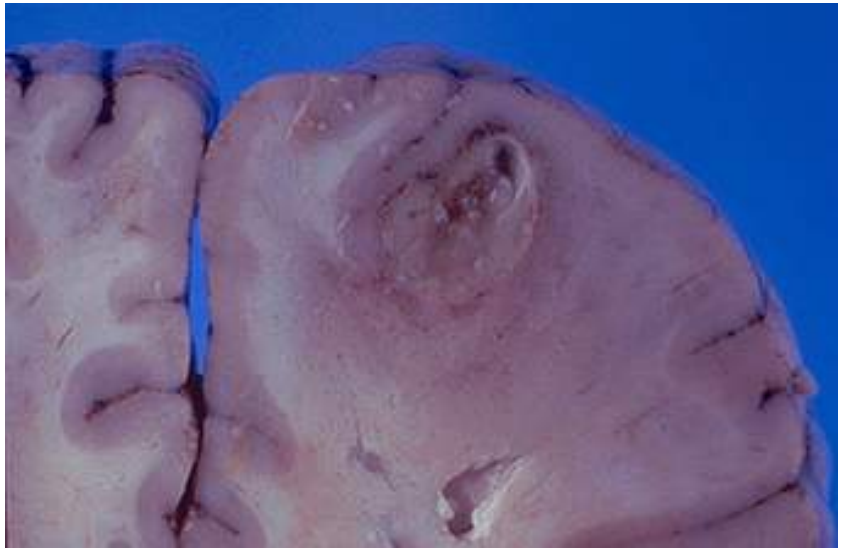


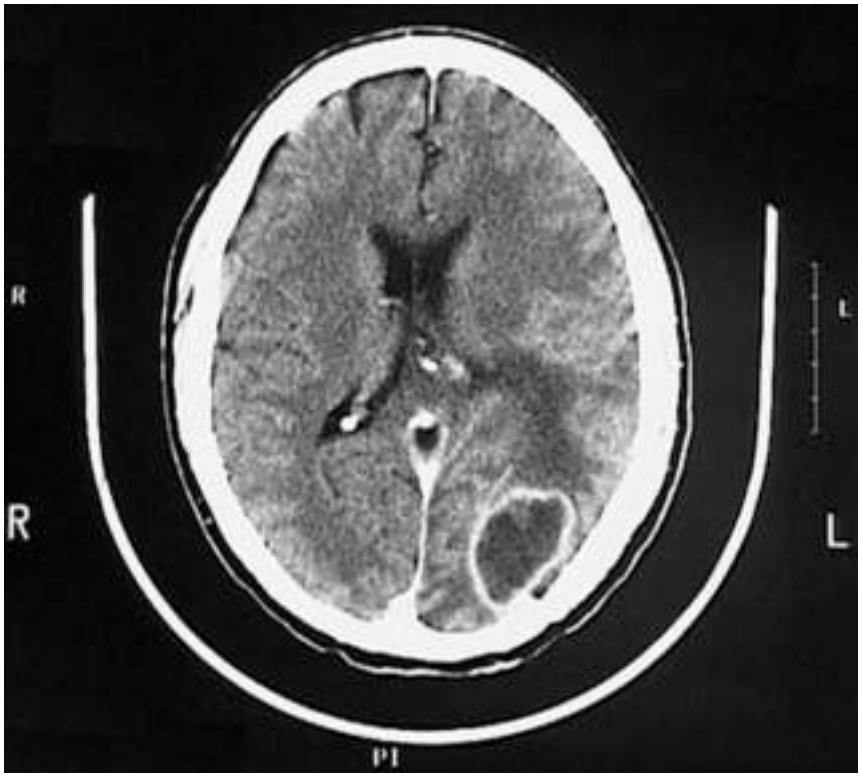
Haemorrhagic inflammation



Meningococcal Septicemia.
A vessel is occluded by a fibrin thrombus.
There are some neutrophils in the surrounding dermis.

