

ANEMIA IN WOMEN

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OBJECTIVES: Upon completion of this presentation each participant should be able to:

1. Describe use and interpretation of laboratory tests for anemia
2. Identify diagnoses and differential diagnoses of various forms of anemia, based upon symptoms, physical examination, and diagnostic strategies.
3. Describe appropriate management for anemia, based upon diagnosis.

CONTENT:

I Common Laboratory Tests

A What is blood?

1. Plasma (60%) of blood composed of water, dissolved ions, and proteins
2. Cellular components (40%) of blood
 - 1) White blood cells (WBCs)
 - 2) Red blood cells (RBCs)
 - 3) Platelets

B Red Blood Cell count (RBC) – measure of number of Hgb carrying red blood cells

C Hematocrit (Hct) – measure of the percentage of RBCs in the total blood volume, normal range for nonpregnant female adult is 37%-47%

D Hemoglobin (Hgb) – main component of RBCs; serves as vehicle for oxygen and carbon dioxide transport; normal range for nonpregnant adult female is 12-16 g/dl

E Red Blood Cell Indices – provides information about the size, weight, and Hgb concentration in RBCs

1. Mean Corpuscular Volume (MCV) – measure of size of RBCs, normocytic, microcytic, or macrocytic
2. Mean Corpuscular Hemoglobin (MCH) – measure of average amount (weight) of Hgb in RBC
3. Mean Corpuscular Hemoglobin Concentration (MCHC) – normochromic, hypochromic, hyperchromic
4. Peripheral Blood Smear – provides information about variations in RBC size, shape, color, and intracellular structures

F Reticulocyte Count – provides a direct measurement of RBC production by the bone marrow by measuring immature blood cells

1. Anemia caused by decreased RBC production will have low reticulocytes (Iron, Folate, or B-12 deficiencies)
2. Anemia caused by hemolysis or hemorrhage will have elevated reticulocyte count (thalassemia)
3. Can be used as an indicator of response to treatment in some anemia

G Iron Studies – used to differentiate type of anemia

1. Serum Iron Level – concentration of iron bound in transferrin, which transports iron into the cell during the maturation process
2. Total Iron Binding Capacity (TIBC) – measures the amount of iron that transferrin can still bind
3. Serum Ferritin – major iron storage protein present in serum concentrations directly related to available stores, normal range for adult female is 10-1500 mg/ml

H Sickle Cell Screening

1. Sickledex is a screening test for Hgb S
2. Hemoglobin electrophoresis is necessary for definitive diagnosis

II Iron Deficiency Anemia

A Definition

1. Low Hgb concentration due to inadequate intake or absorption of iron
2. Microcytic and hypochromic
3. Low serum iron, high TIBC, low ferritin
4. Most common anemia in developed countries and the cause of 95% anemia in pregnancy

B Etiology

1. Chronic blood loss
 - a. Menorrhagia
 - b. Overt or occult bleeding (trauma, disease, medications)
2. Inadequate iron intake
3. Inefficient absorption of iron
 - a. Post gastrectomy
 - b. Chronic diarrhea
4. Increased iron requirements
 - a. Adolescence
 - b. Pregnancy

C Assessment and Differential Diagnoses

1. History
 - a. Menstrual changes
 - b. Diet – inadequate iron in diet, pica, eating disorders
 - c. Medications – ASA, NSAIDs
 - d. GI symptoms suggestive of GI bleeding

- e. Dark, tarry stools or bleeding from hemorrhoids
 - f. Headache, fatigue, dyspnea with exercise, dizziness, poor concentration, anorexia, palpitations
 - g. Absence of symptoms in mild – moderate anemia (Hct 30% or more)
2. Physical examination
- a. Skin: pallor, dryness, severe anemia – brittle nails and hair
 - b. HEENT: pale conjunctiva and gums, severe anemia – atrophy of tongue, with papillae with smooth red appearance, cracking of corners of mouth
 - c. Cardiovascular: in severe anemia systolic flow murmur, tachycardia
 - d. Abdomen in severe anemia – enlarged liver
 - e. Pelvic: possible fibroids, polyps, cervicitis, adenomyosis
 - f. Rectal: possible hemorrhoids, stool for occult blood
3. Laboratory tests
- a. Low Hct (<37%) and Hgb (<12 g/dl)
 - b. CBC with differential – low RBCs, low MCV, low MCHC
 - c. Iron studies – low serum Fe, high TIBC, low ferritin
 - d. Ferritin may drop below normal before significant decrease Hct/Hgb
 - e. Stool for occult blood

D Management

1. Premenopausal, low Hgb/Hct, history and exam indicative of Fe deficiency anemia – reasonable to provide therapeutic trial of oral Fe therapy
 - a. If no improvement in 4 weeks of treatment, additional lab tests may be indicated
 - b. Improvement is identified as Hgb increase of 1-2 g/dl in 4 weeks

