Elevated Right Hemidiaphragm and Abdominal Pain in a 36-Year-Old Postpartum Woman*

Janet M. Nicolas, MD; John C. Elkas, MD; and Allen H. Roberts II, MD, FCCP

At the 26th week of gestation, a 36-year-old black woman, gravida 2, para 1, presented with a chief complaint of abdominal pain. Her prenatal course had been uneventful to date. Findings at the time of presentation were consistent with preterm labor, and she was admitted for magnesium tocolysis. An ultrasound examination demonstrated a fetus of appropriate size for gestational age in footling breech presentation. She continued to have regular uterine contractions and progressive cervical dilation despite tocolytic therapy. On hospital day 1, she was noted to have mild hypertension, proteinuria, and elevated liver enzyme levels; a diagnosis of preeclampsia was made. In light of the presentation of the fetus, the advanced cervical dilation, and the diagnosis of preeclampsia, a primary cesarean section was performed with delivery of a viable female infant. Twenty-four hours after delivery, she complained of persistent epigastric pain and light-headedness. She denied shortness of breath or chest pain.

Physical Examination

The patient’s vital signs included the following: temperature, 38.3°C; pulse, 100 beats per minute; respiration, 20 breaths per minute; and BP, 155/90 mm Hg. She was a well-developed woman in no acute distress. The cardiac examination disclosed no murmurs or jugular venous distension. An examination of the chest revealed decreased breath sounds at the right base. Abdominal findings showed Pfannenstiel’s incision, diffuse tenderness without rebound, and absent bowel sounds. The extremities were not edematous.

Laboratory Findings

Values included WBC count, 27,000/mm³ (90% PMNs); hematocrit, 18%; and platelet count, 74,000/mm³. Prothrombin and partial thromboplastin times were within normal limits. Liver function tests included aspartate aminotransferase, 545 mg/dL (normal, <49 mg/dL); alanine aminotransferase, 389 mg/dL (normal, <56 mg/dL); and total bilirubin, 1.7 mg/dL (normal, <1.3 mg/dL). A chest radiograph showed an elevated right hemidiaphragm (Fig 1).

What diagnosis would explain the clinical findings, and which diagnostic test would you perform next?

*From the Division of Pulmonary/Critical Care Medicine and Division of Obstetrics and Gynecology, National Naval Medical Center, Bethesda, MD.

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Reprint requests: Janet M. Nicolas, MD, Division of Pulmonary/Critical Care Medicine, National Naval Medical Center, 8901 Wisconsin Ave, Bethesda, MD 20889-5600
Diagnosis: Subcapsular hepatic hematoma in the setting of hemolysis, elevated liver enzymes, low platelets (HELLP) syndrome. A CT scan of the abdomen is the imaging modality of choice; however, ultrasound is appropriate for patients whose conditions are unstable.

Discussion

Critical illnesses in pregnant patients are relatively uncommon, and many critical care physicians have limited experience in their management. Preeclampsia is a complication of pregnancy characterized by hypertension, proteinuria, and generalized edema. The acronym HELLP was coined by Weinstein in 1982 to describe 29 patients with preeclampsia; later, characteristic laboratory findings developed in these patients. Most cases of the syndrome occur in white women over 25 years of age who typically present between 23 and 29 weeks of gestation. However, the majority of patients in an extensive review by Sibai et al were noted to be older and multiparous. All 29 of the patients included in Weinstein’s review were antepartum; however, in 30% of the 442 patients reviewed by Sibai, the manifestations of HELLP syndrome developed postpartum. In patients in whom HELLP developed postpartum, pulmonary edema and renal failure were more likely to develop.

The pathogenesis of the HELLP syndrome is not known. Classic hepatic histopathologic findings include periportal or focal parenchymal necrosis in which hyaline deposits of fibrin-like material can be seen in the hepatic sinusoids. Immunofluorescence studies show fibrin microthrombi and fibrinogen deposits in the hepatic sinusoids. Recently, activated protein C resistance resulting from a mutation in coagulation factor V has been found to be the leading cause of thrombosis in pregnancy. Brenner et al have postulated an association of HELLP syndrome with a thrombotic process and have suggested investigation for activated protein C resistance in patients with HELLP syndrome.

Controversy exists as to the diagnostic criteria and methods used in various case reports describing the HELLP syndrome. The syndrome is thought to be part of a spectrum involving the same pathophysiologic findings as in preeclampsia. However, hypertension and proteinuria, typical of preeclampsia, are not necessary for diagnosis of the syndrome. A proposed standardization of the diagnosis includes the following: (1) hemolysis, defined by abnormal peripheral smear; increased bilirubin level (>1.2 mg/dL); and increased lactate dehydrogenase value (>600 U/L); (2) elevated liver enzyme levels, defined as increased aspartate amino transferase (>70 U/L) and increased lactate dehydrogenase level; and (3) thrombocytopenia, defined as a platelet count of <100,000/mm³. These criteria were used to evaluate a series of 316 women in whom a diagnosis of HELLP syndrome or severe preeclampsia was made; it was found that women with HELLP syndrome had more frequent serious complications, including acute renal failure, abruptio placentae, pulmonary edema, and the need for blood products transfusion, than those with preeclampsia.

One of the most severe complications of the HELLP syndrome is hepatic hemorrhage. Despite the practice of immediate delivery of the fetus for relief of preeclampsia, postpartum patients also are at continued risk for the development of HELLP syndrome and hepatic hemorrhage. Patients may complain of nausea, vomiting, and malaise. Epigastric, right upper quadrant, or shoulder pain frequently are present and may be accompanied by dyspnea. Hemorrhage may result in sudden hypotension. Because signs and symptoms are variable, diagnosis may be problematic. In a review of hepatic findings in 34 patients with the HELLP syndrome, CT and MRI scans had excellent sensitivity for detecting liver hemorrhage; however, a CT scan was faster and more available for the patient whose condition was unstable and ultrasound was useful as a screening tool. Decreased platelet counts <20,000/mm³ were associated with abnormal CT scans of the liver in 10 of 13 patients with liver abnormalities. In the present patient, elevation of the right hemidiaphragm was associated with subcapsular hepatic hematoma and upward displacement of the diaphragm (Fig 2).

Patients with the diagnosis of ruptured hepatic hematoma should undergo surgical or angiographic stabilization. Current experience demonstrates that unruptured subcapsular hematoma may be managed conservatively with serial assessment and supportive care.

![Figure 2. CT scan of the abdomen showing subcapsular hepatic density (areas 1 and 2) consistent with hematoma.](image-url)
care. Survival is associated with rapid diagnosis and immediate medical or surgical stabilization. Angiographic embolization may be useful in patients whose condition is too unstable for surgery or who have had ineffective surgical intervention.

The present patient recovered uneventfully with conservative management. A CT scan of the chest 1 month after hospitalization demonstrated interval decrease in the size of the hematoma. A subsequent chest radiograph 4 months later showed resolution of the right hemidiaphragm elevation. Hematologic evaluation for a hypercoagulable state disclosed no abnormalities.

**Clinical Pearls**

1. **Hepatic hemorrhage should be suspected in patients with HELLP syndrome who complain of right upper quadrant, epigastric, or shoulder pain and should be evaluated serially with ultrasound or CT scans.**

2. **Elevated right hemidiaphragm on a plain radiograph in a patient with HELLP syndrome should be considered to represent subcapsular hepatic hematoma until proven otherwise.**

3. **Rapid diagnosis and surgical or medical stabilization are critical to improve survival of patients with hepatic hemorrhage.**

**Suggested Readings**


