

Ultrasound diagnosis of diaphragmatic rupture

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A 34-year-old female was the restrained passenger in a high-speed motor vehicle collision. On arrival to the Emergency Department she was alert and complaining of pain in her left chest and abdomen. Her initial vital signs were the following: blood pressure 80/45, heart rate 112, respiratory rate 18, and saturation was 96% on 15 l of oxygen. Her physical exam was remarkable for profound tenderness in her left chest and abdomen, with abrasions but no gross deformity or crepitus. A bedside ultrasound (extended focused assessment with sonography for trauma) was performed, and the following images were obtained of her left upper quadrant.

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Acute diaphragmatic rupture with hemoperitoneum

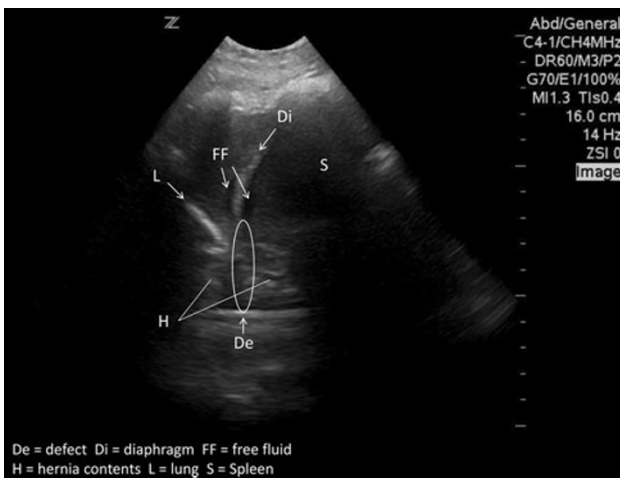
Diaphragmatic injury, hemothorax, and hemoperitoneum were all apparent on bedside ultrasound. This image demonstrates a free-floating diaphragm with abdominal contents herniating into the chest cavity, which was more prominent on the dynamic scan. The patient went directly to the operating room where she underwent a splenectomy and repair of her diaphragm rupture.

Blunt diaphragmatic rupture is a serious condition that requires surgical repair. Unfortunately, the diagnosis is often delayed because clinical and radiographic evaluations are insensitive. Initial plain radiographs have demonstrated sensitivities of 28–65%, and computed tomography has been shown to be 50–84% sensitive [1, 2].

There is no consensus on the sensitivity of ultrasound in this diagnosis, but there are several reports in the literature describing findings suggestive of diaphragmatic rupture on ultrasound. These findings include the use of M mode to demonstrate abnormal diaphragmatic excursion, and the direct visualization of loops of bowel with peristalsis above the level of the diaphragm [3, 4]. Kim et al. [5] described the features of diaphragmatic rupture, including a floating and non-visualized diaphragm and subphrenic fluid collection. When considering right sided diaphragmatic rupture, Kirkpatrick et al. [6] described a “liver sliding” sign, where hepatic parenchymal movement is seen against the parietal pleural surface where lung parenchyma is normally expected. Most recently, a case report by Gangahar [7] described the non-visualization of the spleen and heart in the diagnosis of ruptured diaphragm. This “Rip’s absent organ sign” describes another indirect marker for the diagnosis of diaphragmatic rupture.

Compared with radiography, ultrasound has the additional advantage of providing dynamic assessment of the

diaphragm. Our ultrasound images and video reveal direct visualization of a diaphragmatic rupture discovered during acute resuscitation. In the future, larger studies are needed to delineate the accuracy of ultrasound in diagnosing diaphragmatic injury.



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