2. Any concern about GI bleeding or excessive menstrual bleeding needs further investigation
3. Oral iron therapy
 - a. Ferrous sulfate, gluconate, and fumerate are effective and inexpensive
 - b. Ferrous sulfate 325 mg tid for 3-6 months is usually adequate to correct Hgb deficit and to restore ferritin levels to normal
 - c. Absorption facilitators – take between meals, take with vitamin C
 - d. Absorption inhibitors – milk products, Ca supplements, tea/coffee (tannin), very high fiber foods
 - e. Common side effects
 - 1) Nausea, epigastric discomfort, abdominal cramps, constipation, diarrhea
 - 2) Decrease iron dosage, try different type, or take with meals
 - 3) May cause black stools
 - f. Potential causes of failure to respond to Fe therapy
 - 1) Failure to take or absorb Fe
 - 2) Continuing iron loss
 - 3) Incorrect diagnosis
 - 4) Concurrent chronic disease suppressing bone marrow function
4. Diet
 - a. RDA for Fe – 15 mg/day for women age 15-50; 10 mg/day for women over 50 years of age
 - b. Good food sources are lean meat, poultry, fish, legumes, egg yolks, whole or enriched grains/cereals, nuts, dried fruit
 - c. Vitamin C rich foods – citrus fruits/juices, strawberries, broccoli, cabbage, cauliflower, peppers, dark green leafy vegetables

5. Follow-up care
 - a. Repeat Hgb in 1 month, expecting an increase of 1-2 g/dl
 - b. Repeat Hgb in 2-3 months after treatment initiation expecting Hgb deficit to be restored
 - c. Continue iron therapy for 6 months to assure Fe stores are replenished
 - d. Ferritin level at 6 months should be within normal range
6. Indication for consultation
 - a. Initial Hgb low (<10 g/dl)
 - b. Positive stool for guaiac
 - c. History of unexplained bleeding
 - d. Possibility of underlying conditions
 - e. No improvement when iron has been taken correctly

III Thalassemia

A Definition/Etiology

- 1 Second most common microcytic anemia
- 2 Inherited, autosomal recessive disorder that results in an impaired synthesis of either the alpha or beta chain of adult hemoglobin, results in premature RBC heomolysis
- 3 Increased incidence in people from the Mediterranean Coast, Central Africa, and parts of Asia
- 4 Thalassemia major (Cooley's Anemia) is usually detected in infancy or early childhood and is life threatening
- 5 Thalassemia minor is usually asymptomatic

B Assessment and Differential Diagnoses

1. History
2. At risk ethnic groups: Chinese, Vietnamese, Cambodian, Laotian, Greek, Italian, some Jewish and Arabic groups, some African groups
 - a. May have same symptoms as iron deficiency anemia
 - b. Possible absence of symptoms
3. Physical exam
 - a. Normal unless severe
 - b. Skin: pallor or bronzed appearance
 - c. Abdomen: enlarged liver and spleen
 - d. Cardiovascular: tachycardia, systolic flow murmur
 - e. Musculoskeletal: bone deformity of face (chipmunk) related to expansion of bones with hyperplastic marrow
4. Laboratory tests
 - a. Low Hgb and Hct
 - b. CBC with differential: normal or high RBCs, low MCV, low MCHC
 - c. Iron studies: normal or high serum iron, normal or low TIBC, normal or high ferritin
 - d. Hgb electrophoresis is diagnostic

C Management

1. Iron supplementation is contraindicated because of iron overload possibility
2. Genetic counseling
3. Severe forms – transfusions with chelation therapy to avoid Fe overload; splenectomy

IV Pernicious Anemia

A Definition

1. Megaloblastic (large immature RBCs), macrocytic, normochromic anemia
2. Deficiency of intrinsic factor produced by the stomach resulting in malabsorption of Vitamin B-12
3. Vitamin B 12 is necessary for normal DNA synthesis and RBC formation

B Etiology

1. Autoimmune reaction resulting in non-production of intrinsic factor
2. Increased incidence after age 60 and in those with other immunological disorder
3. Other causes of vitamin B 12 deficiency include gastrectomy, disorders of the ileum, fish tapeworm, or a strict vegetarian diet

C Assessment and Differential Diagnosis

1. History
 - a. Family history
 - b. Other immunologic diseases
 - c. Gastric surgery
 - d. Disorders of the ileum
 - e. Possible exposure to fish tapeworm (waters around Norway))
 - f. Triad of symptoms: weakness, glossitis, paresthesis of extremities
 - g. Other GI and neurological symptoms
2. Physical examination
 - a. Skin: pallor
 - b. HEENT: smooth, beefy red tongue

