Abstract—Background: Emergency physicians can utilize bedside ultrasound to aid in the diagnosis of abdominal wall hernias and in the reduction of incarcerated hernias. Objectives: To review the sonographic appearance and diagnostic criteria of abdominal wall hernias and to describe the potential use of ultrasound as an aid in hernia reduction. Case Report: An emergency physician utilized bedside ultrasound to confirm the diagnosis of an incarcerated ventral abdominal wall hernia and to assist in its successful reduction. Conclusions: A physician trained in bedside ultrasound can diagnose an abdominal wall hernia and facilitate the appropriate treatment of an incarcerated hernia.

Keywords—ultrasound; bedside; point-of-care; hernia; reduction

INTRODUCTION

The evaluation and management of abdominal wall hernias in the emergency department (ED) requires accurate diagnosis and prompt intervention to prevent complications. Bedside ultrasonography by emergency physicians (EPs) may be a useful adjunct in both the diagnosis and treatment of abdominal wall hernias and in the identification of strangulation. We present a case in which bedside ultrasound was used to confirm the diagnosis and guide the reduction. The case, the ultrasound evaluation of abdominal wall hernia, and the approach to the ultrasound-assisted reduction procedure are described.

CASE REPORT

A 39-year-old man presented to the ED with a chief complaint of abdominal pain. The patient reported that the pain started suddenly in his periumbilical region 2 h prior to his ED presentation when he bent down to pick something up off the ground. Since that time, the pain had worsened in intensity. The pain was sharp, nonradiating, and aggravated by movement. He had never previously experienced this type of abdominal pain. He reported nausea without vomiting, and denied constipation, obstipation, fevers, or urinary symptoms. His last bowel movement the prior evening was normal. There was no relevant past medical history, and the patient had not had any previous abdominal surgeries. He took no medications, had no medication allergies, and he did not smoke cigarettes or drink alcohol. He also denied any recent travel outside of the country or sick contacts.

In the ED, the patient had a blood pressure of 143/101 mm Hg, heart rate of 71 beats per minute, respiratory rate of 18 breaths per minute, and an oral temperature of
36.3°C (97.4°F). He seemed uncomfortable. On the abdominal examination, the patient was overweight but not obese. An approximately 4 × 4-cm firm, nonpulsatile, tender supraumbilical mass was palpated in the midline. The abdomen was otherwise soft and nontender, without evidence of guarding or rebound. There was no rash, warmth, or induration overlying the mass. The bowel sounds were hypoactive. There was no costovertebral angle tenderness, and the genitourinary examination was normal. Eight mg of morphine was given subcutaneously, and the EP, suspecting an umbilical hernia, attempted to reduce the mass without success. Meanwhile, laboratory testing including a complete blood count, metabolic panel, liver function tests, and lipase was unremarkable.

The EP then performed a bedside ultrasound evaluation of the abdominal mass. The structure appeared round and sac-like, with a hyperechoic outline (Figure 1). The sac contained echogenic material, with peristaltic movements, as well as irregular shadowing suggestive of solid, liquid, and gas bowel contents (Video 1). Deep to this structure, the fascial plane of the linea alba was visualized as a hyperechoic line traversing the image. Scanning in the sagittal and transverse planes, the EP was able to identify an approximately 2-cm defect in this fascial plane. Based on these sonographic findings, the diagnosis of umbilical hernia was confirmed. Due to his persistent discomfort, the patient was given an additional 8 mg of morphine intravenously. The patient was placed in Trendelenburg position and the EP manually applied firm, steady pressure in the direction of the previously visualized fascial defect; the mass was felt to pass through this area and the patient’s pain was immediately relieved. A postreduction ultrasound examination demonstrated the previously visualized sac now located deep to the linea alba, thus confirming a successful hernia reduction (Figure 2, Video 2). After a brief observation period, the patient was discharged home with outpatient follow-up in the General Surgery clinic.

