3rd lecture in hematology by Dr.Alaa Fadhil Alwan
IRON DEFICIENCY ANEMIA

Iron deficiency means a deficit in total body iron resulting from a sustained increase in iron requirements over iron supply. Three successive stages of iron lack can be distinguished. 1. iron depletion. 2. Iron-deficient erythropoiesis 3.iron-deficiency anemia

Epidemiology

Iron deficiency is the most common cause of anemia worldwide, occurs especially in toddlers, adolescent girls, women of childbearing age. Without iron supplementation, most women will become iron deficient during pregnancy. Globally, 30% to 70% of the populations in developing countries are iron deficient, with the highest prevalence among persons who have diets low in bioavailable iron, or who suffer from chronic gastrointestinal blood loss as a result of helminthic infection, or both.

Etiology and Pathogenesis

Iron requirement for an individual includes not only the iron needed to replenish physiologic losses and meet the demands of growth and pregnancy but also any additional amounts needed to replace pathologic losses. Physiologic iron losses generally are restricted to the small amounts of iron contained in the urine, bile, and sweat; shedding of iron-containing cells from the intestine, urinary tract, and skin; occult gastrointestinal blood loss; and, in women, uterine losses during menstruation and pregnancy. In normal men, the daily basal iron loss is slightly less than 1.0 mg/day. In normal menstruating women, the daily basal iron loss is approximately 1.5 mg/day.

Causes of Iron Deficiency

1.Decreased Iron Intake e.g Inadequate dietary iron
2.Decreased Iron Absorption e.g Achlorhydria, Gastric resection,Celiac disease (gluten-sensitive enteropathy), Pica
3.Increased Iron Loss
a.Gastrointestinal blood loss:
• Neoplasms
• Erosive gastritis due to nonsteroidal anti-inflammatory drugs
• Peptic ulcer disease
• Erosive esophagitis
• Inflammatory bowel disease (Crohn's disease, ulcerative colitis)
• Diverticular disease
• Hemorrhoids
• Meckel's diverticulum
• Infections: hookworm, schistosomiasis
b.Excessive menstrual blood flow
c.Frequent blood donation
d.Hemoglobinuria: paroxysmal nocturnal hemoglobinuria, malfunctioning artificial heart valve Hereditary hemorrhagic telangiectasia (Rendu-Osler-Weber syndrome), Hemodialysis,Idiopathic pulmonary hemosiderosis ,Runner's anemia
4.Increased Iron Requirements:e.g Infancy,Pregnancy, Lactation

Clinical Presentation

In general, the symptoms of iron deficiency anemia are those of anemia of any cause: fatigue, dyspnea on exertion, and dizziness. There are a few signs and symptoms that are relatively unique to iron deficiency anemia, including “spoon “fingernails, glossitis (atrophy of the papillae of the tongue, with burning or soreness), ulcerations or fissures at the corners of the mouth (angular stomatitis), and dysphagia due to esophageal webs or strictures. The combination of dysphagia, angular stomatitis, and hypochromic anemia has been called the Plummer-Vinson or Paterson-Kelly syndrome. These extreme signs of iron deficiency are now uncommon. Pica is the habitual consumption of unusual substances. It can be both a manifestation and a cause of iron deficiency. Specific examples of pica include geophagia (consumption of earth or clay), pagophagia (ice), and amylophagia (laundry starch). Food pica is the compulsive eating of one kind of food, often crunchy foods such as celery, potato chips, carrots, or raw potatoes. In most cases, pica is a symptom of iron deficiency and disappears when the iron deficiency is relieved.

In koilonychia, the fingernails are thin, friable, and brittle, and the distal half of the nail is a concave or “spoon” shape resulting from impaired nail bed epithelial growth. This condition is considered virtually pathognomonic of iron deficiency but occurs in a small minority of patients. Blue sclerae, a condition in which the sclerae have a definite or striking bluish hue, were recognized in 1908 by Osler as being associated with iron deficiency and have been reported to be a highly specific and sensitive indicator of iron deficiency.

Laboratory Evaluation

The plasma iron level declines, and, in combination with the increase in total iron-binding capacity, transferrin saturation falls to less than 15%. Decreased plasma ferritin concentrations are of great value in the detection of iron deficiency. Marrow examination shows, in addition to the absence of hemosiderin iron, a decrease in the proportion of sideroblasts because too little iron is available to support siderotic granule formation. The erythrocyte zinc protoporphyrin level progressively increases with reduction of the amount of iron available for heme formation. Measurement of reticulocyte index shows low for degree of anemia.

Diagnosis of Iron Deficiency

The primary differential diagnosis of iron deficiency primarily includes the other forms of microcytic anemia: thalassemia, anemia of chronic disease (severe cases), sideroblastic anemias, and some hemoglobinopathies.

	ACD	Fe def.	ACD + Fe def
Serum iron	**Low**	**Low-Very low (<15 mcg/dL)**	**Low**
TIBC	**Low - normal**	**High**	**Normal**
Transferrin saturation	**Low**	**Low -Very low (<10%)**	**Low**
Ferritin	**Normal – high**	**Low - Very low (<15 ng/mL)**	**Low - normal**

Therapy

Oral iron is the treatment of choice for almost all patients because of its effectiveness, safety, and economy and should always be given preference over parenteral iron for initial treatment. Rarely, red cell transfusions are needed to prevent cardiac or cerebral ischemia in patients with severe anemia. The most common side effects are gastrointestinal. The development of either diarrhea or constipation usually can be treated symptomatically. Often, upper gastrointestinal side effects can be managed by administering the iron with or immediately after meals.

Oral Iron Preparations

Ferrous sulfate: Tablets

Parenteral iron therapy should be reserved for patient who (a) remains intolerant of oral iron despite repeated modifications in dosage regimen, (b) malabsorbs iron, or (c) has iron needs that cannot be met by oral therapy because of either chronic uncontrollable bleeding or other sources of blood loss, such as hemodialysis, or a coexisting chronic inflammatory state. The most common preparation is iron dextran complex (Imferon), which contains 50 mg of iron per milliliter of solution. It can be administered intramuscularly or intravenously.

Prognosis

The prognosis for iron deficiency itself is excellent, and the response to either oral or parenteral iron also is excellent. Mild reticulocytosis begins within 3 to 5 days, is maximal by days 8 to 10, and then declines. The hemoglobin concentration begins to increase after the first week and usually returns to normal within 6 weeks. Complete recovery from microcytosis may take up to 4 months.