



Inflammation

Inflammation is a response of vascularized tissues to various injuries that brings cells and molecules of host defense from the circulation to the sites of injury, in order to eliminate the offending agents. There are two types of inflammation (acute and chronic)

- **Acute inflammation:** is the initial and rapid response to infections and tissue damage. Among the acute inflammatory disorders are: acute asthmatic attack, pyelonephritis, acute gouty attack and septic shock.
- **Chronic inflammation:** is an inflammatory response of longer duration and is associated with more tissue destruction, which is induced by persistence of the causative stimulus. Among the disorders are: osteoarthritis and atherosclerosis.

Table (1): differences in general features between acute and chronic inflammation

Feature	Acute	Chronic
Onset	Fast: minutes or hours	Slow: days
Cellular infiltrate	Mainly neutrophils	Monocytes/macrophages and lymphocytes
Tissue injury, fibrosis	Usually mild and self-limited	Often severe and progressive
Local and systemic signs	Prominent	Less

Causes of Inflammation:

- 1. Infections:** by bacteria, viruses, fungi and parasites. These micro-organisms secrete toxins responsible for inflammation
- 2. Tissue necrosis:**
- 3. Foreign bodies:** splinters, dirt and sutures
- 4. Immune reaction (hypersensitivity):** like in case of autoimmune diseases or hypersensitivity to certain drugs.

Main Signs of Inflammation are:

- 1. Redness:** which is due to dilatation of small blood vessels within inflamed tissues
- 2. Heat:** increased blood flow (hyperemia) due to vasodilatation
- 3. Swelling:** accumulation of fluids in the extracellular spaces, due to increased vascular permeability
- 4. Pain:** results from stretching and destruction of tissues causing the release of inflammatory mediators (prostaglandin, bradykinin and serotonin)
- 5. Loss of function:** the inflamed area is inhibited by pain, while swelling also physically immobilize the tissue

Acute Inflammation:

Is the immediate response to injury, usually short duration and aims primarily to removing injurious agents and limiting the extent of tissue damage. Neutrophils are mainly involved in this type of inflammation.

Chronic Inflammation:

An inflammatory response with prolonged duration (up to weeks, months or years), produced by persistence of the causative stimulus. Monocytes and lymphocytes are the main cells involved in this type of inflammation.

The characteristics of Chronic Inflammations:

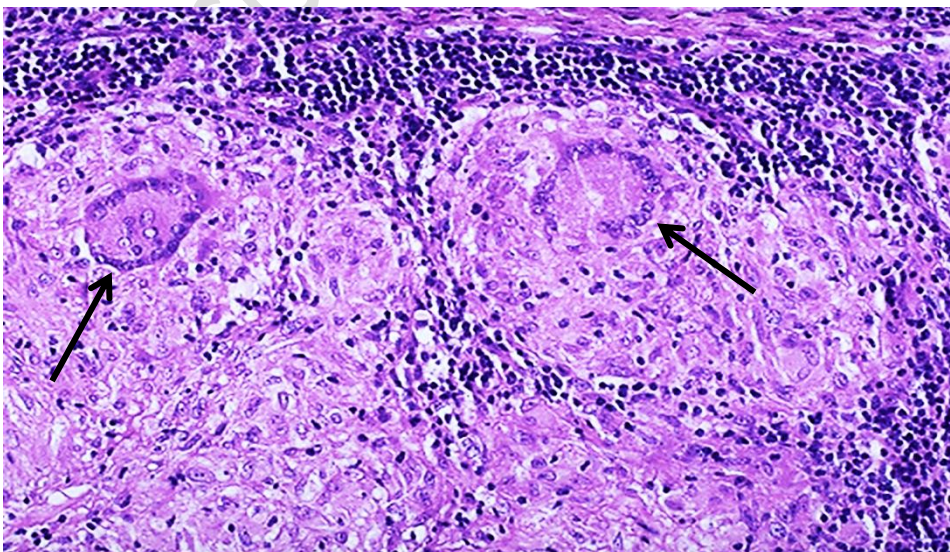
1. Infiltration of mononuclear cells (monocytes and lymphocytes)
2. Tissue destruction produced by the inflammatory mediators (IL-1, IL-6, TNF- α and various antibodies) released from the mononuclear cells
3. Tissue repair and fibrosis, which involves the formation of new blood vessels (angiogenesis) and replacement of lost tissue

In chronic inflammation a certain type of cells may appear in the histopathological section, they are called **Giant cells**.

