



Review Article *Gastrointestinal imaging*

Emergency transabdominal preperitoneal (TAPP) repair of a strangulated obturator hernia: A literature review and video vignette

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ABSTRACT

Obturator hernia (OH), a rare and potentially life-threatening condition, presents diagnostic and therapeutic challenges. This review article comprehensively delves into the clinical features, diagnosis, and management of OH, with a particular emphasis on the pivotal role of computed tomography (CT) in timely and accurate diagnosis. Delays, particularly in contrast-enhanced CT, dramatically increase mortality due to potential bowel strangulation. To illustrate the challenges and complexities surrounding OH, we present a video vignette of a 74-year-old female patient who presented with symptoms suggestive of bowel obstruction (BO) secondary to a strangulated left-sided OH. This patient case complements the theoretical framework established in the review, serving as a practical example for healthcare professionals. Her presentation included abdominal pain, absence of flatus and bowel movements, and abdominal distension. Laboratory tests demonstrated a mildly elevated white blood cell count and C-reactive protein. CT imaging confirmed the diagnosis of a strangulated OH with an ischemic small bowel. An emergency laparoscopy was undertaken, and the hernia was repaired using the transabdominal preperitoneal approach. A portion of the ischemic small bowel was resected through a 5-cm extension of the umbilical port, and an anastomosis was performed using a modified Barcelona technique. The surgery was successfully completed without immediate or long-term complications. This case highlights the crucial role of timely CT diagnosis and minimally invasive surgical management in achieving improved outcomes in acute BO secondary to OH, particularly when facilitated by pre-operative CT planning.

Keywords: Laparoscopy, Hernia, Obturator, Abdominal pain, Gastrointestinal diseases

INTRODUCTION

Obturator hernia (OH), a relatively uncommon type of pelvic hernia, represents a mere 0.07–1% of all intra-abdominal hernias. They are a contributing factor to approximately 0.2–1.6% of small bowel obstruction (BO) cases. These hernias are primarily observed in frail, elderly women aged 70–90 years. Multiparity associated with excessive stretching of pelvic ligaments is a prevalent risk factor for OH formation. This risk is amplified by a history of recent weight loss, which can further weaken the pelvic floor musculature and increase the likelihood of hernia development. In addition, chronically elevated intra-abdominal pressure – often encountered in patients with ascites, chronic obstructive pulmonary disease, chronic cough, and chronic constipation – poses a significant risk for OH formation.^[1-4]

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Surgical anatomy

The obturator foramen, the largest opening in the human body, is formed by the pubis and ischium and is covered anteriorly and superiorly by the obturator membrane. The foramen is effectively sealed by a robust quadrilamellar musculoaponeurotic barrier, consisting of bilateral internal and external obturator muscles enclosing internal and external obturator membranes. The membranes are united inferiorly and separated superiorly, forming a protective archway. Within the large cranial portion of the foramen lies the obturator canal, a narrow passageway approximately 2–3 cm in length. This canal serves as a conduit for the obturator nerve and blood vessels, which are further cushioned by the surrounding adipose tissue. This fatty padding normally occupies the canal's space, significantly reducing the risk of small bowel prolapse. However, in the presence of severe weight loss or malnutrition, this protective adipose tissue diminishes, potentially facilitating OH development.^[5-7]

Clinical presentation

The colloquial term “little old lady hernia” accurately reflects the phenotypic characteristics of OH, which is typically observed in older, underweight women. The propensity for this type of hernia in women stems from their broader pelvic anatomy, featuring a larger, triangular obturator canal opening with a greater transverse diameter than in men. This anatomical predisposition facilitates the protrusion of intra-abdominal contents through the obturator foramen. OHs frequently manifest as a sudden onset of BO accompanied by bowel incarceration or strangulation. Notably, OHs typically occur on the right side due to the left obturator foramen typically being covered by the sigmoid colon.

The literature describes three diagnostic signs: Obturator neuralgia, the Howship-Romberg sign, and the Hannington-Kiff sign. Although these have been characterized as indicative of strangulated OHs during clinical examination, all three signs are notoriously unreliable. In the absence of advanced imaging facilities, clinical examination is paramount.

The obturator neuralgia sign, representing pain radiating along the distribution of the obturator nerve, is a hallmark of this condition. The Howship-Romberg sign involves pain in the medial thigh extending to the knee and represents a more specific indicator of incarceration. The Hannington-Kiff sign, manifesting as the absence of the adductor reflex in the thigh despite a normal patellar reflex, is highly suggestive of strangulation.