Suppurative inflammation





Pseudomembranous inflammation

Gangrenous or necrotising inflammation

Necrosis

Termination of inflammation

- Resolution
- Fibrosis
- Suppuration
- Necrosis

IV. Chronic inflammation

Chronic inflammation

- exudation is less obvious
- characterized more by changes in cell and connective tissue proliferation

Forms of Chronic inflammation

1. Diffuse interstitial inflammation
2. Granulomatous inflammation

1. Diffuse interstitial inflammation

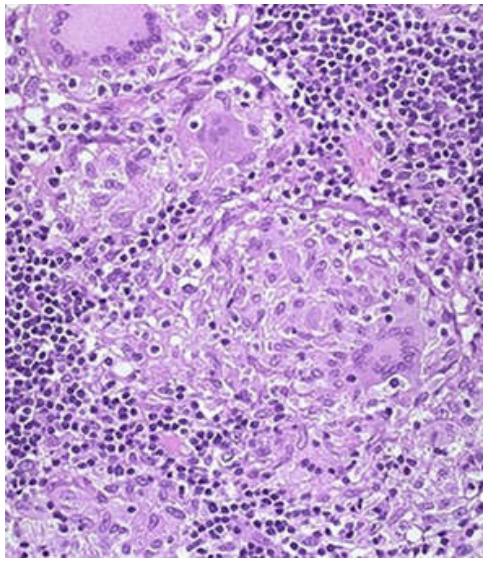
- has no particularly characteristic pattern of tissue reaction.
- The cells involved are monocytes, lymphocytes, plasma cells and fibroblasts (connective tissue cells).

2. Granulomatous inflammation

- There is an attempt to wall-off and so isolate the affected site.
- The cells involved are reticuloendothelial cells and their derivatives (largely macrophages).

Granuloma

A granuloma is a focal area of granulomatous inflammation which consists of a spherical accumulation of activated macrophages (epithelioid histiocytes) surrounded by lymphocytes & occasional plasma cells and giant cells and usually connective tissue.



Granuloma(Contd.)

- occur in relatively few diseases
- e.g. tuberculosis, syphilis, rheumatic fever
  rheumatoid arthritis (as subcutaneous nodules)
  foreign-body inflammation

Causes of Chronic Inflammation

- Persistence of infection with microorganisms
- Autoimmunity
- Prolonged exposure to either exogenous or endogenous toxins
- Persistence of acute inflammation

V. Systemic effects of inflammation

Systemic effects of inflammation

- Constitutional symptoms
- Haematological changes
- Pyrexia
- Reactive hyperplasia of the reticuloendothelial system
- Amyloidosis

VI. Factors affecting healing

Factors affecting healing

- Many factors affect the healing of an individual, from their own hormonal status through to the use of deliberate interventions such as the use of a cold compress, ultrasound or drugs.