- c. Cardiovascular: tachycardia, irregular beats, cardiomegaly
 - d. Abdomen: enlarged liver and spleen
 - e. CNS: increased or decreased DTRs, + Romberg and Babinski, mental changes
3. Laboratory tests
- a. Low Hgb/Hct
 - b. CBC with differential: low RBCs, high MCV, normal MCHC
 - c. Iron studies: high serum Fe, normal TIBC, high ferritin
 - d. Low serum vitamin B 12
 - e. Positive Shilling test
 - f. Other tests: GI x-rays, gastric analysis, bone marrow aspiration

D Management

1. Lifelong IM vitamin B 12 replacement
2. Monitor for gastric cancer because at increased risk

V Folate Deficiency Anemia

A Definition

1. Megaloblastic, macrocytic, normochromic anemia
2. Deficiency of folic acid needed for DNA synthesis, RBC maturation, and maintenance of gastric mucosa

B Etiology

- 1 May have malabsorption syndrome
- 2 Increased demand in pregnancy – megaloblastic anemia of pregnancy

- 3 Alcoholism and other disorders of malnutrition
- 4 Oral contraceptives and some anticonvulsants inhibit absorption and metabolism of folic acid

C Assessment and Differential Diagnoses

- 1 History
 - a. Symptoms or history of malabsorption syndrome
 - b. Diet: malnourishment, alcoholism
 - c. Medications: oral contraceptives, anticonvulsants
 - d. Symptoms: fatigue, sore tongue, nausea, emotional disturbances
- 2 Physical examination – similar findings as pernicious anemia except normal neurological findings
- 3 Laboratory tests
 - a. Low Hgb/Hct
 - b. CBC with differential: low RBCs, high MCV, normal MCHC
 - c. Iron studies: high serum Fe, normal TIBC, high ferritin
 - d. Low serum folate
 - e. Negative Shilling test

D Management

- 1 Treatment of associated disease
- 2 Adequate diet and rest
- 3 Usually no response to iron therapy

VI Anemia of Chronic Disease

A Definition/Etiology

1. Normocytic, normochromic with progression to hypochromic anemia
2. Associated with chronic inflammatory diseases (lupus, rheumatoid arthritis), infection (TB, AIDS, Crohn's disease), and some malignancies
3. Decreased erythrocyte life span, ineffective erythropoiesis, and disturbances of the cyclic use of iron

B Assessment and Differential Diagnoses

1. History
 - a. Symptoms or history of associated disease
 - b. General symptoms common to other types of anemia
2. Physical examination
 - a. Signs pertaining to associated disease
 - b. General appearance; may be thin and pale
 - c. HEENT: sclera may be icteric, coated tongue
 - d. Cardiovascular: cardiomegaly, tachycardia, systolic flow murmur
 - e. Abdomen: enlarged liver and spleen
3. Laboratory tests
 - a. Low Hgb/Hct
 - b. CBC with differential: lower RBCs, normal or slightly low MCV, normal MCHC
 - c. Iron studies: low serum Fe, normal or low TIBC, normal or high ferritin

C Management

- 1 Treatment of associated disease
- 2 Adequate diet and rest - usually no response to iron therapy

VII. Sickle Cell Anemia

A Definition/Etiology

- 1 Hemolytic anemia characterized by distortion of erythrocytes in to crescent shapes, Hgb A (Adult hemoglobin) is replaced by Hgb S (Sickle hemoglobin)
- 2 Autosomal recessive disorder
- 3 Also increased incidence in Greek, Italian, Middle Eastern, Asian populations
- 4 Persons with disease experience episodic crises with vaso-occlusion caused by clumping of RBCs

B Assessment and Differential Diagnoses

- 1 History
 - a. Family history
 - b. Crisis symptoms: pain, malaise, chills, headache. Epistaxis. Vomiting
 - c. Remission: no symptoms
- 2 Physical examination
 - a. Remission: normal
 - b. Crisis: low BP; elevated pulse, respirations, and temperature; pallor or cyanosis
- 3 Laboratory tests
 - a. Very low Hgb with Sickle Cell Disease (6-9 g/dl)
 - b. Sickle cell preparation (Sickledex, Hgb S test) detects abnormal hemoglobin with varying levels of sensitivity, specificity Hgb electrophoresis is used for definitive diagnosis

C Management

- 1 Remission: treat any infection aggressively, give folic acid supplements
- 2 Crisis: hydration, analgesia, oxygen, transfusion
- 3 Genetic counseling

Summary of Lab Findings

	Hgb/Hct	MCV	MCHC	Serum Fe	TIBC	Ferritin
Iron Deficiency Anemia	Low	Low	Low	Low	High	Low
Thalassemia	Low	Low	Low	High	Low	High
Pernicious Anemia	Low	High	Normal	High	Normal	High
Folate Deficiency Anemia	Low	High	Normal	High	Normal	High
Anemia of Chronic Disease	Low	Normal or Low	Normal or Low	Low	Low	Normal

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