HEMOLYTIC ANEMIA & HEREDITARY SPHEROCYTOSIS

Hemolytic Anemia is:

❶A basic pathological change that leads in the reduction of life span of RBCs.
❷An increase in the rate of RBCs destruction.

Notes

- Normal life span of RBCs is about 120 days
- The life span in hemoly c anime is usually 30 days
- In hemolytic anime the is usually an increase in the bilirubin witch will give some sighs of jaundice.

Red cell breakdown

Extravascular	intravascular
Spleen and liver	**Blood stream**
Destruction of Hb released by macrophages • **Globin → amino acids** • **Iron → bind to transferring** • **Heam → metabolized to bilirubin**	**Free Hb released** • **Hbemia , hburia** • **Haemosiderinuria** • **methaemalbumiemia**

Intravascular and extra vascular hemolysis:

- Extra vascular hemolysis:
  - Excessive removal of RBCs by RE system.
- Intravascular hemolysis:
  - ✓ RBCs are broken down in the circulation.
  - ✓ Free Hb is released saturation of haptoglobin.

Excess free Hb → urine → hemoglobinuria and iron accumulation in renal tubules → hemosidrinuria
The urine will be black

List 3 lab abnormalities in hemolytic anemia.
1. Increased uneonjugated bilinibin
2. Decreased serum haptoglobin
3. Decreased hemoglohinuria

What are some clinical effects of hypebilirubinemia?
Jaundice and pigment-containing gallstones

What usually causes intracorpuscular hemolytic anemia?
Genetic defects in the nBC, leading to their destruction.

What is the most frequent cause of extracorpuscular hemolytic anemia?
Acquired changes in the nBC environment, which lead to their destruction (e.g., circulatiag antibodies, enlarged spleen)

HEREDITARY SPHEROCYTOSIS (HS)

It is a hereditary hemolytic anemia due to membrane defect

Pathogenesis

- ✓ HS is usually caused by defect in proteins involved in the vertical interactions between the membrane skeleton and the lipid bilayer of the red cell.
- ✓ the loss of the membrane may be caused by the release of parts of the lipid bilayer that are not supported by skeleton.

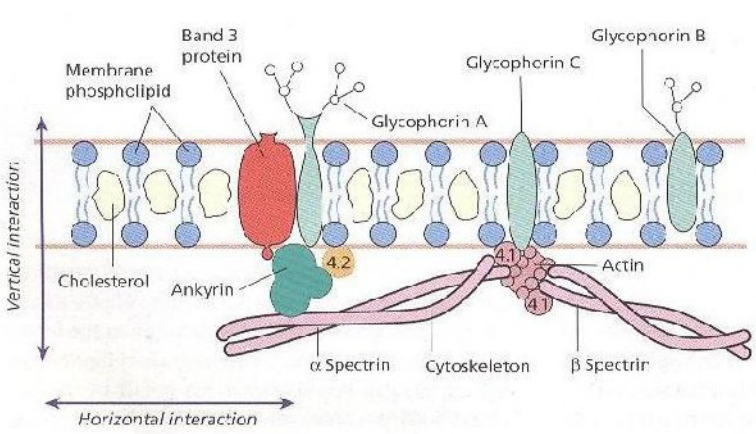

Fig. 2.12 The structure of the red cell membrane. Some of the penetrating and integral proteins carry carbohydrate antigens; other antigens are attached directly to the lipid layer.

- ✓ In HS the defect is in Actin, Ankyrin , **and bind 3 α** band 4.1 to allow the flexibility and convexity to RBCs. " that's way they are destroyed in the spleen"
- ✓ The marrow produce red cells of normal biconcave shape BUT they loss membrane and become more and more spherical (loss of the surface area relative to volume) as they circulate through spleen and the rest of reticuloendothelial system
- ✓ Ultimately the spherocytes are unable to pass through the splenic microcirculation where they die prematurely.

Clinical features

- ☒ Autosomal dominant , rarely it may be recessive.
- ☒ Anemia present at any age
- ☒ Splenomegaly.
- ☒ Jaundice is typically fluctuating and is particularly marked if anaemia associated with Gilbert's disease (defect of hepatic conjugation of bilirubin).
- ☒ Aplastic crisis precipitated by parvovirus infection "by suppression of the bone marrow by the virus", causing a sudden increase in severity of anemia. " acute hemolytic + decrees erythpoisis"
- ☒ pigment gallstone "cholethiaris"

> The difference between the stones of hemolytic anime and other is that the stones are asympatric.

Laboratory findings:

- Anemia.
- Reticulocytosis.
- Blood film: spherocytes.
- Osmotic fragility: increased.
- Increase the requirement of Glucose

What is the "osmotic fragility" test?
The osmotic fragility test is done to confirm the diagnosis of hereditary spherocytosis. A Patient's red blood cells are placed in different concentrations of saline solution for 24 hours. When red blood cells are placed in saline solution, they absorb water until the cell Membrane bursts. Spherocytes do not tolerate weak saline solutions, causing them to burst Sooner than normal cells.

Treatment

- Splenectomy → it can be effected in other types of hemolytic anime
- Folic acid supplement.

After splenectomy spherocytes persist but are no longer selectively trapped and destroyed within the spleen, an approximately normal red cell life spam is found postoperatively.

What is HS?
The most common inherited intracorpuscular hemolytic anemia. It is characterized by spherical RBCs.
What is its mode of inheritance?
Autosomal dominant , rarely it may be recessive
What causes the anemia?
The abnormally shaped cells are trapped and destroyed in the spleen.
Why are the RBCs shaped like spheres?
Molecular defects in cytoskeletal proteins in the RBC (e.g., spectrin. ankyrin, and protein 4.2) cause the deformity.
What is the diagnostic test?
Increased erythrocyte osmotic fragility to hypotonic saline
What other abnonnalities may contribute to the diagnosis?
In lab values?
Reticulocytosis, increased mean corpuscular hemoglobin concentration)MCHC), and unconjugated hyperbilimbinemia
On physical exam?
Acholuric jaundice and splenomegaly