The Anemias

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اهداف درس

۱-یادگیری تعریف کم خونی در کودکان

۲- شناخت علل کم خونی در کودکان

۳-شناخت تطابق های فیزیولوژیک بدن در برابر کم خونی

۴-یادگیری گرفتن شرح حال و انجام معاینه فیزیکی

۵-شناخت علایم کم خونی در کودکان

۶-آشنایی با انواع کم خونی ها در کودکان

۷- یادگیری چگونگی افتراق انواع کم خونی

Definition

- Anemia is defined as a reduction of the hemoglobin concentration or
- Red blood cell (RBC) volume below the range of values occurring in healthy persons.
- "Normal" hemoglobin (Hb) and hematocrit vary with age, sex and race.

Normal Meanand Lower Limits of Normal for Hemoglobin, Hematocrit, and Mean Corpuscular Volume

	HEMOGLOBIN (g/dL)		HEMATOCRIT (%)		MEAN CORPUSCULAR VOLUME (μM^3)	
AGE (yr)	Mean	Lower Limit	Mean	Lower Limit	Mean	Lower Limit
0.5-1.9	12.5	11.0	37	33	77	70
2-4	12.5	11.0	38	34	79	73
5-7	13.0	11.5	39	35	81	75
8-11	13.5	12.0	40	36	83	76
12-14 female	13.5	12.0	41	36	85	78
12-14 male	14.0	12.5	43	37	84	77
15-17 female	14.0	12.0	41	36	87	79
15-17 male	15.0	13.0	46	38	86	78
18-49 female	14.0	12.0	42	37	90	80
18-49 male	16.0	14.0	47	40	90	80

From Brugnara C, Oski FJ, Nathan DG: *Nathan and Oski's hematology of infancy and childhood*, ed 7, Philadelphia, 2009, Saunders, p 456.

Causes of anemia

Nutrition: Iron deficiency, folate, Vitamin B١٢ & Vitamin A deficiency.

Infectious disease: Malaria, soil-transmitted helminths, TB, AIDS, Leishmaniosis.

Genetic disorders: Thalassemia, G٦PD, Spherocytosis.

Physiologic adjustments to anemia

- Increased cardiac output
- Augmented oxygen extraction
- A shunting of blood flow toward vital organs and tissues.
- The concentration of ٢’٣-diphosphoglycerate increases within the RBC

Physiologic adjustments (continue)

- The resultant "shift to the right" of the oxygen dissociation curve reduces the affinity of Hb for O٢.

- Higher levels of erythropoietin (EPO) and consequent increased RBC production by the bone marrow.

History and Physical Examination

- Important historical facts should include age, sex, race and ethnicity, diet, medications, chronic diseases, infections, travel, and exposures.
- Clinical findings generally do not become apparent until the hemoglobin level falls to <٧-٨ g/dL.
- Clinical features can include pallor, sleepiness, irritability, and decreased exercise tolerance.

Physical Examination (continue)

- Pallor can involve the tongue, nail beds, conjunctiva, palms, or palmar creases.
- A flow murmur is often present.
- Ultimately, weakness, tachypnea, shortness of breath on exertion, tachycardia, cardiac dilation, and high-out put heart failure will result.

Physical Findings in the Evaluation of Anemia

- Skin: hyperpigmentation, vitiligo, jaundice and petechiae
- Head: frontal bossing, microcephaly
- Eyes: blue sclera, microphtalmia, retinopathy
- Ears: deafness
- Mouth: glossitis, angular stomatitis

Physical Findings (continue)

- Chest: shape, murmur
- Abdomen: hepatosplenomegaly
- Extremities: absent thumbs, triphalengeal thumb, spoon nails
- Rectal: hemorrhoids
- Nerves: irritable, apathy, peripheral neuropathy, stroke

Laboratory Studies

Initial laboratory testing should include:

- CBC: hemoglobin, hematocrit, and RBC indices as well as a white blood cell (WBC) count and differential, platelet count
- Reticulocyte count
- The peripheral blood smear (PBS)

Anemias may be morphologically categorized on the basis of :

- Red cell size: (mean corpuscular volume [MCV]) or microscopic appearance.
- Anemias can be classified as microcytic, normocytic, or macrocytic.
- RBC size also changes with age, and normal developmental (Slide ۴).
- Examination of a PBS often reveals changes in RBC appearance.

Anemias may also be further divided on the basis of underlying physiology

- The two major categories are:
- Decreased RBC production may be a consequence of ineffective erythropoiesis or a failure of erythropoiesis.

- Increased RBC destruction or loss: may be secondary to hemolysis, sequestration, or bleeding.

Anemias may also be further divided (continue)

- The normal reticulocyte percentage of total RBCs is approximately١%, with an absolute reticulocyte count of ٢٥’٠٠٠-٧٥’٠٠٠/mm٣.
- Low or normal numbers of reticulocytes generally represent bone marrow failure or ineffective erythropoiesis.
- Increased numbers of reticulocytes represent hemolysis, sequestration, or loss (bleeding).

