


# Internal Abdominal Hernia Accompanied by Intestinal Malrotation and Bezoar: A Rare Combination.

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Radiology Case. 2025 December ; 19(12):1-6 :: DOI: 10.3941/jrcr.5887

## AUTHORS' CONTRIBUTIONS

The idea for the manuscript was conceived jointly by all authors. HG was responsible for the initial diagnosis and wrote the initial draft of the case report. LTQ contributed to the literature review and helped revise the manuscript. YYC provided overall supervision and made the final approval of the submitted version. All authors reviewed and edited the text.

## ACKNOWLEDGEMENTS

We appreciate the valuable insights provided by our colleagues and the support from Yantai Laiyang Central Hospital, which were crucial for the completion of this case report.

## DISCLOSURES

The authors declare no conflicts of interest related to this case report.

## CONSENT

Did the author obtain written informed consent from the patient for submission of this manuscript for publication?  
Yes.

## HUMAN AND ANIMAL RIGHTS

All procedures performed were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## ABSTRACT

Internal abdominal hernia is a relatively rare type of acute abdomen that can cause small bowel obstruction; in severe cases, it can result in incarceration, intestinal necrosis, and ischemia, which can be life-threatening. Therefore, a timely diagnosis and prompt surgical treatment are of crucial importance. The causes of internal abdominal hernia are diverse. Complex causes sometimes create difficulties in diagnosis and treatment. Herein, we report a case of a patient with internal abdominal hernia accompanied by intestinal malrotation and a bezoar. A 50-year-old woman was admitted to our hospital with abdominal pain, bloating, and nausea for 3 days, a computed tomography (CT) scan revealed small bowel obstruction, abnormal colon position, and an intestinal bezoar. An emergency exploratory laparotomy was performed, with an uneventful recovery, the patient was discharged from the hospital 14 days after surgery.

## CASE REPORT

### BACKGROUND

Internal abdominal hernia is a rare condition in which an intra-abdominal organ leaves its original anatomical position through a normal or abnormal foramen or fissure, accounting for less than 6% of cases of small bowel obstruction [1]. Rapid and accurate identification of internal hernia is essential in patients presenting with small-bowel obstruction, as failure to intervene promptly may lead to bowel necrosis and perforation, posing a direct threat to patient survival. We present a rare case of internal hernia accompanied by intestinal malrotation and a gastrointestinal bezoar, highlighting its imaging findings and clinical management.

### CASE REPORT

A 50-year-old female patient was admitted to our hospital with abdominal pain, bloating, nausea, and vomiting for three days without obvious inducement. On physical examination, the patient's abdomen was flat and soft, with tenderness in the upper abdomen, without significant rebound tenderness. The patient exhibited hyperactive bowel sounds and tympanic on percussion upon abdominal examination. A review of the patient's medical history revealed that the patient had received surgical treatment for intestinal obstruction 25 years ago. However, the patient cannot recall the surgical method or other details.

### Imaging Findings

Computed tomography (CT) scan demonstrated dilated small bowel loops with gas and fluid accumulation in the upper abdomen, accompanied by air-fluid levels. An oval-shaped focus of mixed density with distinct margins was observed within the lumen of the small intestine in the left upper quadrant of the abdomen. The arrangement of the mesenteric vessels was disordered, with multiple enlarged lymph nodes visible at the root of the mesentery (Figure 1). The descending and sigmoid colon were located on the right side of the abdominal cavity (Figure 2). Magnetic resonance imaging (MRI) revealed significant dilation of the bowel loops in the upper abdomen, with intraluminal accumulation of gas and fluid, accompanied by air-fluid levels, and compression of adjacent organs such as the stomach and pancreas. Enlarged mesenteric lymph nodes were observed (Figure 3). The descending and sigmoid colon were located on the right side of the abdominal cavity (Figure 2).

### Management and Follow-Up

The patient underwent an exploratory laparotomy. Surgical exploration along the ileocecal region of the right lower abdomen to the mid-transverse colon revealed that the bowel had extended to the retroperitoneal area. The bowel was fixed in position due to adhesions, which made separation difficult. A part of the jejunum ascended and was severely compressed, forming a hernia ring. The proximal jejunum was significantly dilated. The ectopic descending colon was identified behind the ascending colon in the right abdominal cavity, extending superiorly beneath the liver to the retroperitoneal area. Partial small bowel resection was performed, with transection of a segment of the jejunum exhibiting an abnormal blood supply approximately 2 cm below the hernial ring. Following decompression and disinfection of the proximal jejunum, an end-to-side anastomosis of the jejunum was performed. Postoperative pathology revealed significant dilation of the resected small bowel, and the serosal and mucosal surfaces were both dark red and rough. A single bezoar resembling an egg was identified, with a smooth surface, gray-yellow cross-section, and hard consistency. After surgery, the patient's condition was stable, with no complaints of abdominal pain, bloating, nausea or vomiting. The patient was discharged from the hospital 14 days after the surgery.

