Lec 8 part 2 / Sickle Cell Anemia

Definition : Sickle cell anemia is an inherited hemolytic anemia caused by a structural abnormality of hemoglobin (HbS), leading to chronic hemolysis, vaso-occlusion, and organ damage.

Pathogenesis

• A point mutation occurs in the β-globin gene on chromosome 11

• Glutamic acid is replaced by valine at position 6 of the β-globin chain

• This produces Hemoglobin S (HbS)

Mechanism:

1. Under low oxygen tension, HbS polymerizes
2. RBCs become rigid and sickle-shaped
3. Leads to:

• Hemolysis (shortened RBC lifespan ~10–20 days)

• Vaso-occlusion → ischemia and pain

• Splenic damage → functional asplenia

Triggers of sickling:

• Hypoxia • Dehydration •Infection • Acidosis • Cold exposure

Causes:

• Autosomal recessive inheritance

• Occurs when an individual inherits two HbS genes (HbSS)

• Common in :Africa و Middle Eastو Mediterranean region India

Signs and Symptoms:

1.General:

• Chronic anemia → fatigue, pallor

• Jaundice (due to hemolysis)

2.Painful (Vaso-occlusive) Crises:

• Severe bone pain

• Dactylitis (hand-foot syndrome) in children

• Chest pain (acute chest syndrome)

3. Organ-related:

• Splenomegaly in early childhood → autosplenectomy later

• Increased infections (especially encapsulated bacteria)

• Stroke

• Leg ulcers

• Delayed growth and puberty

• Priapism (males)

Laboratory Diagnosis:

1.Complete Blood Count (CBC):

↓ • Hemoglobin

• Normocytic or mildly macrocytic anemia

↑ • Reticulocyte count

2.Peripheral Blood Smear:

• Sickle-shaped RBCs

• Target cells

• Howell–Jolly bodies (functional asplenia(

• Polychromasia

3.Sickling Test (Screening):

• Sodium metabisulfite induces sickling (positive(

4.Hemoglobin Electrophoresis (Confirmatory)

- HbS present
- ↓or absent HbA
- ↑HbF (protective)

5.Other Findings:

- ↑Indirect bilirubin
- ↑LDH
- ↓Haptoglobin