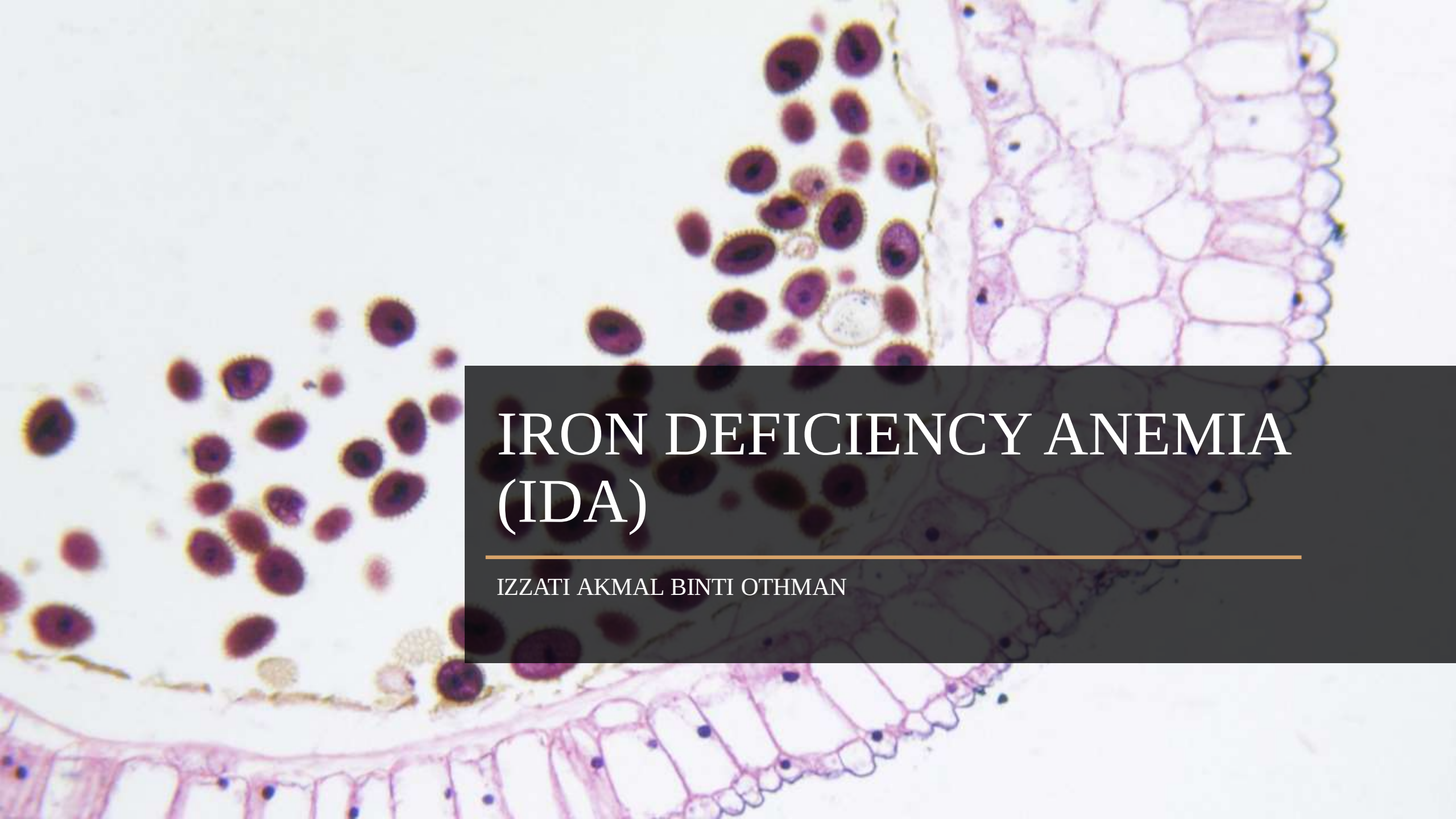


IRON DEFICIENCY ANEMIA (IDA)