## DISCUSSION

### Etiology & demographics

The causes of internal hernia are complex, one aspect is related to anatomical abnormalities of intra-abdominal structures, which are mainly caused by congenital development, surgery, trauma, and inflammation, another aspect relates to increased intra-abdominal pressure, such as constipation, chronic cough, and pregnancy [2]. Some studies indicate that laparoscopic surgery has a higher incidence of postoperative internal hernia compared to other surgical methods. This

might be because laparoscopic surgery reduces post surgical adhesions, while this helps prevent mechanical obstruction, it also allows for greater intestinal mobility, thereby raising the risk of internal hernia [3].

Intestinal malrotation belongs to a kind of congenital intestinal malformation resulting from impairment of midgut rotation around the superior mesenteric artery during midgut development in embryos [4]. Under normal circumstances, the development of the midgut is a complex process occurring between the 4th and 10th weeks of embryonic development, during which the midgut undergoes a 270-degree counterclockwise rotation around the axis of the superior mesenteric artery. During the 5th week of embryonic development, the rapidly developing midgut herniates into the extraembryonic coelom as the abdominal cavity cannot yet accommodate it. As the abdominal cavity enlarges, by around the 10th week, the midgut loops return to the abdominal cavity, displacing the hindgut to the left. Abnormalities in hindgut migration can result in anomalies of the colonic anatomical positions mentioned above [5]. Intestinal malrotation has an incidence of 1/6000 newborns, 90% of cases were diagnosed within the first year of life. Intestinal malrotation in adults is exceedingly rare, with an incidence rate ranging from 0.00001% to 0.19% [6].

Gastrointestinal bezoars refer to solid masses formed within gastrointestinal tract, typically resulting from the accumulation and enlargement of indigestible foreign bodies such as food residues, seed hulls, wood fragments, or sand, etc [7]. It is generally believed that the formation of bezoars is associated with improper diet, abnormal gastrointestinal motility, and inappropriate medication use. Notably, patients with a history of abdominal surgery are more prone to developing gastrointestinal bezoars. This could be due to postoperative gastrointestinal motility disorders, decreased gastric acid secretion, and impaired gastric digestion and food breakdown [8]. In this case, the patient's history of abdominal surgery may be related to bezoar formation.

### Clinical & imaging findings

Clinically, the symptoms in patients with internal hernias are diverse. Depending on the ease of hernia reduction, milder cases may present with only intermittent gastrointestinal discomfort, whereas more severe cases can manifest as acute intestinal obstruction, present with abdominal pain, bloating, constipation, nausea, vomiting, etc [9]. Imaging examinations, including abdominal ultrasonography, plain film radiography, gastrointestinal contrast studies, CT, and MRI, are crucial ancillary diagnostic tools for internal hernias. Among these, CT is the preferred examination method. CT not only offers rapid imaging, allowing for direct visualization of the location, morphology, and dilated or disordered bowel loops, as well as the presence of bowel wall edema or pneumatosis, but also reveals other important signs, such as the whirlpool sign caused

by the rotation and traction of the mesenteric vessels. Contrast-enhanced CT scanning can elucidate alterations in the spatial relationships of the mesenteric vessels [10].

However, other imaging modalities also possess some unique advantages. Ultrasonography is cost-effective, easy to perform, with the added benefit of being radiation-free. Ultrasonography can provide real-time imaging of dynamic changes in intra-abdominal organs. Given its limited role in assessing the degree of intestinal obstruction and associated complications, and considering that its diagnostic efficacy is dependent on the operator's skill and the patient's cooperation, ultrasonography cannot be regarded as the first-line imaging modality for internal hernias [11]. MRI also has certain advantages in the diagnosis of internal hernias. MRI is free of radiation, and contrast-enhanced scans can be used in patient populations with iodine contrast agent allergies. MRI excels in soft tissue contrast compared with CT, facilitating clearer delineation of the bowel's structural layers, particularly in the assessment of bowel edema and necrosis. However, MRI is more expensive, takes longer to perform, and requires greater patient compliance, limiting its application in clinical practice [12]. In summary, for clinical diagnosis, the selection of imaging examinations should be tailored to the individual patient's clinical context to establish a definitive diagnosis.

