

A 4-year-old Jamaican American boy with hemoglobin SS disease is brought to the physician for evaluation of worsening fatigue that began a few days ago. He has abdominal pain and decreased appetite but no fever. The boy has been hospitalized about twice a year for vasoocclusive crises. His last hospitalization was 2 months ago during which he received a blood transfusion. He had dactylitis during infancy but has had no priapism or acute chest syndrome. He takes folic acid and penicillin daily. Temperature is 36.7 C (98 F), blood pressure is 92/54 mm Hg, pulse is 138/min, and respirations are 18/min. Examination shows a tired-appearing boy with jaundice of his skin and scleral icterus. His cardiovascular and respiratory examinations are normal. Splenomegaly and tenderness in the left upper abdominal quadrant are present. Laboratory results are as follows:

Complete blood count

Hemoglobin	7.2 g/dL
Hematocrit	22%
MCV	84 fL
Reticulocytes	9%

Liver function studies

Total bilirubin	2.3 mg/dL
Direct bilirubin	0.6 mg/dL
Aspartate aminotransferase (SGOT)	27 U/L
Alanine aminotransferase (SGPT)	24 U/L

Blood, plasma, and serum

Lactate dehydrogenase, serum	136 U/L
Haptoglobin, serum	28 mg/dL (Normal 41 - 165 mg/dL)

Peripheral blood smear is pending. Which of the following best explains this patient's

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Peripheral blood smear is pending. Which of the following best explains this patient's anemia?

- ☐ A. Autoantibody formation against intrinsic factor
- ☐ B. Autoimmune hemolysis
- ☐ C. Extravascular hemolysis
- ☐ D. Folic acid deficiency
- ☐ E. Iron deficiency
- ☐ F. Transient arrest in erythropoiesis