IZZATI AKMAL BINTI OTHMAN

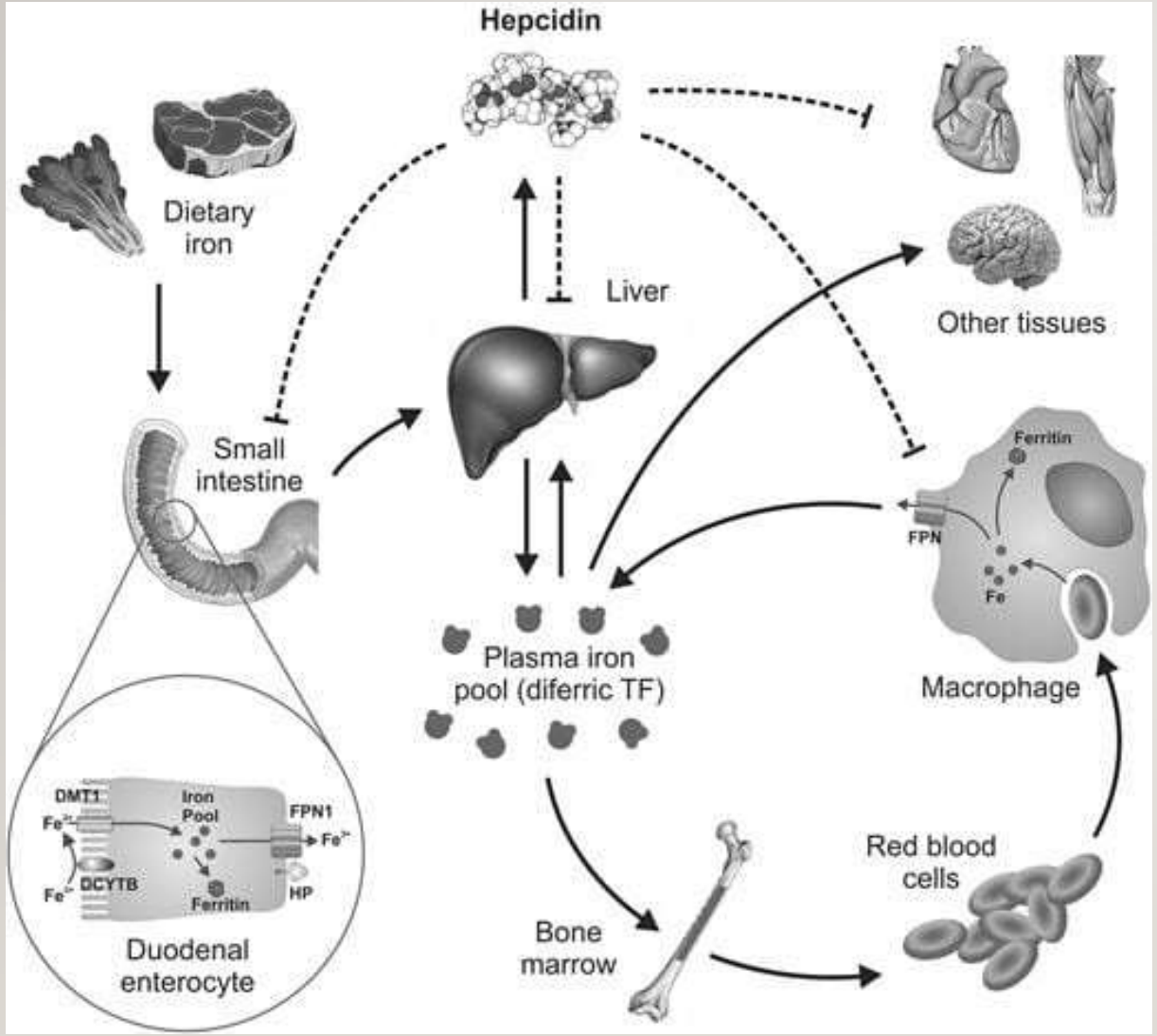
OUTLINE:

- Definition
- Pathophysiology
- Stage of Development
- Clinical Presentation
- Diagnosis Criteria
- Treatment

DEFINITION

- “**Anemia**” refers to a condition in which your blood has a lower number than normal red blood cells.
- “**Iron**” is an essential mineral that is needed to form hemoglobin, an oxygen carrying protein inside red blood cells.
- “**Iron Deficiency Anemia**” is a condition in which the body lack enough red blood cell to transport oxygen-rich blood to body tissues.