### Treatment & prognosis

Generally, internal hernias require surgical treatment. The main surgical options include open and laparoscopic surgery. During surgery, the herniated intestines should be reduced, and carefully examined for signs of vascular compromise. Bowel segments with vascular compromise should be resected and anastomosed. Additionally, anatomical defects within the abdominal cavity should be closed in order to prevent recurrence [13]. If the obstruction is not promptly relieved, it may progress to intestinal strangulation, intestinal necrosis, or even intestinal perforation. The overall mortality rate in patients who do not receive timely and effective treatment can exceed 50% [14].

### Differential Diagnoses

In clinical practice, internal abdominal hernias are primarily differentiated from other acute abdomen conditions such as adhesive bowel obstruction and acute bowel volvulus.

**Adhesive bowel obstruction:** The site of obstruction is not fixed, and sometimes adhesion band can be identified. There are no signs of bowel loop displacement or clustering, and the course of the mesenteric vessels is generally normal.

**Acute bowel volvulus:** The imaging findings of volvulus are very similar to those of internal hernia, causing diagnostic challenges. Volvulus is often located at the root of the mesentery, and characteristic signs such as the "whirlpool sign" and "beak sign" can be identified. However, there is no herniation of the bowel, thus no hernia sac can be observed.

### TEACHING POINT

In this paper, we report a rare and complicated case of a middle-aged female with internal abdominal hernia, as well as intestinal malrotation and gastrointestinal bezoar. This case highlights the importance of considering internal hernia in patients presenting with abdominal pain, particularly in those with a history of abdominal surgery, and timely CT scan should be performed to avoid delays in diagnosis and treatment.

### QUESTIONS

**Question 1:** Which of the following factors is not related to the development of internal hernia?

1. Surgical history
2. Inflammation
3. Irritable bowel syndrome (applies)
4. Tumor
5. Constipation

**Explanation:** Irritable bowel syndrome is not accompanied by anatomical abnormalities and therefore is not associated with the development of internal hernia. [The causes of internal hernia are complex, one aspect is related to anatomical abnormalities of intra-abdominal structures, which are mainly caused by congenital development, surgery, trauma, and inflammation, another aspect relates to increased intra-abdominal pressure, such as constipation, chronic cough, and pregnancy.]

**Question 2:** During embryonic development, in which time period does the development of the midgut occur?

1. 1st to 4th weeks
2. 4th to 10th weeks (applies)
3. 10th to 14th weeks
4. 14th to 20th weeks
5. 20th to 24th weeks

**Explanation:** The development of the midgut occurs during the 4th to 10th weeks of embryonic development. [Under normal circumstances, the development of the midgut is a complex process occurring between the 4th and 10th weeks of embryonic development, during which the midgut undergoes a 270-degree counterclockwise rotation around the axis of the superior mesenteric artery.]

**Question 3:** Which of the following is not a common component of gastrointestinal bezoars?

1. Cholesterol (applies)
2. Food residues
3. Seed hulls
4. Gas
5. Sand

**Explanation:** Cholesterol is a major component of gallstones, not of gastrointestinal bezoars. [Gastrointestinal bezoars refer to solid masses formed within gastrointestinal tract, typically resulting from the accumulation and enlargement of indigestible foreign bodies such as food residues, seed hulls, wood fragments, or sand, etc.]

**Question 4:** Which of the following is the preferred imaging modality for diagnosing internal hernia?

1. Plain film radiography
1. MRI
2. PET-CT
3. CT (applies)
4. Ultrasonography

**Explanation:** CT is the imaging modality of choice for diagnosing internal hernia. [Among these, CT is the preferred examination method. CT not only offers rapid imaging, allowing for direct visualization of the location, morphology, and dilated or disordered bowel loops, as well as the presence of bowel wall edema or pneumatosis, but also reveals other important signs, such as the whirlpool sign caused by the rotation and traction of the mesenteric vessels.]

**Question 5:** Which of the following symptoms is least likely to be present in a patient with internal hernia?

1. Vomiting
2. Constipation
3. Mild gastrointestinal discomfort
4. Abdominal pain
5. Rebound pain

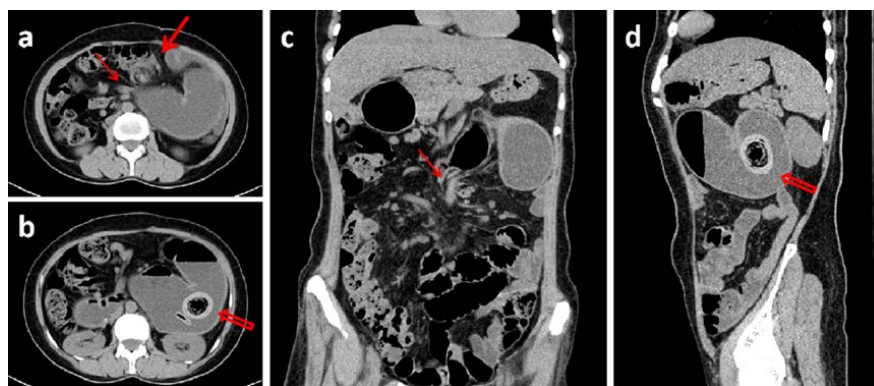
**Explanation:** Rebound pain is commonly seen in patients with abdominal inflammation, not in patients with internal hernia. [Clinically, the symptoms in patients with internal hernias are diverse. Depending on the ease of hernia reduction, milder cases may present with only intermittent gastrointestinal discomfort, whereas more severe cases can manifest as acute intestinal obstruction, present with abdominal pain, bloating, constipation, nausea, vomiting, etc.]