**DISCUSSION**

Patients with hernias commonly present to the ED with acute abdominal or groin pain. Typically, the hernia appears as a palpable mass that is reducible and demonstrates an expansile cough impulse (1). The primary goals for the EP when evaluating a suspected hernia are to differentiate a hernia from other causes of an abdominal or groin mass such as abscess or hematoma, and to determine whether the hernia may be incarcerated or strangulated. An incarcerated hernia is a surgical emergency and requires immediate reduction, as the inflammation and edema that develop increase the risk of strangulation and resultant bowel obstruction and ischemia (2). Bedside ultrasound, which is well suited for evaluation of superficial structures such as a hernia, can provide a valuable adjunct both for diagnosis and reduction of suspected hernias in the ED (3).

The use of radiology-performed ultrasound to assist in the diagnoses of hernias has been described in the surgical literature over the last two decades; however, the use of bedside ultrasound by EPs to directly assist in the reduction of incarcerated hernias is relatively novel (4). Although ultrasound is of limited utility in diagnosing clinically occult hernias in a surgical setting, in the acute presentation of incarcerated hernia seen in the ED, bedside ultrasound by the EP seems to be a useful adjunct to the clinical examination, as well as an effective aid in procedural reduction (5,6). Although a handful of case reports over the last decade have described ultrasound-assisted hernia reduction in the ED, to date, only...
one study has investigated the utility of bedside ultrasound by EPs for hernia reduction (7,8). Chen et al. randomized 112 patients with clinical examination suggestive of incarcerated hernia to blind manual reduction vs. ultrasound-guided reduction if the initial manual attempts failed, with the patients proceeding to emergency surgery if the hernia could not be reduced (2). The authors demonstrated a significantly lower rate of emergent surgery in the ultrasound group, suggesting that ultrasound guidance may be a worthwhile adjunct to this procedure (2).

For the suggested evaluation of a suspected hernia, the EP should utilize a high-frequency linear-array transducer and image the structure in at least two orthogonal planes. When visualized with ultrasound, the hernia appears as a hyperechoic, sac-like structure with a distinct boundary (3). The structure may demonstrate peristalsis as well as so-called “dirty” shadowing from intraluminal bowel gas. The fascia of the abdominal wall will be visualized deep to the hernia sac as a hyperechoic linear structure, and the EP should look for a defect in this fascia, remembering that it may not directly underlie the hernia sac. When reducing the hernia, pressure should be applied in the direction of this defect. The reduction may be performed manually or with the help of the ultrasound transducer itself under dynamic guidance. After the procedure, the area should be scanned again to confirm successful reduction. The EP should be familiar with the ultrasonographic appearance of common hernia mimics such as abscess, lymphadenopathy, and hematoma. Each has a unique sonoanatomy and will have no visible peristalsis or associated fascial defect.

The utility of ultrasound to determine the presence of strangulated bowel remains unclear. Recognizing strangulation is of utmost importance in the management of incarcerated hernias due to the danger associated with the reduction of ischemic bowel into the peritoneal cavity. Blaivas described several ultrasonographic signs suggestive of bowel strangulation, including lack of peristalsis, edema of the bowel wall, and lack of blood flow on Doppler ultrasound (7). To date, these findings have not been correlated with surgical pathology or clinical outcomes, so their diagnostic value is unclear. Strangulation remains a clinical diagnosis, but must be considered if any of these findings are present.

**CONCLUSION**

Bedside ultrasound has been demonstrated as a useful adjunct to the clinical examination and manual reduction in the evaluation and treatment of abdominal wall hernias. Our case report describes a patient in which bedside ultrasound was used by the EP to confirm the diagnosis of a suspected abdominal wall hernia and to guide the reduction procedure. This case illustrates how EP-performed bedside ultrasound may hasten confirmation of the diagnosis and expedite treatment, potentially preventing complications and avoiding unnecessary emergency surgery in such patients.

**REFERENCES**


**SUPPLEMENTARY DATA**

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jemermed.2013.09.026.

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