

# MISSED ON ULTRASOUND, CAUGHT ON MRI: A CASE OF CLOSED-LOOP SMALL BOWEL OBSTRUCTION IN PREGNANCY

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## SUMMARY

Small bowel obstruction (SBO) in pregnancy is an emergency challenge due to overlapping symptoms between obstetric and gastrointestinal conditions. We report the case of a 27-year-old woman at 26 weeks and 6 days of gestation, with a history of open appendectomy and ovarian cystectomy, who presented with persistent right-sided abdominal pain, vomiting, and absence of bowel movements. Initial imaging at a referring hospital suggested enteritis and raised concerns for threatened preterm labor. Upon transfer to our facility, our ultrasound revealed dilated small bowel loops with minimal peristalsis and echogenic free fluid in the right iliac fossa, suggesting closed-loop SBO with ischemia, but findings were inconclusive. Magnetic resonance imaging (MRI) was performed and its findings are consistent with closed-loop obstruction.

The patient underwent emergency laparotomy, which confirmed twisted, necrotic ileal loops. Resection and ileocecal anastomosis were performed. Both maternal and fetal conditions remained stable postoperatively.

This case highlights the importance of accurate evaluation, timely diagnosis and intervention in SBO during pregnancy. MRI should be considered early when ultrasound is inconclusive, as it can provide critical information without radiation exposure. Delayed diagnosis may result in severe complications, including bowel necrosis and adverse pregnancy outcomes.

**Keywords:** *closed-loop small bowel obstruction, MRI in pregnancy, emergency abdominal imaging*

## I. INTRODUCTION

Bowel obstruction during pregnancy is a rare but serious condition that can pose significant risks to both the mother and fetus [1]. Patients with a history of prior abdominal surgery are the most at risk [2]. Symptoms of SBO often mimic pregnancy-related discomfort and can be mistaken for premature labor or gastroenteritis. Additionally, concerns about ionizing radiation may lead to reluctance in ordering imaging, potentially delaying diagnosis and treatment [1]. Eventually, SBO can lead to severe maternal complications [2]. In terms of imaging

modalities of choice in pregnancy, ultrasound often comes first [3] but its accuracy depends on the skill of the sonographer. Advances in rapid scanning techniques have made MRI an accessory viable option for evaluating the small bowel without concerns of radiation exposure in case ultrasound is inconclusive [3]. This case report will discuss the role and value of ultrasound and MRI in acute surgical abdominal situations, which was specifically small bowel obstruction due to volvulus in a gravid patient. The condition was confirmed after significant progression, which unfortunately required a resection of the necrotic bowel.

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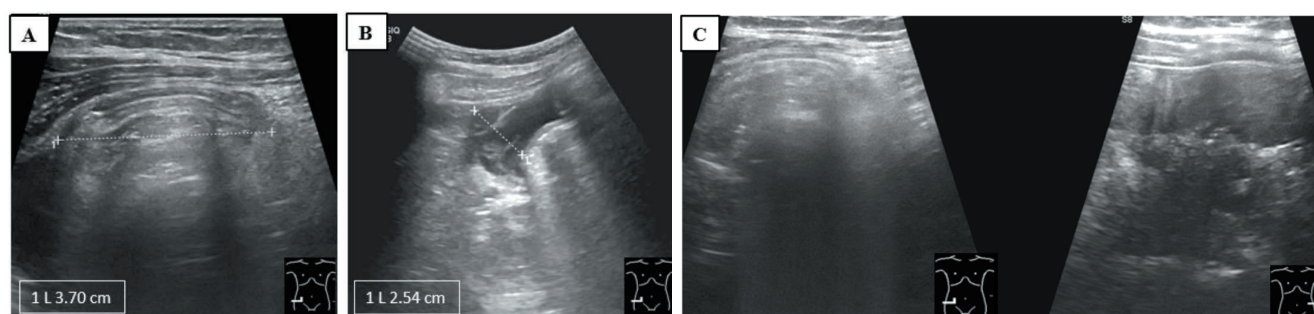
## II. CASE PRESENTATION