PATHOPHYSIOLOGY



- IDA is a hypochromic microcytic anemia in which red blood cells (RBCs) are abnormally small with low levels of hemoglobin.
- Despite the cause, IDA occurs when the body’s iron demand exceeds that of its supply.
- Two types: iron store depletion or metabolic/functional disorder
- Inflammatory response of body in response to infection may also contribute to an acute form of IDA
- How quickly IDA develops depends on cause, but develops in five stages

IRON STORE DEPLETION

1. *Inadequate dietary intake*
    1. Diets low in meat, fish, beans or iron fortified foods – commonly seen with vegetarians or individuals living in poverty
    2. Mechanism – low iron stores leads to demand > supply

2. *Excessive blood loss*
    1. Hemorrhage, menorrhagia (heavy menstrual bleeding)
    2. Mechanism – depleting iron stores faster than replacing combined while increasing body's demand for iron

METABOLIC/FUNCTIONAL DISORDER

1. *Insufficient iron delivery to bone marrow*
    1. Iron stores adequate to meet body's need
    2. Mechanism – delivery to bone marrow to be utilized in the production of RBCs is impaired

2. *Impaired use of iron within bone marrow*
    1. Iron stores adequate to meet body's need
    2. Mechanism – even when delivered, there is impaired use of iron in the bone marrow to produce RBCs

STAGES OF DEVELOPMENT

- **Stage 1** is characterized by decreased bone marrow iron stores; hemoglobin (Hb) and serum iron remain normal, but the serum ferritin level falls. The compensatory increase in iron absorption causes an increase in iron-binding capacity (transferrin level).

- During **stage 2,** erythropoiesis is impaired. Although the transferrin level is increased, the serum iron level decreases; transferrin saturation decreases. Erythropoiesis is impaired when serum iron and transferrin saturation falls. The serum transferrin receptor level rises.

- During **stage 3,** anemia with normal-appearing RBCs and indices develops.
- During **stage 4,** microcytosis and then hypochromia develop.
- During **stage 5,** iron deficiency affects tissues, resulting in symptoms and signs.