Healing of a skin wound

1. Primary union(First intention)
2. Secondary union(Second intention)

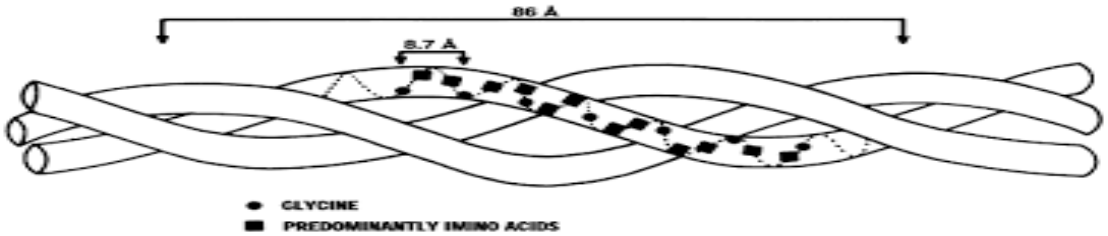
Proline → Hydroxyproline

Proline hydroxylase

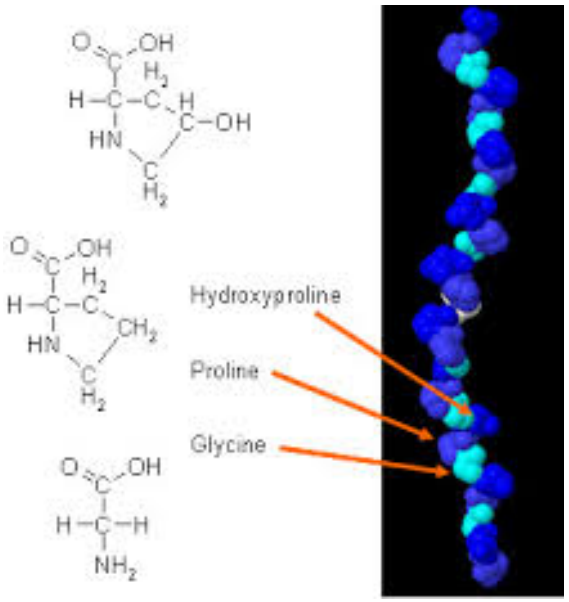
Oxygen

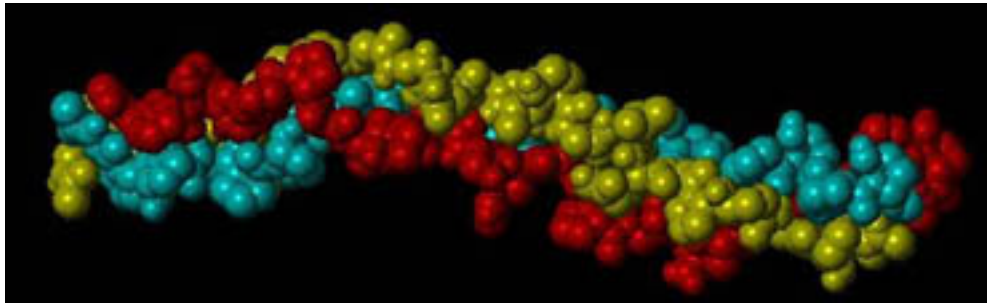
Vitamin C

Triple helix structure of collagen

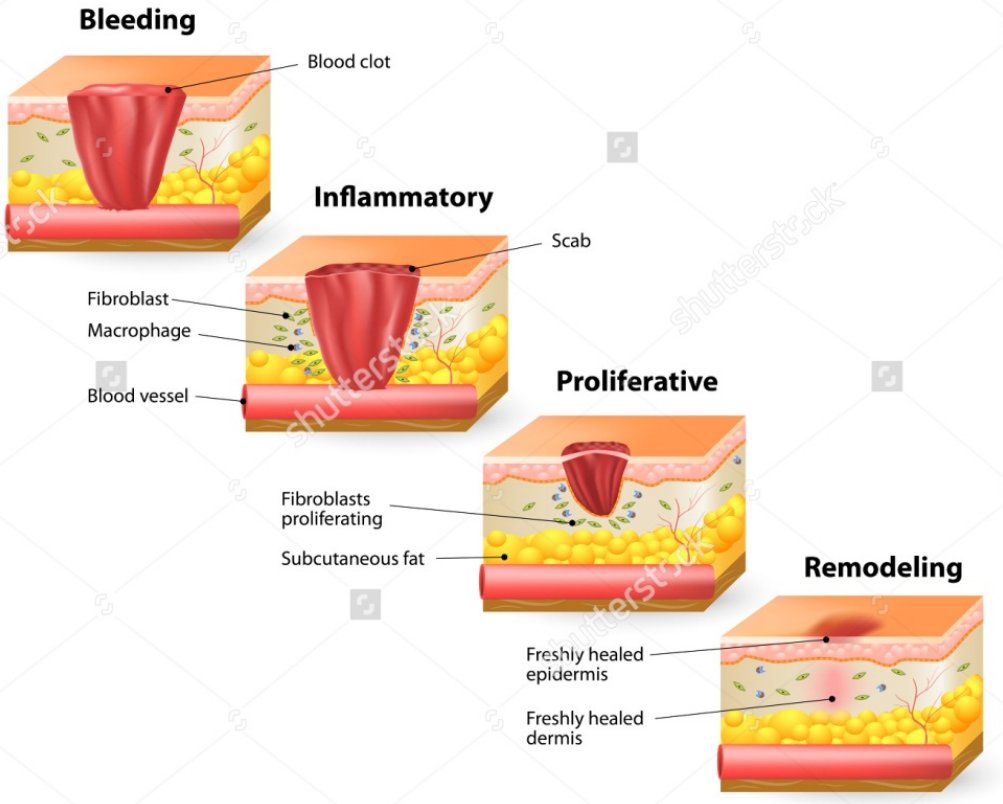

86 Å
8.7 Å
GLYCINE
PREDOMINANTLY IMINO ACIDS


Polypeptide chain
Collagen

