Microcytic Anemias
Clinical changes in iron deficiency anemia

Koilonychia

Glositis due to iron deficiency
Subsequent stages of maturation show a marked difference in the production of hemoglobin and the amount of cytoplasm.

The maturation of the nucleus appears similar for both maturation sequences.
Microcytic Anemia

MCV <80 and/or MCH <27

Microcytic and/or Hypochromic anemia

Causes

iron deficiency
thalassemia
anemia of chronic disease
lead toxicity
some sideroblastic anemias
IRON

- Must be in ferrous (Fe$^{+2}$) state for activity
- Ferric (Fe$^{+3}$) ions cannot transport electrons or $O_2$
Iron evaluation

- Serum iron - (80-150)
- TIBC - (250-400)
- % Saturation - (20-45%)
- Evaluate storage iron
  - Hemosiderin - BM stain for iron
  - Ferritin - Serum storage (10-250)

INFLAMMATION ELEVATES SERUM FERRITIN
IRON DEFICIENCY *versus* anemia of chronic disease

<table>
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<tr>
<th>Serum Iron</th>
<th>Transferrin</th>
<th>Ferritin</th>
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Iron Deficiency

Anemia of chronic disease
Iron Deficiency Anemia - caused by decreased iron stores

**Causes of Iron Deficiency**

- **Blood Loss**
  - Gastrointestinal Tract
  - Menstrual Blood Loss
  - Parasitic infections which cause bleeding
  - Urinary Blood Loss (Rare)

- **Increased Iron Utilization**
  - Pregnancy
  - Infancy
  - Adolescence
  - Polycythemia Vera

- **Malabsorption**
  - Tropical Sprue
  - Gastrectomy
  - Chronic atrophic gastritis

- **Dietary inadequacy**

- **Combinations of above**
IRON DEFICIENCY ANEMIA

*Progression of Findings*

- Stainable Iron - Bone Marrow Aspirate
- Serum Ferritin - Low in Iron Deficiency
- Desaturation of transferrin
- Transferrin (Iron Binding Capacity) Increases
- Blood Smear - Microcytic, Hypochromic
- Anemia
IRON DEFICIENCY

Symptoms

- Fatigue - Sometimes out of proportion to anemia
- Atrophic glossitis (smooth tongue)
- Koilonychia (Nail spooning)
Iron Deficiency Anemia

- **Laboratory**
  - Microcytic and/or hypochromic anemia
  - anisocytosis and poikilocytosis
  - no Bone Marrow iron stores
  - decreased serum iron
  - decreased ferritin
  - Increased TIBC - decreased % saturation
IRON THERAPY

Response

- Initial response takes 7-14 days
- Modest reticulocytosis (7-10%)
- Correction of anemia requires 2-3 months
- 6 months of therapy beyond correction of anemia needed to replete stores,
- Parenteral iron possible, but problematic
HYPOCHROMIC ANAEMIAS (1)
IRON DEFICIENCY ANAEMIA

• Is the commonest cause of A. in every country of the world
• It is the most important cause of a microcytic, hypochromic anaemia
• All three red cell indices are reduced:
  MCV - mean corpuscular volume
  MCH - mean corpuscular haemoglobin
  MCHC - mean corpuscular haemoglobin concentration
• The blood film shows microcytic, hypochromic red cells
• This appearance is due to a defect in Hb synthesis
Sideroblastic Anemia

- Impaired erythropoiesis
  - $B_6$, iron, porphyrin
- Diagnosed with ringed sideroblasts
Sideroblastic Anemia

- **Primary**
  - pyridoxin resistant (refractory anemia)
  - pyridoxin responsive
- **Secondary**
  - Many causes -
Sideroblastic Anemia

- **Primary**
  - pyridoxin resistant (refractory anemia)
    - Acquired
    - Hereditary
      - abnormal chromosome - MCV increased
      - over 65 year old female, diabetes, myelodysplastic
      - sex linked - male
  - pyridoxin responsive
    - Acquired
    - Hereditary
      - predominately males
Sideroblastic Anemia

- Clinically
  - Mild to severe anemia
  - Pyridoxin resistant - MCV - N
  - Lead poisoning
  - Serum iron - increased
  - TIBC - normal or decreased
  - % saturation - increased
  - Storage iron/ferritin - increased