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Haptoglobin, serum

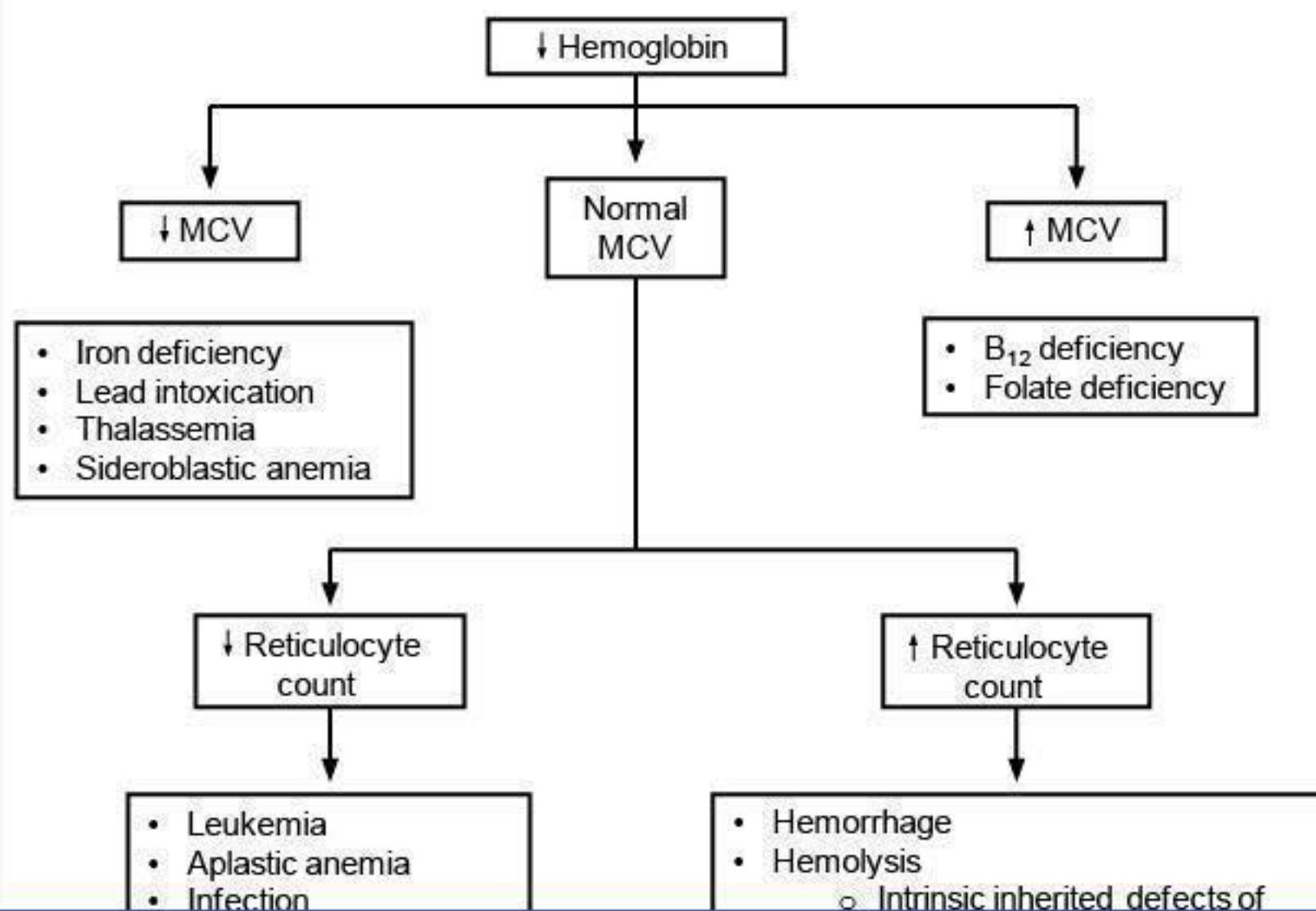
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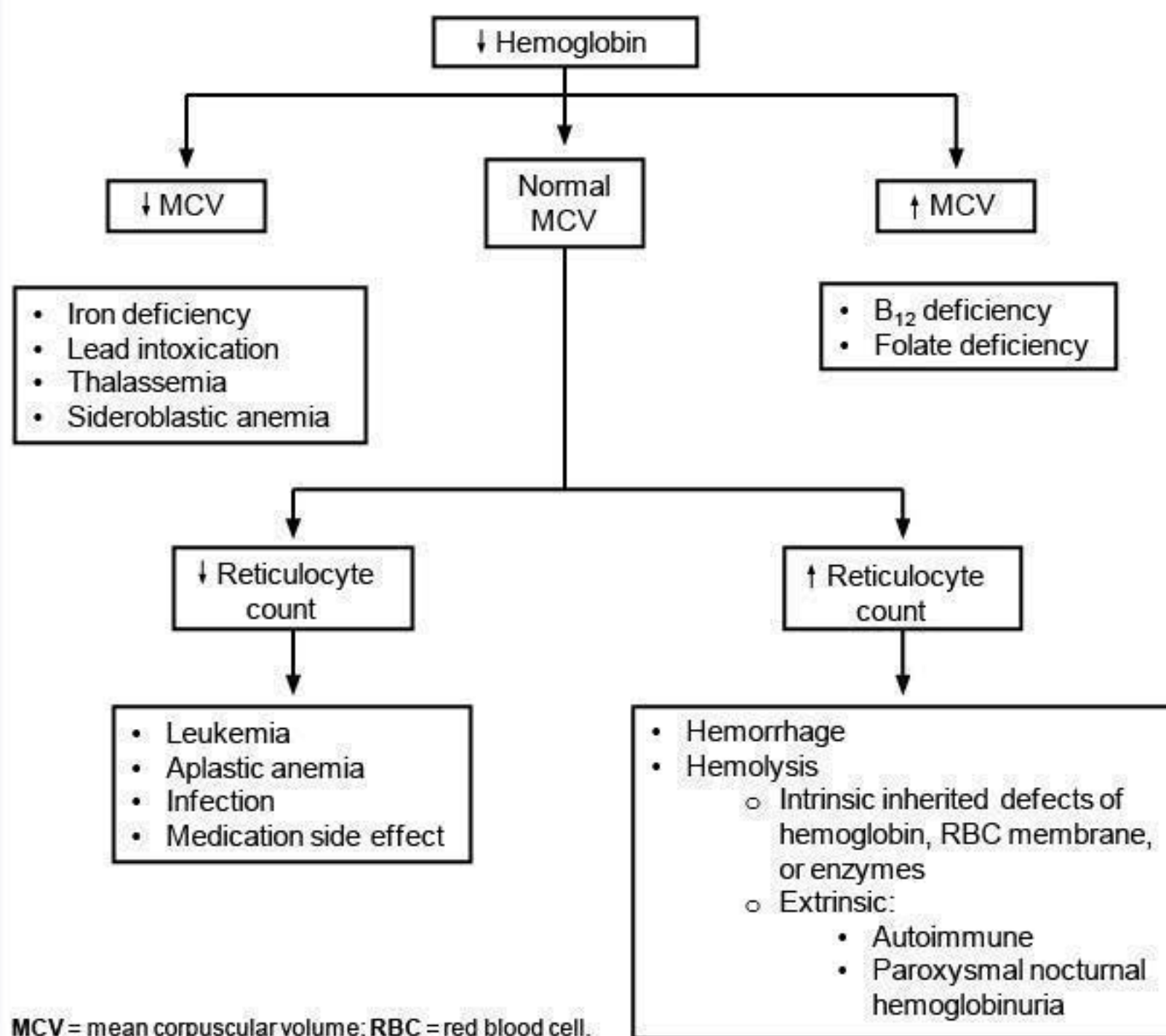
- ☐ A. Autoantibody formation against intrinsic factor [0%]
- ☐ B. Autoimmune hemolysis [9%]
- ☒ C. Extravascular hemolysis [87%]
- ☐ D. Folic acid deficiency [1%]
- ☐ E. Iron deficiency [1%]
- ☐ F. Transient arrest in erythropoiesis [2%]