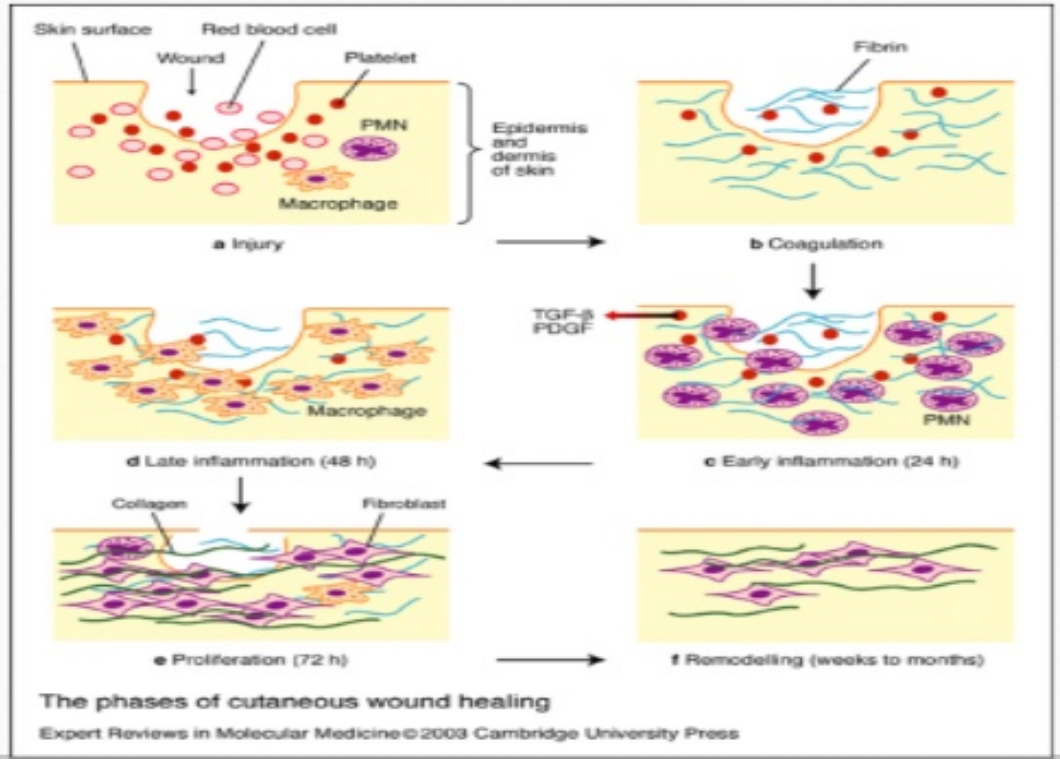

Hydroxyproline
Proline
Glycine



WOUND HEALING



Stages of Wound Healing



The phases of cutaneous wound healing

VII. Treatment of inflammation

Treatment of inflammation

- **Temperature Therapy**
  - Cold therapy (cryotherapy)
  - Heat therapy
- **Mechanical Manipulation**
- **Electrotherapy**
- **Ultrasound Therapy**
- **Drug Therapy**

Review

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QUESTIONS?

THANK YOU