

ANEMIA

Clinical features

- Dizziness
- Fatigue
- Pallor
- Headache

Clinical symptoms

- Tachycardia
- Tachypnea
- increased redcell 2,3-diphosphoglycerate
- If the patient has heart or lung diseases, symptoms will be worse
- Adaptive changes
- jaundice
- pigmented gall bladder stones
- Redurine
- Chronic hemolytic anemia:
 - Extramedullary hematopoiesis: splenomegaly, hepatomegaly
 - growth retardation
 - bone deformity
 - secondary hemochromatosis (damage to heart, endocrine glands)
- Thalassemia major and sickle cell anemia

Definitions

- Anemia - Reduction of oxygen carrying capacity of blood secondary to decrease in red cell mass
- Leads to tissue hypoxia
- Practically, measure by Hemoglobin concentration, and Hematocrit

ANEMIA AND ERYTHROPOIETIN

- Anemia triggers production of erythropoietin:
 - in acute anemia, production can increase by 5x or more in healthy people
 - In severe cases, causes extramedullary hematopoiesis in secondary hematopoietic organs (spleen, liver and lymph nodes)
 - *Causes compensatory erythroid hyperplasia in bone marrow (BM)
- Exceptions with low levels of erythropoietin:
 - anemia of renal failure
 - anemia of chronic inflammation

RBC indices

- Can be directly measured, or automated
- «Slight variation is present between labs, geographic areas
- sex, age, race, mobility status have effect
- Reticulocyte count: helps differentiate hemolytic anemia (high) from aregenerative anemia (low)

Classification

Cause

- Blood loss
 - Acute blood loss
 - related to decreased intravascular volume
 - If loss is > 20% of blood volume, patient might have hypovolemic shock and death
 - 2-3 days
 - Body response (adaptation)
 - Body responds by shifting fluid from interstitial to intravascular space, causing dilutional anemia and worse hypoxia
 - *Erythropoietin secretion is stimulated, activating BM erythropoiesis
 - 5-7 days
 - Iron fate:
 - In internal hemorrhage, iron is restored from extravasated RBCs and used again in erythropoiesis
 - In external and GIT hemorrhage, iron is lost, which complicates anemia
 - The anemia is normochromic normocytic, with reticulocytosis
 - Chronic blood loss
 - Occurs when the rate of RBC loss exceeds regeneration
 - Cause
 - Mostly occurs in gastrointestinal diseases
 - Excessive menstruation
 - Result
 - Iron deficiency
 - anemia appears hypochromic and microcytic, lowreticulocytes
- Diminished RBC production
 - Extrinsic factors (infection, antibody, mechanical)
 - Intrinsic RBC abnormalities:
 - 1) Hereditary (membrane, enzyme, Hg abnormalities)
 - 2) Acquired (Paroxysmal nocturnal hematuria)
 - Increase destruction (hemolytic anemia)

Morphology blood film

- Macrocytic anemia reflects stem cell disease and maturation
 - normo, micro, macrocytic (MCV)
 - Size
- Hypochromic microcytic anemia usually reflects impaired Hg synthesis
 - normo, hypochromic (MCH), hyper
 - Color
- anisopoikilocytosis (spherocytes, sickle, schistocytes) (RBC distribution width)
 - Shape