[Proceed to Next Item](#)**Explanation:****User Id:** [REDACTED]

Evaluation of anemia



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MCV = mean corpuscular volume; RBC = red blood cell.

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Sickle cell anemia (SCA) is a common inherited disorder of red blood cell sickling. **Chronic hemolysis** is a trademark of sickle cell disease; intrinsic hemoglobin defects lead to high red blood cell turnover and anemia. Hemolysis occurs primarily outside the vessels, especially in the **spleen** and **bone marrow**, where there is slow blood flow; it also occurs intravascularly. The high rate of heme catabolism and short red blood cell life span (~20 days) results in **elevated lactate dehydrogenase**, **unconjugated hyperbilirubinemia**, and compensatory **reticulocytosis**. Excess hemoglobin (from extravascular and intravascular hemolysis) binds to haptoglobin, depletes circulating haptoglobin, and results in **low to absent serum haptoglobin** on laboratory measurement.

An acute worsening of anemia can occur during **splenic sequestration**, which occurs periodically beginning as early as infancy. The accumulation of red blood cells in the spleen causes **splenomegaly** and the acute anemia manifests as increasing fatigue

- Paroxysmal nocturnal hemoglobinuria

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An acute worsening of anemia can occur during **splenic sequestration**, which occurs periodically beginning as early as infancy. The accumulation of red blood cells in the spleen causes **splenomegaly**, and the acute anemia manifests as increasing fatigue and hypotension in severe cases.

(Choice A) Pernicious anemia is a type of megaloblastic anemia. Autoantibody formation against intrinsic factor results in vitamin B12 deficiency. This pathologic process occurs in atrophic gastritis but not in sickle cell anemia.

(Choice B) Autoimmune hemolysis also results in elevated lactate dehydrogenase, unconjugated hyperbilirubinemia, and reticulocytosis due to high red blood cell turnover. However, the hemolysis in sickle cell disease is due to an intrinsic defect of the cell shape, not an extrinsic autoimmune process.

(Choice D) High red cell turnover can deplete folic acid stores and cause megaloblastic anemia. However, this patient is taking folic acid supplementation and has normal mean corpuscular volume, making this diagnosis less likely.

(Choice E) Patients with SCA are at risk of iron overload and hemosiderosis due to a lifetime of recurrent blood transfusions. Iron deficiency is unlikely in this patient due to normal mean corpuscular volume and recent blood transfusion.

(Choice F) Aplastic crisis can cause an acute worsening of anemia in patients with SCA. It typically follows parvovirus B19 infection and presents as sudden arrest of erythropoiesis. The primary clue to this etiology is reticulocytopenia (<1%). This patient has reticulocytosis, making aplastic crisis unlikely.

Educational objective:

Patients with sickle cell anemia suffer from chronic extravascular and intravascular

measurement.

An acute worsening of anemia can occur during **splenic sequestration**, which occurs periodically beginning as early as infancy. The accumulation of red blood cells in the spleen causes **splenomegaly**, and the acute anemia manifests as increasing fatigue and hypotension in severe cases.

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Educational objective:

Patients with sickle cell anemia suffer from chronic extravascular and intravascular hemolysis. Characteristic laboratory findings include mild to moderate anemia with reticulocytosis and unconjugated hyperbilirubinemia. An acute worsening of anemia can occur from splenic sequestration, which manifests as splenomegaly and increasing fatigue.

References:

1. [Types of anaemic crises in paediatric patients with sickle cell anaemia seen in Enugu, Nigeria.](#)
2. [Sickle-cell disease.](#)