



Brief Report

Feasibility of sonographic localization of the inferior epigastric artery before ultrasound-guided paracentesis^{☆,☆☆,★}

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ABSTRACT

Background: Ultrasound-guided paracentesis is commonly performed in the emergency department (ED) setting. Injury to the inferior epigastric artery (IEA) is an uncommon but potentially life-threatening complication of paracentesis. Use of anatomic landmarks has been recommended to avoid this structure. If feasible, sonographic localization of the IEA before ultrasound-guided paracentesis may provide the operator with anatomic mapping of this vascular structure.

Case reports: We present 5 cases demonstrating the feasibility of identifying the IEA in ED patients with ascites. Why should an emergency physician be aware of this? Sonographic localization of the IEA before ultrasound-guided paracentesis may provide a more reliable means of avoiding iatrogenic injury to this vessel. Further study is warranted to determine whether routine IEA visualization before paracentesis results in a decreased complication rate.

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1. Introduction

Needle aspiration of ascites fluid from the peritoneal cavity or paracentesis is routinely performed in the emergency department (ED) setting for both diagnostic and therapeutic purposes. Complications include infection and injury to anatomic structures such as solid organs and the inferior epigastric artery (IEA) [1–4]. This latter complication can have devastating consequences including hemorrhage, pseudoaneurysm formation, and death [5–7]. Prior investigation has shown that the use of ultrasound-guidance confers a greater success rate during paracentesis than a traditional landmark approach [8]. The use of sonography also reduces complications and may in turn decrease costs [9].

To date, no known studies or case descriptions exist for use of ultrasound to identify the IEA in ED patients with ascites. Although a standard emergency medicine procedure textbook recommends use of ultrasound to identify ascites, no mention is made of sonography for IEA identification [10]. Rather, the recommendation is to use a traditional avoid-by-landmarks approach, staying lateral to the rectus sheath to avoid the IEA [10]. Some authorities recommend using ultrasound to identify fluid pockets amenable to paracentesis, with the goal of improving paracentesis success rates and minimizing complications;

however, we are unaware of standard recommendations for identifying the IEA [8,9,11,12].

Two locations for performing needle insertion in paracentesis have been described, at the avascular midline lower abdomen and the lateral, lower quadrant [11]. The lateral lower quadrant is generally preferred, as it offers a thinner abdominal wall with less collateral vessels and a larger pool of ascites fluid. In addition, rising obesity has caused increases in midline wall thickness, which can decrease ease of use of the midline site for large volume paracentesis [11,13].

The IEA typically arises from the external iliac artery just superior to the inguinal ligament. The artery then courses superiorly and medially to enter the rectus sheath. Several studies have attempted to define the usual anatomic location of the IEA [14–16]. These studies, however, did not focus on patients with ascites who may have altered anatomy due to abdominal distension. We reviewed charts over a 13-month period from November 2011 to December 2012 to identify patients on whom we documented visualization of the IEA during paracentesis performed in the ED. In this retrospective case series, we describe 5 cases of ED patients with ascites in whom the use of ultrasound to identify the IEA was feasible. We also describe the sonographic technique for identifying this important structure. This study was approved by the medical center institutional review board (IRB) and was not part of any other study.

2. Case reports

2.1. Case 1

A 65-year-old man with a history of hepatitis C and alcoholic liver disease presented to the ED with abdominal pain and distension. He

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Fig. 1. Sonographic appearance of the IEA (red) flanked by 2 accompanying inferior epigastric veins (blue). Hypochoic fluid can be seen deep to the abdominal wall.

appeared jaundiced and had diffuse abdominal tenderness without rebound. Bedside ultrasound was positive for ascites. The IEA was visualized sonographically before performing ultrasound-guided paracentesis (Fig. 1). Five liters of ascites fluid were removed without complication. The patient experienced symptomatic improvement and was admitted to the gastroenterology service for further care.

2.2. Case 2

A 62-year-old man with a history of alcoholic liver disease and bleeding gastric varices presented with abdominal pain and shortness of breath. Physical examination revealed a tense, grossly distended abdomen. Using bedside ultrasonography, the location of the right IEA was marked (Fig. 2). Large volume paracentesis was then performed in the ED with removal of 5 L of peritoneal fluid. There were no complications. The patient reported improved symptoms and was subsequently admitted.



Fig. 2. Photograph demonstrating the location of the inferior epigastric vessels in a patient with ascites.

2.3. Case 3

A 36-year-old man with a history of hepatitis B presented as a walk-in with complaints of fluid retention and swelling of the abdomen, scrotum, and bilateral lower extremities. He also noted occasional hematemesis, epistaxis, shortness of breath, and urinary retention. He noted hemorrhoids and was taking furosemide 20 mg daily. Examination revealed an afebrile male with abdominal protuberance, shifting dullness, a positive fluid wave, and anasarca. Diagnostic and therapeutic ultrasound-guided paracentesis was performed. The left IEA was identified in the lower quadrant, and needle insertion was performed lateral to that site. Two liters of cloudy yellow fluid was removed, and fluid analysis was negative for spontaneous bacterial peritonitis. He was discharged with increased doses of diuretics after a 2-day admission (Video 1).

2.4. Case 4

A 57-year-old man with a history including hepatitis C, cirrhosis, and hepatic encephalopathy was transferred to the ED for evaluation of liver failure and altered mental status. He had undergone a therapeutic paracentesis 4 days prior. Jaundice, bibasilar crackles, abdominal fluid wave, right upper quadrant tenderness, and asterix were noted on examination. Bedside ultrasonography was used to identify the IEA and mark an optimal site for paracentesis, which was conducted without complication. He required 2 additional therapeutic paracenteses during a 2-week admission and was treated for spontaneous bacterial peritonitis and hepatic encephalopathy.

2.5. Case 5

A 40-year-old woman with a history of cirrhosis, hepatitis C, alcohol dependence, and transjugular intrahepatic portosystemic shunt was transferred to the ED from an outlying hospital for abdominal pain, vomiting, and worsening transaminitis. Of note, paracentesis had been performed 4 times in the 6 weeks before presentation, most recently a large volume (5 L) of paracentesis just before transfer. On evaluation, she was afebrile and tachycardic with a distended, tight, diffusely tender abdomen. The IEA was identified. Right lower quadrant diagnostic and therapeutic paracentesis were performed, obtaining 2 L of fluid. The patient was subsequently admitted to the gastroenterology service. She improved to discharge with lactulose, a short antibiotic regimen, and diuresis.

3. Sonographic technique for identifying the IEAs

In each of the cases described, a Sonosite M Turbo with a 6- to 13-MHz 25-mm linear array transducer was used. All procedures were done with static ultrasound guidance by junior-level resident physicians under the supervision of a single ED attending physician with more than 10 years of experience in the use of ultrasound. The attending also has experience as an emergency ultrasound fellowship director. In all cases, the IEA was identified. There were no complications from the procedure in any case.

3.1. Technique

The IEA is identified along its course in the lower abdomen by scanning with a high-frequency transducer, beginning at the mid-inguinal ligament and proceeding superomedially toward the umbilicus. Commonly, the IEA may be seen as a round, pulsatile, hypochoic structure flanked by 2 inferior epigastric veins (see Fig. 1). In patients with a particularly large amount of ascites, a more lateral starting point may be required. If the IEA is not visualized just above the inguinal ligament or if this area is difficult to access due to the patient's body habitus, an alternate approach may be used. First, place the transducer in a transverse

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