A 27-year-old female, gravida 1, para 0, at 26 weeks and 6 days gestation, with a history of open appendectomy and ovarian cystectomy 7 years ago, was admitted due to 11 hours of abdominal pain. Prior to admission, the patient experienced persistent, cramping pain localized around the right periumbilical region, which did not subside between contractions. She had been previously examined at another hospital, where an abdominal ultrasound suggested enteritis. To rule out and prevent threatened preterm labor, a clinical examination was conducted, uterine contractions were monitored, and antispasmodic medication was administered. The patient was thereafter transferred to an obstetrics hospital for further evaluation, but no signs of labor were observed. She was later referred to our hospital. Upon admission, the patient was alert, reporting cramping pain in the right abdomen, infrequent uterine contractions, nausea, and had been vomiting three times. She had not passed gas or had a bowel movement.

During the clinical examination, the patient was alert and responsive, with stable hemodynamic status. Physical findings included an old surgical scar on the right lateral abdomen, abdominal distension with the uterus tilting to the left, and right-sided abdominal pain with strong positive rebound tenderness. No signs of peritoneal

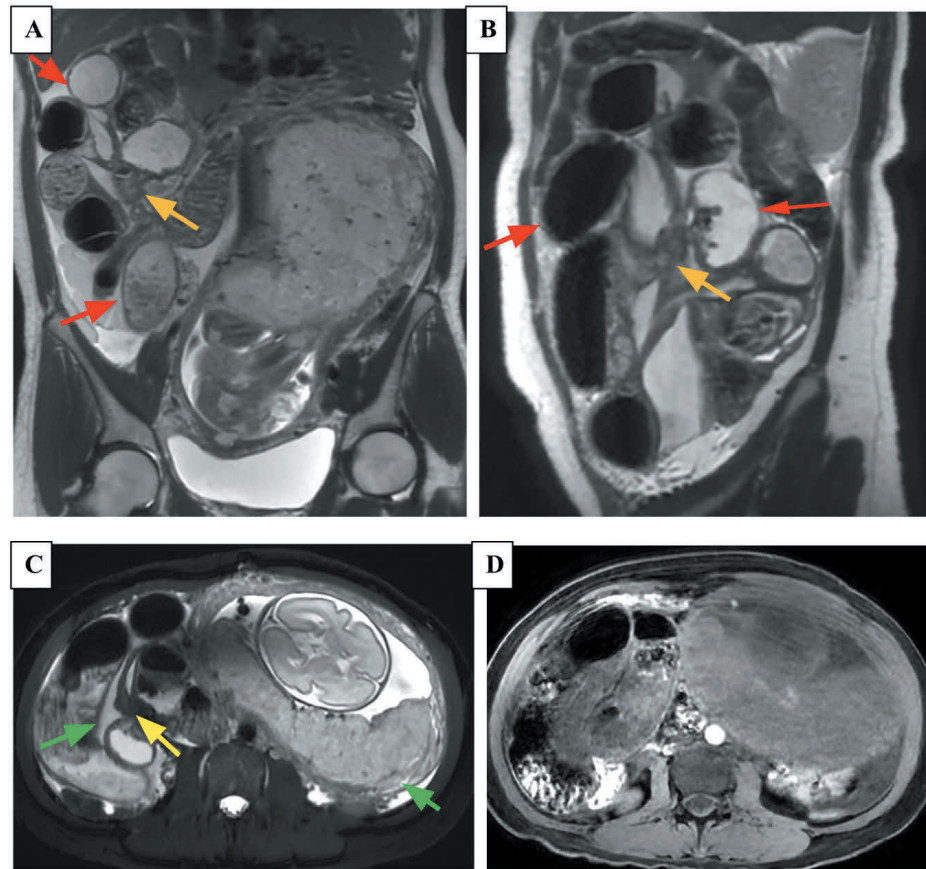
irritation were noted. Infrequent, mild uterine contractions were observed. The fetal heart rate was 150 beats per minute. No vaginal bleeding or leakage of amniotic fluid was reported.