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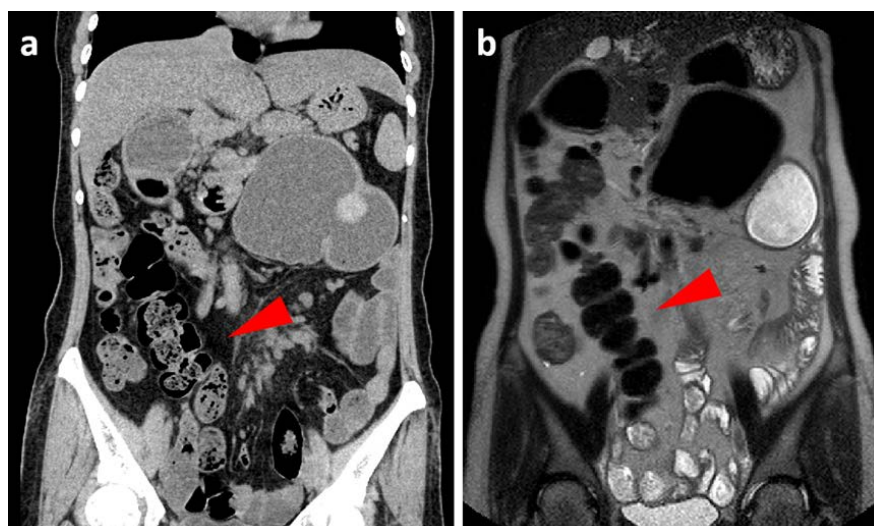


## FIGURES



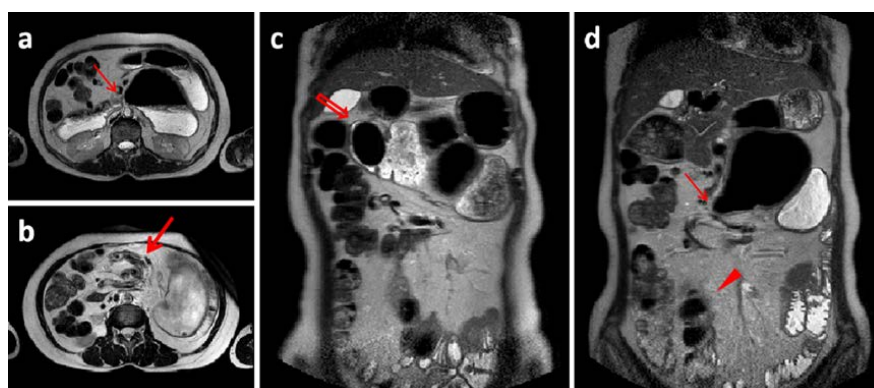
**Figure 1:** 50-year-old female with internal hernia- CT.

**FINDINGS:** CT scan shows a left paraduodenal hernia. Neck of the hernia sac (thin arrow) with adjacent fluid-filled dilated small bowel, and a “whirlpool-sign” signifying rotation and traction of the mesenteric vessels (thick arrow). An oval-shaped bezoar of mixed density in the left upper quadrant of the abdomen (hollow arrow).



**Figure 2:** 50-year-old female with internal hernia- CT/MRI.

**FINDINGS:** CT and MRI scans show the descending colon is located on the right side of the abdominal cavity (arrowhead).



**Figure 3:** 50-year-old female with internal hernia- MRI.

**FINDINGS:** MRI scan shows the neck of the hernia sac (thin arrow), dilated small bowel, the whirlpool sign composed of rotating mesenteric vessels (thick arrow), and an egg-shaped bezoar manifested as a hypo-intense signal on T2-weighted images (hollow arrow). The descending colon is located on the right side of the abdominal cavity (arrowhead).

## KEYWORDS

*Acute abdomen, small bowel obstruction, internal abdominal hernia, bezoar, intestinal malrotation*

## ABBREVIATIONS

CT = Computed Tomography

MRI = Magnetic Resonance Imaging

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