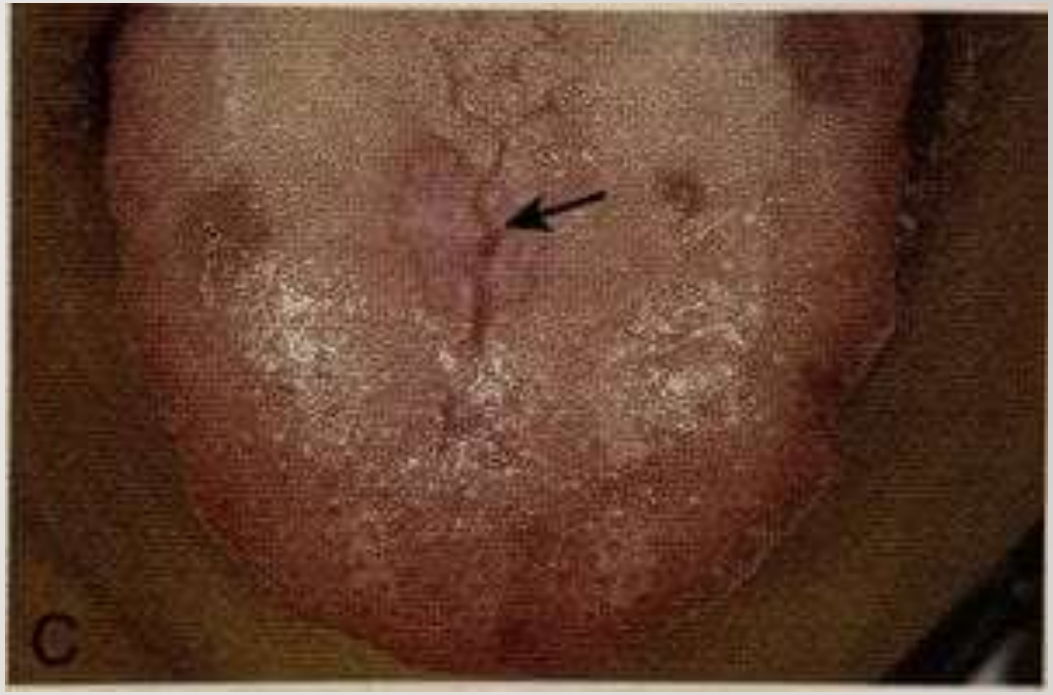
CLINICAL PRESENTATION

- Early symptoms of IDA include fatigue, weakness, shortness of breath, and pallor
  - *These symptoms start to develop in stage three of development due to the reduction in hemoglobin contributing to hypoxemia*

- As hemoglobin levels continue to drop, epithelial tissue begins to express structural and functional changes such as brittle, thin, ridged and spoon-shaped finger’s nail

- These changes are a result of impaired capillary circulation

- Caused by tongue papillae atrophy
- Leads to soreness and redness of the tongue



- Additionally, individuals with IDA experience angular stomatitis, a dry soreness in the epithelial tissues at the corners of the mouth

- Iron is an essential component of many enzymes in the body (cytochromes, myoglobin, catalases, peroxidases)
  - *Individuals with IDA can also experience gastritis, neuromuscular changes, irritability, headaches, numbness, tingling, and vasomotor disturbances due to deficiencies in these iron-dependent enzymes*

CLINICAL PRESENTATION

Low hemoglobin levels in the blood

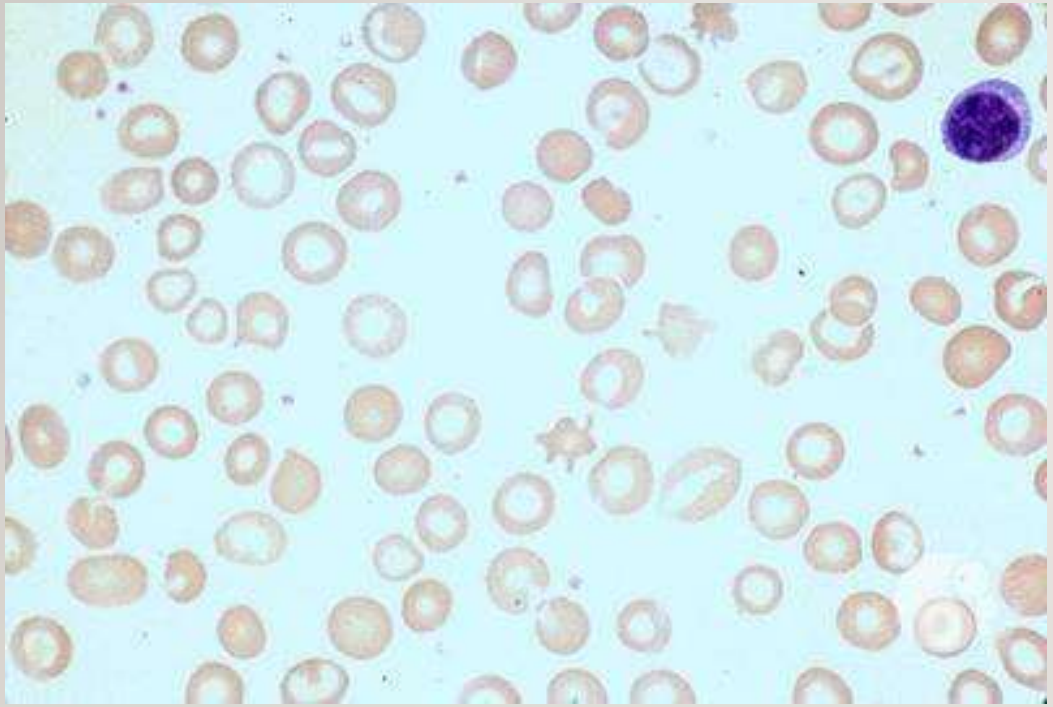
- Caused by the direct reduction of hemoglobin synthesis due to low levels of iron or impaired RBC production

