Paracentesis

Summary

Ultrasound can identify as little as 250cc of free fluid in the peritoneal cavity\(^{(18)}\).

Paracentesis is a safe procedure with less than a 1-5% complication rate\(^{(15-17)}\).

In a randomized controlled study, ultrasound assisted paracentesis had a 95% success rate as compared to 65% when performed with landmark techniques\(^{(2)}\).

Paracentesis is important for the diagnosis and management of certain infections such as spontaneous bacterial peritonitis (SBP) and for assessing peritoneal fluid for blood or ascites. In addition, some patients may require therapeutic paracentesis for comfort when excessive fluid causes respiratory discomfort. Paracentesis is a safe procedure with less than a 1-5% complication rate\(^{(15-17)}\). Ultrasound is a sensitive modality for the identification of fluid within the peritoneal cavity and can identify as little as 250cc of free fluid\(^{(18)}\). The use of ultrasound can demonstrate the best location for the procedure, and can help decrease adverse events. In a randomized controlled study, ultrasound assisted paracentesis had a 95% success rate as compared to 65% when performed with landmark techniques\(^{(2)}\).

Depending on the quantity of fluid to be aspirated, paracentesis may require a considerable amount of time. Physician experience and comfort with the procedure often dictate the frequency of bedside paracentesis performed. A national study demonstrated that the percentage of paracentesis performed by interventional radiologist drastically increased from 16% in 1993 to 74% in 2008\(^{(19)}\). Given that success rates of bedside paracentesis are equally effective and may change the management of patients, clinicians are urged to become more facile with the procedure\(^{(20)}\).

Prior to performing the bedside paracentesis, appropriate laboratory tests such as platelet count and coagulation factors should be reviewed. Paracentesis may be performed with an ultrasound-assisted technique or with an ultrasound guided technique. The ultrasound-guided technique requires an additional step: direct visualization of the needle tip as it enters the peritoneum. Sonographic evaluation prior to paracentesis can help decrease complications as well as improve operator confidence. In one study ultrasound assisted paracentesis was compared with the anatomical landmark approach. In this study, adverse events occurred in 1.4% of the ultrasound group and 4.7% of the anatomical landmark group\(^{(17)}\). In addition, sonographic evaluation can reduce futile attempts in patients without fluid or scant amount of fluid.\(^{(2)}\).
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**Technique**

The curvilinear probe is ideal for patients undergoing paracentesis, because it uses lower frequencies and has improved penetration. Skin, fluid, and other anatomy should be visualized. Before proceeding with the paracentesis, a focused abdominal ultrasound should be performed to evaluate normal anatomy and decrease potential complications (see detailed technique in FAST chapter in Introduction to Bedside Ultrasound Volume 1). Sonographic evaluation of the right upper quadrant establishes the presence of the liver and right kidney in the anticipated location. Hepatomegaly may extend into the lower quadrant and renal cysts may be disguised as abdominal free fluid. Evaluation of the left upper quadrant can demonstrate the spleen and left kidney and eliminate concern for splenomegaly or displacement of these organs. Lower quadrants must be imaged to assess for adhesions (ABD 7), dilated loops of bowel, or pathology other than peritoneal fluid. Suprapubic imaging will confirm bladder emptying was successful. (ABD P1,2,3,4,5). Simple peritoneal fluid will appear anechoic outside of the bowel lumen. Fluid from abscesses or hemoperitoneum may contain echoes from blood cells, fecal material, purulent fluid or fibrinous products.

The sonographic evaluation of the abdomen will reveal the largest pocket of fluid (which is usually in the lower quadrants) and its identification is paramount to a successful procedure (ABD 6). To maximize success, the patient may be placed in the left lateral decubitus position. The position of bowel, mesentery, and bladder should be noted. The distance from the skin surface to the fluid pocket should be noted. Once the largest pocket of free fluid is identified and the skin is marked with a patient marker, the patient must not change positions. Switch to a high frequency transducer, evaluate for superficial vessels and identify the epigastric vessels (US image WITH linear transducer showing epigastric vessels). Using sterile precautions, prepare and drape the patient for the procedure. For the ultrasound-guided approach, transducer should be covered with a sterile sheath. At the site marked for puncture, use a small gauge needle to create a superficial wheel of anesthetic solution such as lidocaine with epinephrine. With a scalpel, make a small incision in the skin large enough for the peritoneal catheter to advance through. When performing the ultrasound-guided technique, observe as the needle advances and enters the peritoneum. The needle will appear echogenic with a ring-down artifact in the ascitic fluid. If the needle tip is difficult to assess, a saline flush may be administered to determine the location.

**Pitfalls and Pearls**

Misinterpretation of the ultrasound image can occur in circumstances such as ovarian cysts, renal cysts, or a distended bladder. Evaluate the corresponding quadrant thoroughly.
Bowel obstruction with fluid seen filling the bowel should not be mistake for ascetic fluid.

Once the ideal location for paracentesis is identified and marked, the patient must not move.

Placing the patient in reverse trendelenburg or lateral decubitus position can maximize the pocket of fluid.

Empty the bladder prior to performing a paracentesis.

Failure to identify epigastric vessels can lead to puncture and significant bleeding.

The operator should continue to watch mobile bowel loops, or mesentery in the ascitic fluid while advancing the needle under real time guidance.

If a patient has a large amount of ascites, a fistula can be created if the catheter is inserted parallel to the skin puncture site. To prevent this, move the skin and soft tissue laterally prior to needle insertion thereby creating a tunneled path between skin and peritoneum. This technique will help tamponade the wound after procedure.

Galleria 25.3
The catheter may get stuck in mesenteric fat due to negative pressure created by the vats. In this situation, a saline flush can be used to loosen the catheter and resume aspiration. The saline flush can be visualized as it creates a motion artifact.