Laboratory results showed a WBC of 16.12 G/l, with a neutrophil percentage of 95.4%. The CRP level was 4.1 mg/L, hemoglobin (HGB) was 117 mg/L, hematocrit (HCT) was 0.344, and platelet count (PLT) was 133 G/L. The patient later underwent a second abdominal ultrasound which revealed a normal fetus and placenta. Amniotic fluid appeared normal. However, there was dilation of some small bowel loops in the right flank and right iliac fossa. These loops were clustered in this region, with the largest transverse diameter measuring approximately 34 mm. The loops contain both fluid and air. The bowel wall thickness was not clearly defined, and there was no increase in bowel peristalsis observed on ultrasound. Doppler imaging showed perfusion of the bowel wall at the time of the examination. There was also presence of free fluid in the abdominal cavity, with echogenic fluid in both the right flank and right iliac fossa. The thickest fluid collection was seen in the right iliac fossa, measuring about 25 mm. The colon was not dilated, and there was no dilation of small bowel loops in the left flank. The findings suggest closed-loop small bowel obstruction.



**Figure 1.** *Ultrasound images of the patient show a significantly dilated loop of small bowel in the right lower quadrant (Image A), with air-filled small bowel loops and minimal peristalsis (Images A and C), without bowel wall thickening (Images A and C). Additionally, echogenic free fluid is observed between the bowel loops (Image B). No small bowel dilatation is noted in the left lower quadrant (Images C).*

As her symptoms worsened and ultrasound findings could not confirm the diagnosis, the patient then underwent an MRI.



**Figure 2.** Abdomen MRI with Coronal T2-HASTE (A), Sagittal T2-HASTE (B), Axial T2-HASTE FS (C), and Axial T1 VIBE (D). The MR images demonstrate dilated small bowel loops clustered together (red arrow), a clump of mesenteric vessels (orange arrow), the small bowel feces sign (D), and the transition point of obstruction (yellow arrow), consistent with a closed-loop small bowel obstruction. Additionally, mesenteric edema (orange arrow) and free ascites (green arrow) are present, findings that are highly suggestive of ischemia.

Following a comprehensive evaluation of ultrasound and MRI findings, the patient consented to an emergency laparotomy. Intraoperatively, the consulting surgeons found twisted, necrotic, dark purple, and malodorous ileal loops near the ileocecal angle. The bowel loops distal to the volvulus were collapsed, with mild dilation of the jejunum and stomach. The uterus was noted to be enlarged, corresponding to a 26-week pregnancy. A diagnosis of necrotizing ileal obstruction secondary to volvulus was established, necessitating resection of the affected bowel segment. The patient subsequently underwent a side-to-side ileocecal anastomosis. Postoperatively, the patient experienced incisional pain but was able to pass gas and ambulate after two days. The condition of both the patient and the fetus remained

stable, with no postoperative complications. The patient improved and was discharged 6 days after surgery.

### III. DISCUSSION

Small bowel obstruction (SBO), a rare but serious condition, most commonly occurs in the second or third trimester [2]. The highest risk involves a history of previous abdominal surgery. The leading causes are adhesions with 30%, and less frequently, followed by internal hernias (25%) and volvulus (24%) [2]. In clinical settings, symptoms include abdominal pain, vomiting, and signs of tenderness and distention on examination [2], which can be misinterpreted for pregnancy-related conditions. Moreover, the enlarged gravid uterus displaces the abdominal and pelvic structures, making clinical examination more challenging [4].