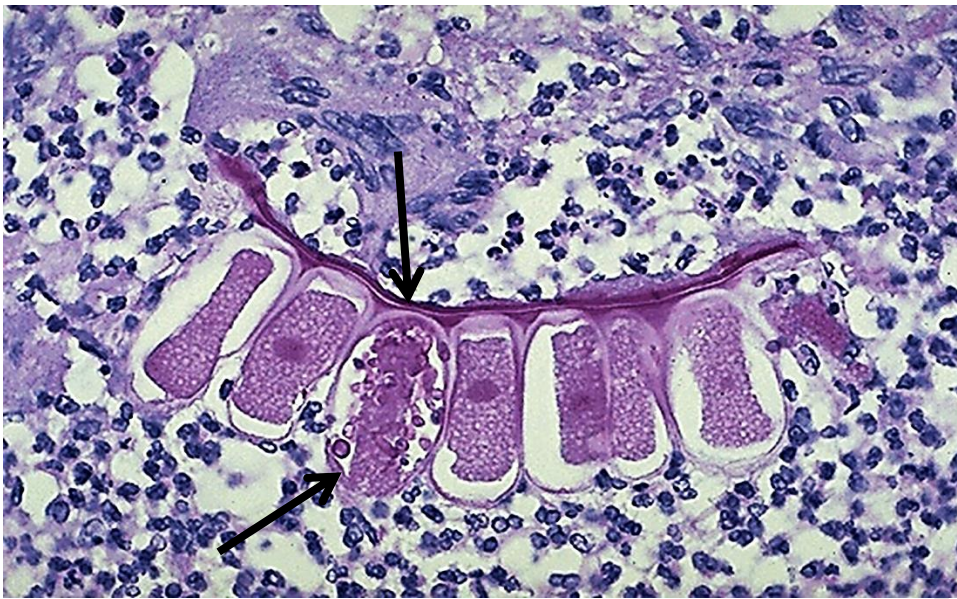
Giant cells:

They are a group of epithelioid cells, poly-nucleated cells and mono-nucleated cells fused together with a large mass of cytoplasm. Giant cells can have diameter of 40 – 50 μm and the nucleated cells may arrange:

- Peripherally (called Langhans - type giant cells)
- Haphazardly (called Foreign body - type giant cells)



A section of tissue showing Langhans - type giant cells (indicated by the black arrows), in which the nucleated cells are arranged around the periphery of the cell



A section of tissue showing Foreign body - type giant cell (indicated by black arrows), in which the nucleated cells are scattered haphazardly within the cell

Morphological Changes of Acute and Chronic Inflammation:

1. Serous inflammation:

Thin watery exudate, results from insufficient amount of fibrinogen to produce fibrin (eg: blisters from second degree burn, viral pleuritis).

2. Fibrinous Inflammation:

Due increased vessel permeability with deposition of fibrin - rich exudate. Often occurs in the serosal lining of the pericardium, peritoneum and pleura, so it will be covered with an opaque creamy layer of fibrin and there is a danger of adhesions (eg: fibrinous pericarditis)

3. Suppurate (purulent) Inflammation:

This is characterized by formation of pus consisting of neutrophils, necrotic cells and edema fluids (eg: acute appendicitis, meningitis)

4. Catarrhal Inflammation (inflammation of mucous membrane):

It is a mild form of inflammations, marked by secretion of mucous (eg: common cold and hay fever)

5. Ulcerative Inflammation:

Necrosis on the surface or near the surface of the tissue leading to loss of tissue and creating a local defect (ulcer) (eg: bed sore, gastric epithelium, colonic mucosa and bladder epithelium).

6. Pseudomembranous Inflammation:

It is characterized by the formation of a second or false membrane. It is formed when there is a severe inflammation with extensive necrosis of the surface epithelium.

The fibrinogen in the inflammatory exudate coagulates with the necrotic epithelium together with neutrophils, RBCs, bacteria and tissue debris forming a false (pseudo membrane) membrane, which appears as a white layer on the surface of the inflammatory mucosa (eg: diphtheria, pseudomembranous colitis due to *Clostridium difficile*, certain drugs like the antibacterial lincomycin)

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