



# Ultrasound in Emergency Medicine

## POINT-OF-CARE ULTRASONOGRAPHY FOR HERNIA REDUCTION: A CASE OF INCARCERATED UMBILICAL HERNIA

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**Abstract—Background:** Manual reduction of an incarcerated hernia is used to avoid emergency surgery, which comes with risks of complications and death, especially in patients with severe comorbidities. However, there are no established procedures for hernia reduction. **Case Report:** We present the case of an 82-year-old man with refractory ascites due to nephrotic syndrome and chronic heart failure who developed an incarcerated umbilical hernia. Color Doppler ultrasonography allowed us to detect clearly visible blood-flow signals in the incarcerated bowel and rule out necrosis, which is a contraindication for reduction. Several attempts at manual reduction failed; ultrasonography-guided reduction revealed that fluid collection within the hernia sac was blocking the manual pressure directly on the incarcerated bowel toward the hernia orifice. After sac paracentesis (draining the fluid from the sac), the incarcerated bowel became palpable, leading to a successful reduction. Four days later, once the patient was in a stable condition, an elective surgery was performed to prevent the recurrence of incarceration. **Why Should an Emergency Physician Be Aware of This?:** We believe that this is a useful report on the use of point-of-care ultrasonography for incarcerated hernia from the initial assessment of bowel viability to reasonable hernia reduction through hernia sac paracentesis according to real-time observation. An approach based on visualization by ultrasonography, and not on the operator's experience, would be rational, and we believe that this approach will be feasible for emergency physicians, who are responsible for the initial treatment of incarcerated ventral hernia. © 2019 Elsevier Inc. All rights reserved.

**Keywords—**point-of-care ultrasonography; incarcerated umbilical hernia; hernia reduction; sac paracentesis

### INTRODUCTION

Umbilical hernias are more often observed in patients with large volumes of ascites, and their incarceration generally requires emergency surgery (1,2). Patients with incarcerated hernias have higher surgical risks and worse outcomes (3). Manual reduction, rather than emergency surgery, is favorable when possible. However, there are no established procedures for hernia reduction regarding how to evaluate the viability of the incarcerated bowel or how to perform reasonable reduction according to the case-by-case hernia. Herein, we report a case of incarcerated umbilical hernia successfully managed with novel procedures under point-of-care ultrasonography.

### CASE REPORT

An 82-year-old male patient with refractory ascites due to nephrotic syndrome and chronic heart failure was admitted to our hospital for congestive heart failure. The following day he began to complain of periumbilical pain after admission. On physical examination, a periumbilical bulge that was tense and tender to palpation was newly noted. Noncontrast abdominal computed tomography demonstrated moderate ascites and incarceration of



detected clearly visible blood-flow signals in the incarcerated bowel wall, which indicated the safety for hernia reduction instead of surgical repair. The usefulness of color Doppler ultrasonography to assess the viability of incarcerated bowels has been previously reported (5,6).

Second, ultrasonography-guided reduction attempts revealed the fluid within the hernia sac to be the culprit of the reduction failure in real time. As ultrasonography had initially provided a clear image of the hernia orifice and incarcerated bowel, it seems that ultrasonography-guided reduction may provide more specific information and lead to hernia-reduction success. There have been some reports of applying ultrasonography-guided reduction for incarcerated hernia treatment and its contribution to the rate of success (7,8). In this case, ultrasonography-guided hernia reduction did not lead to reduction success. However, it allowed for real-time observation during the reduction and revealed that fluid collection within the sac was preventing the incarcerated bowel from being pressed directly toward the hernia orifice. This demonstrates the usefulness of ultrasonography-guided maneuvers, not only for hernia reduction itself, but also for identifying the cause of reduction failure by obtaining real-time information on the motion of hernia content under manual pressure.

Third, ultrasonography-guided sac paracentesis led to a successful hernia reduction and the avoidance of emergency surgery. To the best of our knowledge, only two cases of this procedure have been reported for incarcerated hernia (9,10). However, the indication of sac paracentesis for incarcerated hernia reduction remains unclear. The indication of sac paracentesis could be defined by the real-time observation of the hernia contents and orifice. In this case, no focal deformity of the incarcerated bowel was observed despite sufficient manual pressure, which meant no effective pinpoint pressure was obtained due to fluid collection within the sac; this indicated a need for sac paracentesis.

This case indicates that point-of-care ultrasonography for the treatment of incarcerated umbilical hernia is a promising procedure. We performed a series of novel procedures, especially for Richter's hernias, which generally require emergency surgery. The hernia reduction was successful, and we avoided surgical risks. Although a few reports have documented color Doppler evaluation, ultrasonography-guided maneuvers, and sac paracentesis for incarcerated hernia, we are not aware of any other report on systematic procedures for the use of point-of-care ultrasonography for incarcerated hernia (5,7–11). In this case, ultrasonography played a significant role in the incarcerated hernia reduction. It allowed us to rule out gangrenous necrosis and provided real-time information during the hernia reduction and subsequent sac para-

centesis, which led to reduction success. Naturally, these procedures contain potential pitfalls due to the shortage of skills with ultrasonography or lack of anatomical knowledge of ventral hernia, such as misinterpreting inadequate flow as adequate or bowel fluid as sac fluid when performing a paracentesis. However, one of the prominent features of this case was that the fluid within the sac allowed us to obtain significantly clearer ultrasonographic images than in cases without the fluid. Fluid collection within the sac prevents some artifacts in the images due to ultrasonic attenuation or reflection, which makes evaluation of the detailed structures around the herniated bowel and interpretation of blood flow signals in the bowel easier and more accurate. We believe this is a useful report on the use of point-of-care ultrasonography that provides a systematic approach for incarcerated hernia from the initial assessment of viability to real-time observation leading to reasonable treatment, including sac paracentesis. These procedures could be applied not only for umbilical hernia, but also for other types of incarcerated ventral hernias, especially those with fluid collection within the hernia sac. This case may contribute to further studies to establish a new approach for incarcerated hernia reduction using point-of-care ultrasonography.

#### WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

The approach based not on operator's experience but on visualization by ultrasonography should be reasonable. We believe that these procedures will be feasible for emergency physicians who are responsible for the initial treatment of incarcerated ventral hernia.

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