Differential Diagnosis

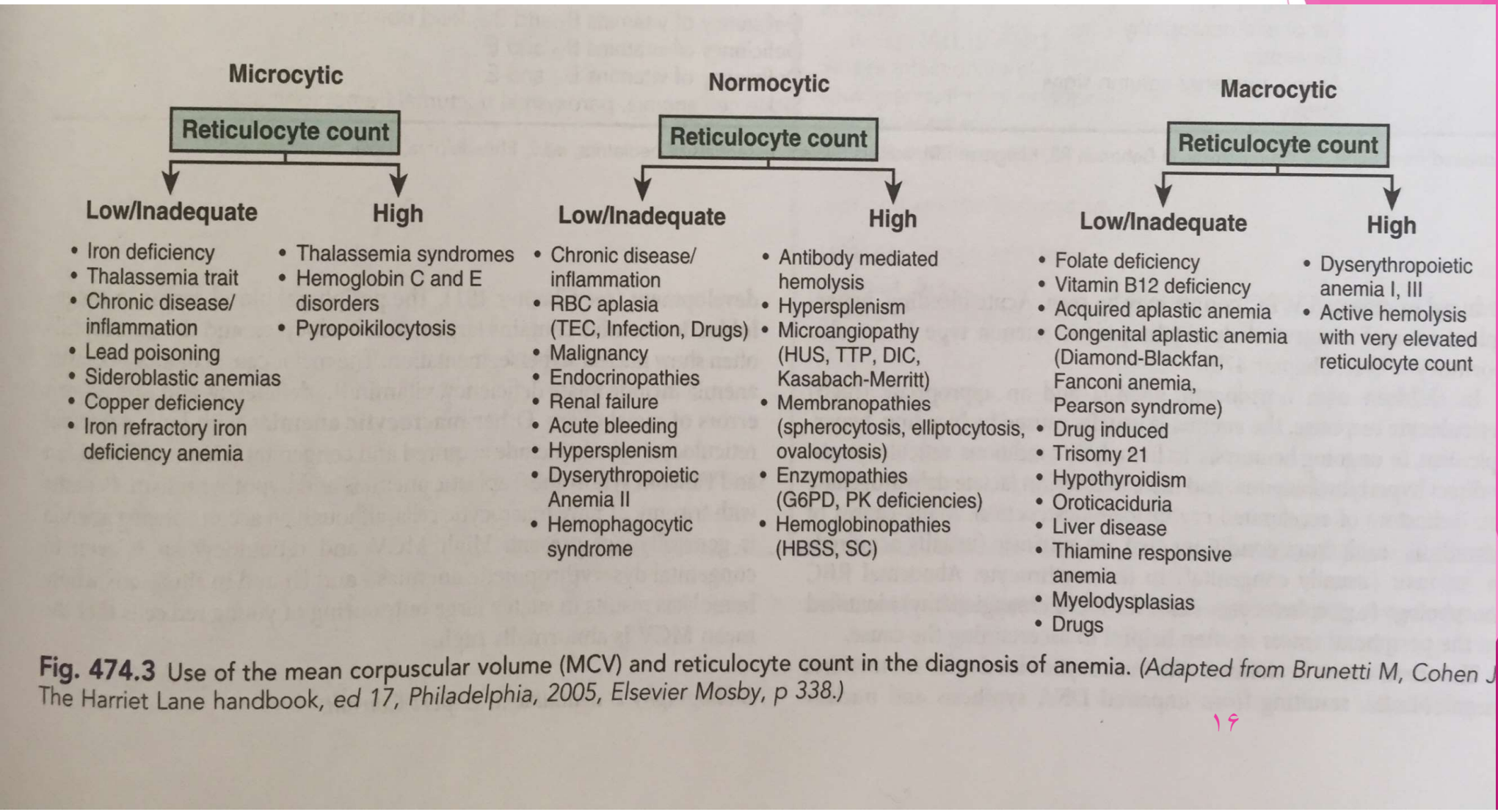

Fig. 474.3 Use of the mean corpuscular volume (MCV) and reticulocyte count in the diagnosis of anemia. *(Adapted from Brunetti M, Cohen J*
The Harriet Lane handbook, *ed 17, Philadelphia, 2005, Elsevier Mosby, p 338.)*

Conclusion

- **In the defining anemia in children, unlike adults, the age of the child and sex (at puberty) is an important criterion.**
- **Nutritional deficiencies, infections and genetic disorders are major causes of anemia.**
- **In classifying anemias based on red cell size, we must also consider normal MCV values for different ages.**

سوالاتی که باید در پایان به خود پاسخ دهیم:

۱ - در تعریف کم خونی های کودکان توجه به چه نکاتی دارای اهمیت است؟

۲- علل اصلی کم خونی کودکان در کشور ما چیست؟

۳- تعریف کم خونی درکودکان با بزرگسالان چه تفاوتی دارد؟

۴- در تشخیص انواع کم خونی های کودکان چه معیارهای مهم هستند؟

References

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٢- Marcdante J and Kliegman M. Nelson Essentials of Pediatrics, ٩th edition, ٢٠٢٢.


Thank you