Hemolytic anemia

Hemolytic anemia refers to that there are both hemolysis and anemia (low Hb and PCV) at the same time.

Hemolysis means that the destruction of red cells is accelerated, i.e., shortened red cell survival.

Normally, in adults, the bone marrow output is well below its maximal capacity, so red cell production can be increased about six-folds. When compensation for Hemolysis fails then hemolytic *anemia* supervene.

So the clinical features of hemolysis are due to increased red cell destruction and production.

The difference between hemolysis (usually referred to as ***compensated hemolysis***; i.e., no associated anemia) and hemolytic anemia should be noted.

Hemolytic anemia is usually a normochromic normocytic type of anemia.

Hemolytic anemia can be classified into:

1) Hereditary or acquired.

- Hereditary:

i) Red cell membrane: as spherocytosis or elliptocytosis.

ii) Metabolism (enzymopathy): as G6PD deficiency. iii) Hemoglobinopathy: thalassemia and sickle cell anemia.

- Acquired:

i. Immune.

ii. Non-immune.

2) Intra-corpuscular (red cell membrane, metabolism "enzymopathy" and hemoglobin) and extra-corpuscular.

Extra-corpuscular causes are usually acquired, whereas intra-corpuscular causes are usually inherited.

3) Intravascular and extravascular (usually with splenomegaly).

General features of hemolysis:

I- **Increased red cell destruction:** In the degradation of hemoglobin, the molecule is broken down and bound to haptoglobin, the complex being rapidly internalized in the hepatocyte, so in the presence of hemolysis, serum *haptoglobin* levels are greatly reduced or absent.

The red cell destruction will overload pathways for hemoglobin breakdown, causing a modest *rise in unconjugated bilirubin* in the blood and mild *jaundice*. The bilirubin level is usually not more than two to three times normal because the normal liver is able to increase excretion to compensate for at least some of the increased production. Increased re-absorption of urobilinogen from the gut results in an increase in urinary *urobilinogen*.

Red cell destruction releases *LDH* and increases its serum level.

II- **Increased red cell production:** The bone marrow compensation results in *reticulocytosis*, and *nucleated red cell* precursors may also appear in the blood. The expansion of the active bone marrow may result in a *neutrophilia and immature granulocytes* in the blood to cause a *leucoerythroblastic blood film*.

The appearances of the red cells may give an indication of the likely cause of the hemolysis. Spherocytes are small, dark-red cells and suggest autoimmune hemolysis or hereditary spherocytosis; sickle cells suggest hemoglobinopathy; and red cell fragments indicate microangiopathic hemolysis.

Chronic hemolytic anemia may increase iron content of the body through increased iron absorption (as a result of anemia) coupled to the retention of the heme (haem) iron following binding to haptoglobin.

In most hemolytic anemias, owing to membrane defects, the destruction of red cells takes place extravascularly in the reticuloendothelial system.

When destruction is intravascular, free hemoglobin will be released into the plasma, producing *hemoglobinemia* and will pass through the glomerulus to produce *hemoglobinuria* (acute process of hemolysis). Iron deficiency is thus more likely than overload in intravascular hemolysis.

Increased red cell production leads to expansion of the red cell precursor compartment of the bone marrow. In the peripheral blood, the *polychromasia and macrocytosis of reticulocytosis* are the result of this increased throughput and release.

The increased cell production requires an increased supply of folate, which can produce folate deficiency unless supplements are given. It is usual to give folic acid daily to people with chronic hemolytic anemia.