

2- Chronic Inflammation

Chronic inflammation can be defined as a prolonged inflammatory process (weeks or months) where an active inflammation, tissue destruction and attempts at repair are proceeding continuously.

Causes of chronic inflammation:

1. Persistent infections

Certain microorganisms associated with intracellular infection such as tuberculosis, leprosy, certain fungi etc characteristically cause chronic inflammation.

These organisms are of low toxicity and evoke delayed hypersensitivity reactions.

2. Prolonged exposure to nondegradable but partially toxic substances either endogenous lipid components which result in atherosclerosis or exogenous substances such as silica, asbestos.

3. Progression from acute inflammation: Acute inflammation almost always progresses to chronic inflammation following:

a. Persistent suppuration as a result of uncollapsed abscess cavities, foreign body materials (dirt, cloth, wool, etc), sequestrum in osteomyelitis, or a sinus/fistula from chronic abscesses.

4. Autoimmunity. Autoimmune diseases such as rheumatoid arthritis and systemic lupus erythematosus are chronic inflammations from the outset

Morphology:

Cells of chronic inflammation:

Monocytes and Macrophages are the primary cells in chronic inflammation. Macrophages arise from the common precursor cells in the bone marrow, which give rise to blood monocytes. These cells are then diffusely scattered in various parts of the body, in the liver (Kupffer cells), spleen, lymph nodes (sinus histiocytes), lungs (alveolar macrophages), bone marrow, brain (microglia), skin (Langerhan's cells), etc.... These cells constitute the mononuclear- phagocytic system.

Macrophages are scavenger cells of the body.

Other cells in chronic inflammation:

1. **T-Lymphocytes** are primarily involved in cellular immunity with lymphokine production, and they are the key regulator and effector cells of the immune system.
2. **B-lymphocytes and Plasma cells** produce antibody directed either against persistent antigen in the inflammatory site or against altered tissue components.
3. **Mast cells and eosinophils** appear predominantly in response to parasitic infestations & allergic reactions.

Though neutrophils are hallmarks of acute inflammatory reactions, large numbers of neutrophils may be seen in some forms of chronic inflammation, notably chronic osteomyelitis, actinomycosis, & chronic lung diseases induced by smoking and other stimuli. Thus, the overall differentiation points between acute and chronic inflammations include:

Characteristics	Acute inflammation	Chronic inflammation
Duration	Short	Relatively long
Pattern	Stereotyped	Varied
Predominant cell	Neutrophils Lymphocytes	Macrophages, plasma cells
Tissue destruction	Mild to moderate	Marked
Fibrosis	Absent	Present
Inflammatory reaction	Exudative	Productive

Classification of chronic inflammation:

Chronic inflammation can be classified into the following two types based on histologic features:

1) Nonspecific chronic inflammation: This involves a diffuse accumulation of macrophages and lymphocytes at site of injury that is usually productive with new fibrous tissue formations. E.g. Chronic cholecystitis.

2) Specific inflammation (granulomatous inflammation):

Definition: Granulomatous inflammation is characterized by the presence of granuloma. A granuloma is a microscopic aggregate of epithelioid cells. Epithelioid cell is an activated macrophage, with a modified epithelial cell-like appearance (hence the name epithelioid). The epithelioid cells can fuse with each other & form multinucleated giant cells. So, even though, a granuloma is basically a collection of epithelioid cells, it also usually contains multinucleated giant cell & is usually surrounded by a cuff of lymphocytes and occasional plasma cells. There are two types of giant cells:

a. **Foreign body-type giant cells** which have irregularly scattered nuclei in presence of indigestible materials.

b. **Langhans giant cells** in which the nuclei are arranged peripherally in a horse -shoe pattern which is seen typically in tuberculosis, sarcoidosis etc... Giant cells are formed by fusion of macrophages perhaps by a concerted attempt of two or more cells to engulf a single particle.

There are different types of inflammation depending on their exudate:

1) Serous inflammation

This is characterized by an outpouring of a thin fluid that is derived from either the blood serum or secretion of mesothelium cells lining the peritoneal, pleural, and pericardial cavities. It resolves without reactions

2) Fibrinous inflammation

More severe injuries result in greater vascular permeability that ultimately leads to exudation of larger molecules such as fibrinogens through the vascular barrier. Fibrinous exudate is characteristic of inflammation in serous body cavities such as the pericardium

Course of fibrinous inflammation include:

Resolution by fibrinolysis

Scar formation between parietal and visceral surfaces i.e. the exudates get organized

Fibrous strand formation that bridges the pericardial space.

3) Suppurative (Purulent) inflammation

This type of inflammation is characterized by the production of a large amount of pus. Pus is a thick creamy liquid, yellowish or blood stained in color and composed of

A large number of living or dead leukocytes (pus cells)

Necrotic tissue debris

Living and dead bacteria

Edema fluid

There are two types of suppurative inflammation:

A) Abscess formation:

An abscess is a circumscribed accumulation of pus in a living tissue. It is encapsulated by a so-called pyogenic membrane, which consists of layers of fibrin, inflammatory cells and granulation tissue.

B) Acute diffuse (phlegmonous) inflammation

This is characterized by diffuse spread of the exudate through tissue spaces. It is caused by virulent bacteria (eg. streptococci) without either localization or marked pus formation. Example: Cellulitis (in palmar spaces).

4) Catarrhal inflammation

This is a mild and superficial inflammation of the mucous membrane. It is commonly seen in the upper respiratory tract following viral infections where mucous secreting glands are present in large numbers, eg. Rhinitis

5) Pseudomembranous inflammation

The basic elements of pseudomembranous inflammation are extensive confluent necrosis of the surface epithelium of an inflamed mucosa and severe acute inflammation of the underlying tissues. The fibrinogens in the inflamed tissue coagulate within the necrotic epithelium. And the fibrinogen, the necrotic epithelium, the neutrophilic polymorphs, red blood cells, bacteria and tissue debris form a false (pseudo) membrane which forms a white or colored layer over the surface of inflamed mucosa.

Pseudomembranous inflammation is exemplified by Diphtheria infection of the pharynx or larynx and Clostridium difficile infection in the large bowel following certain antibiotic use.

Ex: when a large amount of fibrinous exudate present in the pericardium this give bread and butter appearance

6- Lymphocytis Inflammation

This type of inflammation characterized by only accumulation of lymphocyte in the tissue due to viral infection or poisoning this occur mainly around the blood vessels this called perivascular cuffing.

7- Hemorrhagic inflammation

In this type of inflammation the RBCS present in the tissue outside the blood vessels .this due to highly virulent microorganism (anthrax), acute poisoning by certain material, viral infection