Lower than normal serum iron, ferritin, and transferrin saturation levels

- Ferritin – iron-storing protein
- Transferrin – distributes iron around the body
- If these levels are low, indicated there is less iron being stored and transferred in the body

Iron store levels will be low

- Directly measured by bone marrow biopsy
- Indirectly by serum ferritin level, transferrin saturation levels, or total iron-binding capacity

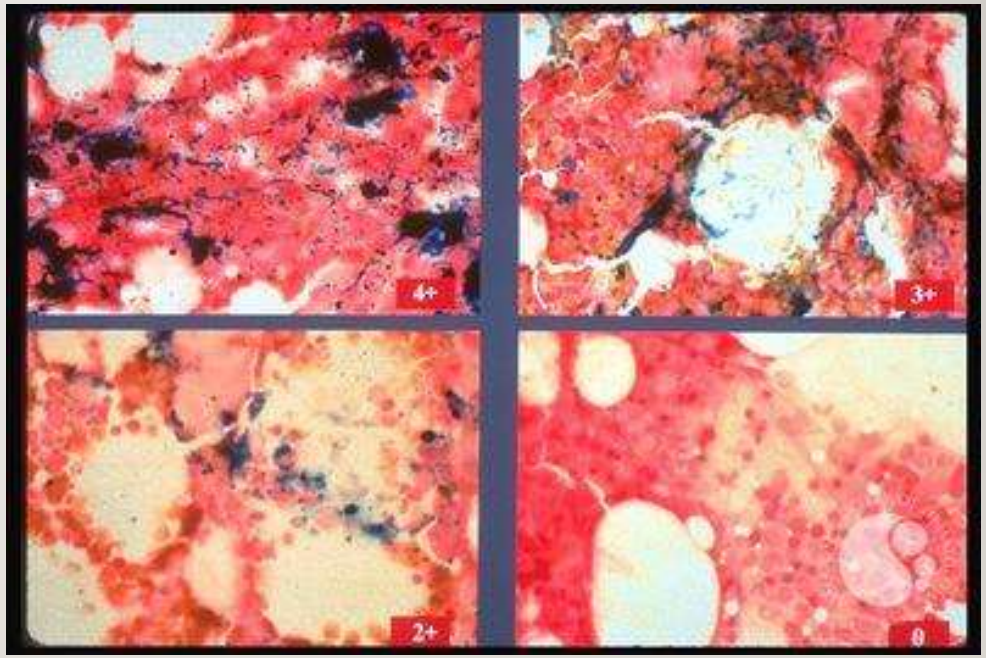


MODERATE IRON DEFICIENCY ANEMIA

This is a peripheral blood smear from a patient with iron deficiency anemia. Normal lymphocyte for comparison purposes is seen at the edge of the smear. Significant hypochromia and microcytosis is seen, as well as moderate variation in size and shape of the red cells

PRUSSIAN BLUE (IRON) STAINED BONE MARROW

This image shows iron stains for comparison. In the left upper corner iron is increased, as demonstrated by the large amount of blue material. The next two images show decreasing amounts of iron. The right bottom image shows no iron. This test is considered the gold standard for evaluating marrow iron stores.



TREATMENT

- **Oral iron** can be provided by various iron salts (eg, ferrous sulfate, ferrous gluconate, ferrous fumarate) or saccharated iron given 30 minutes before meals (food or antacids may reduce absorption).
- **Parenteral iron** causes a more rapid therapeutic response than oral iron does but can cause adverse effects, most commonly allergic reactions or infusion reactions (eg, fever, arthralgias, myalgias). Oral or parenteral iron therapy should continue for ≥ 6 months after correction of hemoglobin levels to replenish tissue stores.

THANK YOU