• Why is it important that a patient comes to clinic because her eyelids are suddenly puffy or her legs are swollen?
Normal fluid homeostasis is critical to orderly cellular functioning, and although mild edema may be simply annoying, pulmonary or cerebral edema may be rapidly fatal.

I. Fluid distribution
   • ~60% of lean body weight is water
   • ~2/3 is intracellular
   • ~1/3 is extracellular (mostly interstitial)
   • ~5% of total body water is in blood plasma
Edema — increased fluid in the interstitial tissue spaces
Fluid collections in different body cavities may have various designations

- Hydrothorax (pleural effusion)
- Hydropericardium
- Hydroperitoneum (usually called ascites)
- Anasarca is severe, generalized edema with profound subcutaneous tissue swelling
• Edema fluid may be:
  • 1] transudate which is more often the case, such as in oedema of cardiac and renal disease
  • 2] exudate such as in inflammatory oedema. The differences between transudate and exudate are tabulated.
• **Transudate**: protein-poor, specific gravity $< \sim 1.012$ to $1.015$, usually with few cells.

• **Exudate**: protein-rich, specific gravity $> \sim 1.015$ to $1.020$, often with inflammatory components such as leucocytes, fibrin, etc.)

• **Edema in inflammatory conditions**
Pathogenesis

- Reduced Plasma Osmotic Pressure
- Increased capillary hydrostatic pressure
- Lymphatic obstruction
- Tissue factors (increased oncotic pressure of interstitial fluid, and decreased tissue tension)
- Increased capillary permeability
- Sodium and water retention.
Reduced Plasma Osmotic Pressure

• A fall in the total plasma protein level (hypoproteinaemia of less than 5 g/dl), results in lowering of plasma oncotic pressure in a way that it can no longer counteract the effect of hydrostatic pressure of blood.

• This results in increased outward movement of fluid from the capillary wall and decreased inward movement of fluid from the interstitial space causing oedema.

• Hypoproteinaemia usually produced generalized oedema (anaasarca).
Causes

• 1-Oedema of renal disease
• 2-Ascites of liver disease e.g. in cirrhosis
• 3-protein-losing enteropathy
• a. Local
• B. Generalized
Increased capillary hydrostatic pressure

• A rise in the hydrostatic pressure at the venular end of the capillary which is normally low (average 12 mmHg) to a level more than the plasma oncotic pressure results in minimal or no reabsorption of fluid at the venular end, consequently leading to oedema.
Causes

• 1-Cardiac disease e.g. in congestive cardiac failure, constrictive pericarditis.
• 2-Ascites of liver disease e.g. in cirrhosis of liver.
• 3-Passive congestion e.g. in mechanical obstruction due to thrombosis of veins of the lower legs, varicosities, pressure by pregnant uterus, tumors etc
• 4- Postural oedema e.g. transient oedema of feet and ankles due to increased venous pressure seen in individuals who remain standing erect for longtime
Lymphatic obstruction

- Normally the interstitial fluid in the tissue spaces escapes by way of lymphatics so that obstruction to outflow of these channels causes localized oedema, known as lymphoedema.
causes

• 1-Removal of axillary lymph nodes in radical mastectomy for carcinoma of the breast produces lymphoedema of the affected arm.
• 2-Pressure from outside on the main abdominal or thoracic duct such as due to
  • A.tumours
  • B.effusions in serous cavities etc may produce lymphoedema
3- Inflammation of the lymphatics as seen in filariasis (infection with Wuchereria bancrofti) results in chronic lymphoedema of scrotum and legs known as elephantiasis.

4- Occlusion of lymphatic channels by malignant cells may result in lymphedema.

5- Milroy's disease or hereditary lymphoedema is due to abnormal development of lymphatic channels. It is seen in families and the edema is mainly confined to one or both the lower limbs.
Tissue factors

• Elevation of oncotic pressure of interstitial fluid as occurs due to increased vascular permeability and inadequate removal of proteins by lymphatics.

• Lowered tissue tension as seen in loose subcutaneous tissues of eyelids and external genitalia.
Increased capillary permeability

- when the capillary endothelium is injured by various 'capillary poisons' such as toxins and their products, histamine, anoxia, venoms, certain drugs and chemicals, the capillary permeability to plasma proteins is enhanced due to development of gaps between the endothelial cells---------- causes reduced plasma oncotic pressure and elevated oncotic pressure of interstitial fluid which consequently produces oedema.
• 1-Generalized oedema due to increased vascular permeability may occur in:
• systemic infections
• poisonings
• certain drugs and chemicals
• anaphylactic reactions and anoxia
2-Localized oedema such as:
- Inflammatory oedema as seen in:
- Infections
- allergic reactions
- insect-bite
- irritant drugs and chemicals
- angioneurotic oedema is an acute attack of localized oedema occurring on the skin of face and trunk and may involve lips, larynx, pharynx & lungs
Sodium and water retention.

- Normally, about 80% of sodium is reabsorbed by the proximal convoluted tubule under the influence of intrinsic renal mechanism or extra-renal mechanism.
- Intrinsic renal mechanism is activated in response to sudden reduction in the effective arterial blood volume (hypovolaemia) as occurs in severe haemorrhage.
- Hypovolaemia stimulated the arterial baroreceptors present in the carotid sinus and aortic arch which in turn, send the sympathetic outflow via the vasomotor centre in the brain.
• Renal ischaemia occurs which causes reduction in the glomerular filtration rate, decreased excretion of sodium in the urine and consequent retention of sodium