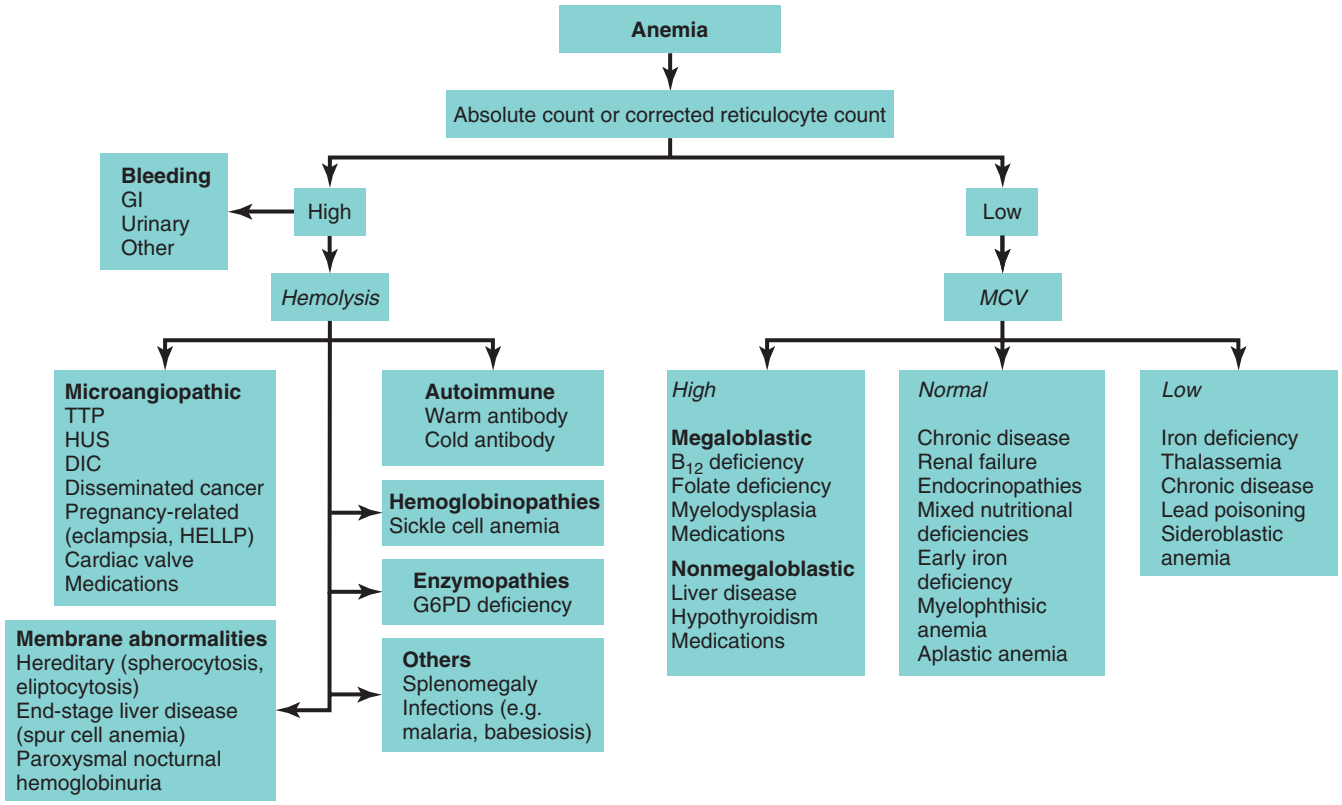

FIGURE 47-1 Overview of the differential diagnosis of anemia. DIC, Disseminated intravascular coagulation; G6PD, glucose-6-phosphate dehydrogenase; GI, gastrointestinal; HELLP, hemolysis, elevated liver enzyme levels, and low platelet count; HUS, hemolytic-uremic syndrome; MCV, mean corpuscular volume; TTP, thrombotic thrombocytopenic purpura.

peripheral blood therefore reflects the response of the bone marrow to anemia.

The reticulocyte count can be expressed either as a percentage of the total number of RBCs or as an absolute number. In patients without anemia, the normal reticulocyte count is 0.5% to 1.5% of RBCs or 20,000 to 75,000/μL. When the anemia is caused by decreased RBC survival, the appropriate marrow response results in a reticulocyte count greater than 2%, with an absolute count of more than 100,000/μL. If the reticulocyte count is not elevated, a cause of failure of RBC production should be sought. Reticulocyte counts that are expressed as a percentage of total RBCs must be corrected for anemia because decreasing the number of circulating cells increases the reticulocyte percentage without any increase in release from the marrow. The *corrected reticulocyte count* is calculated by multiplying the reticulocyte count by the ratio of the patient's hematocrit to a normal hematocrit. The advantage of using the absolute reticulocyte count is that this correction is not necessary.

Evaluation of the *peripheral blood smear* may provide important clues to the cause of anemia. Erythrocyte morphologic examination is especially critical in the evaluation of anemia associated with reticulocytosis, wherein an examination of the smear is essential to distinguish between immune hemolysis (which results in spherocytes) and microangiopathic hemolysis (which causes schistocytes or erythrocyte fragmentation). Changes associated with other causes of anemia include sickle and target cells that are characteristic of hemoglobinopathies, teardrop cells and nucleated RBCs associated with myelofibrosis and marrow infiltration, intracorpuscular parasites in malaria and babesiosis, and pencil-shaped deformities associated with severe iron deficiency. Examination of myeloid cells and platelets may also be helpful. Hypersegmented neutrophils and large platelets support the diagnosis of megaloblastic anemia, and the presence of immature blast forms may be diagnostic of leukemia. Figure 47-2 presents some common peripheral blood smear findings in patients with anemia.

In patients with anemia and an elevated reticulocyte count, the vigorous production of new erythroid cells suggests that marrow function is normal and is responding appropriately to the stress of the anemia. Bone marrow examination in this situation is rarely indicated because the marrow will simply show erythroid hyperplasia, usually without revealing any primary pathologic anomaly of the marrow. Evaluation in these cases should be focused on determining whether the cause of RBC consumption is bleeding or hemolysis. In contrast, bone marrow examination is often required for the evaluation of hypoproliferative anemia. After common abnormalities such as iron deficiency and other nutritional deficiencies have been ruled out, marrow aspiration and biopsy are indicated to search for abnormalities such as marrow infiltration, marrow involvement with granulomatous disease, marrow aplasia, or myelodysplasia.

The *mean corpuscular volume* (MCV) is an extremely helpful tool in the diagnosis of anemia with a low reticulocyte count (hypoproliferative anemia). The size of the RBCs (measured in femtoliters per cell) is used to characterize the anemia as