Nevertheless, persistent, non-remitting abdominal pain should prompt clinicians to consider intestinal obstruction, especially closed-loop obstructions, as pain from gastroenteritis or uterine contractions typically has episodes of relief. Nausea and vomiting continuing into or occurring in the third trimester also require further examination to exclude intestinal obstruction. This is due to the fact that volvulus SBO carries an exceptionally high risk of ischemia, as the entrapment of a bowel segment at two points—often involving the mesentery—compromises both inflow and outflow [8]. This mechanism leads to rapid distension from mucosal secretions, mural edema, and vascular strangulation [8]. Moreover, elevated progesterone level during pregnancy further exacerbates ischemic risk by inducing smooth muscle relaxation and reducing intestinal motility, leading to luminal stasis, progressive distension, and delayed decompression of an obstructed loop [9]. A prolonged interval between symptom onset and diagnosis continues to be a major factor contributing to the high morbidity and mortality rates among pregnant patients [3]. Without timely intervention, SBO can result in severe maternal complications, including bowel perforation and fatal outcomes, while perinatal risks include prematurity and stillbirth [2].

The gravid patient in our clinical case had a history of two prior abdominal surgeries, which constituted a risk factor for the current intestinal obstruction. Regarding her medical history and condition upon admission, she presented with persistent, cramping abdominal pain lasting 11 hours, localized to the right periumbilical region, which did not subside between contractions. Additionally, she experienced three episodes of vomiting, absence of gas passing, and no bowel movements. At her gestational age, the displacement of intra-abdominal organs by the enlarging uterus created a significant diagnostic dilemma, since the management of acute abdominal conditions and threatened miscarriage differs significantly. As a result, the optimal intervention window was missed, ultimately necessitating surgical resection of her necrotic bowel segment following ultrasound and MRI findings.

Imaging is frequently used to clarify the clinical situation and aid in making a definite diagnosis [4]. As for its

lack of radiation exposure and availability, ultrasound is preferred initially in pregnancy for evaluating bowel conditions [3]. Sonographic characteristics of SBO may present as dilated bowel loops with fluid levels and loss of peristalsis, yet identifying the exact location or cause of bowel obstruction is often challenging [4]. According to ESUR recommendations, ultrasound has low accuracy in SBO diagnosis in gravid patients [4]. One study found that ultrasound findings matched surgical findings in only 55% of SBO cases [5]. Therefore, to exclude SBO in pregnancy, ultrasound is not the most sensitive modality [6]. When ultrasound results are inconclusive, MRI is preferred over CT for evaluating specific causes of abdominal and pelvic pain during pregnancy without posing a risk of radiation exposure to the human fetus during pregnancy [4]. For over 20 years, 1.5T or lower magnetic field strength MRI has been applied to investigate diseases in pregnancy with no documented harmful effects according to The American College of Radiology (ACR) [7]. 70% of SBO cases can be accurately identified using MRI studies which are performed with the use of multiplanar T2-weighted single-shot fast spin-echo (SSFSE) imaging even though they have not been extensively validated [4]. Key MRI characteristics of bowel obstruction in gravid patients include the presence of distended loops with transition points on T2 weighted (HASTE, ssFSE), steady state sequences (true FISP, FIESTA, balanced FFE), T1 weighted and submucosal wall edema on T2-weighted FS (HASTE, ssFSE) [4].

The imaging characteristics observed in our patient closely resembled the documented findings of SBO above. Ultrasound examination revealed aperistalsis and dilated small bowel loops containing both air and fluid, predominantly in the right flank and right iliac fossa. However, the definitive diagnosis of closed-loop bowel obstruction remained indeterminate, warranting further evaluation with an MRI which showed the transition points in the right lower quadrant of the abdomen. The patient underwent surgical fixation despite the delayed diagnosis and intraoperative findings later confirmed the diagnosis. The postoperative condition of both the patient and the fetus was stable.

**IV. CONCLUSION**

Acute surgical abdomen in pregnant women is often challenging to diagnose and can be easily mistaken for obstetric conditions. Thorough clinical assessment, careful examination, and close monitoring are essential

for timely management. Ultrasound should be performed by experienced clinicians, and early MRI should be considered when sonographic findings are inconclusive to enhance diagnostic accuracy.

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Received: 31/07/2025. Assessed: 13/08/2025. Accepted: 25/12/2025