

PATHOPHYSIOLOGY – BP204T

UNIT: 1

CLASS: 6

TOPIC: ALTERATION IN VASCULAR PERMEABILITY AND BLOOD FLOW

Alteration in Vascular Permeability and Blood Flow during Inflammation

One of the hallmark features of inflammation is the **change in blood flow and vascular permeability**. These alterations allow immune cells, plasma proteins, and nutrients to reach the site of injury or infection.

1. Changes in Blood Flow (Hemodynamic Changes)

After tissue injury:

- **Vasodilation** occurs:
 - **Arterioles and capillaries** widen, leading to **increased blood flow**.
 - This causes **redness (rubor)** and **heat (calor)** at the site.
- **Slowing of blood flow (stasis):**
 - As fluid leaves the vessels (due to increased permeability), blood becomes more **viscous**.
 - This causes **sluggish circulation** and helps white blood cells to **marginate** (line the vessel wall).

2. Increased Vascular Permeability

Vascular permeability increases to allow **proteins, antibodies, and immune cells** to exit the bloodstream and enter tissues. There are several mechanisms:

a. Endothelial Cell Contraction (Immediate Response)

- Caused by histamine, bradykinin, leukotrienes
- Creates small gaps between endothelial cells (mainly in **post-capillary venules**)
- Rapid and short-lived (minutes)

b. Endothelial Injury

- Direct damage (e.g., burns, toxins) leads to **necrosis** of endothelial cells
- Results in sustained leakage until repaired

c. Transcytosis

- Transport of proteins via vesicles across endothelial cells
- Involves channels such as **VEGF (vascular endothelial growth factor)**

d. Leukocyte-mediated endothelial injury

- Activated white blood cells may release **ROS** and proteolytic enzymes
- Causes further leakage and damage