Management

This pathology is often associated with substantial delays in diagnosis and management due to its rarity and the absence

of a palpable mass during physical examination. The use of abdominal computed tomography (CT) readily facilitates a definitive preoperative diagnosis, enabling early surgical intervention and thereby contributing to the reduction of complications, including those that may demand lower bowel resection or even involve fatality.^[8,9] Perioperative mortality rates in the setting of strangulation can be as high as 70%.^[4] CT scans have demonstrated exceptional specificity for the diagnosis of hernias, achieving accuracy rates exceeding 90% in both acute and non-emergent clinical settings. In addition, CT scans provide valuable insights into the relationship between the hernia sac and the muscles overlying the obturator foramen, allowing for accurate identification of the hernia type. This information is crucial when planning surgical approaches to hernia repair in the groin region. Open laparotomy, involving hernia repair and intestinal resection if required, has been the conventional treatment approach for these patients. However, laparoscopic surgery is gaining popularity due to its safety, practicality, and favorable outcomes. The rising popularity of laparoscopic groin hernia repair techniques stems from increased surgeon expertise in transabdominal preperitoneal (TAPP) and transabdominal extraperitoneal procedures. These minimally invasive approaches surpass open surgery in visualization, operative time, and recovery speed. The magnified, three-dimensional view provided by laparoscopy enables precise defect identification and repair, and the smaller incisions, minimal tissue trauma, and reduced risk of adhesions contribute to accelerated healing and less pain. This trend is expected to continue as laparoscopic proficiency advances. In cases requiring bowel resection, mini-laparotomy, with an incision smaller than 5 cm, presents a minimally invasive alternative to open surgery. This approach offers a reduced risk of complications and conversion while maintaining a shorter hospital stay.

This video and multimedia article aim to elucidate and present our surgical strategy for managing small BO caused by a strangulated OH through a laparoscopic-assisted approach. We present a case where we performed a TAPP repair of an OH with mesh and simultaneous small bowel resection with anastomosis.

METHODS

A 74-year-old multiparous, cachectic woman with a World Health Organization (WHO) performance status of 1 and a body mass index of 22 kg/m², presented with a 2-day history of intestinal obstruction symptoms, including vague, generalized abdominal pain, multiple episodes of bilious vomiting, and not passing flatus or opening the bowels. Her medical history included hypertension, ischemic heart disease, asthma, and atrial fibrillation, all well-controlled.

At presentation, she was afebrile with mild tachycardia of 97 bpm and a stable blood pressure of 119/90 mmHg. The abdominal examination revealed no abnormalities apart from mild abdominal distension, and attenuated bowel sounds were audible. No palpable masses were detected on physical examination, and the rectal examination was negative for stool. Routine blood tests revealed a mild increase in inflammatory markers. Due to a plain film X-ray suggestive of small BO and a raised white blood count and C-reactive protein, a decision was made to organize a CT scan with intravenous contrast of the abdomen and pelvis [Figure 1]. The scan revealed a small bowel dilation with caliber change in the left lower quadrant, suggestive of mechanical small BO due to an intestine segment strangulated through the obturator left foramen trapped between the pectineus and obturator externus muscles. Due to CT scan findings suggestive of small bowel ischemia, the patient was offered diagnostic laparoscopy and proceeded to surgical treatment of small BO with potential conversion if not amendable to a laparoscopic approach.

Operative procedure

Informed consent was obtained for surgery and video recording and publication before the procedure [Video 1]. The patient was transferred to the operating room and underwent a diagnostic laparoscopy proceeding to surgical treatment of the OH. She was positioned supine on the operating table in the Trendelenburg position, with the operating surgeon standing at the right side of the table with an 80° tilt toward the right side. A three-port technique was used with a 12-mm port to achieve

pneumoperitoneum using the Hassan technique 4 cm above the umbilicus. Subsequently, two 5-mm ports were placed under direct vision in the left and right pararectal spaces. Extension of the supraumbilical port to 5 cm in length was used later as the extraction site for the small bowel resection and anastomosis at the end of surgery using a modified Barcelona technique.^[10] Exploration of the peritoneal cavity confirmed the radiological diagnosis of mechanical small BO due to a strangulated loop of the intestine entering the left obturator foramen. The herniated small bowel was carefully reduced. The area of transition appeared ischemic, but no perforation or contamination was detected.

We proceeded to a TAPP repair of the OH using a specifically designed, left-sided, 9 × 13-cm 3D-patterned anatomical mesh. This mesh conforms to the anatomical contours of each side of the groin region and is constructed from non-absorbable monofilament polypropylene textile. Absorbable spiral tackers were used for mesh fixation and peritoneal coverage of the mesh. The supraumbilical port incision was extended to 5 cm in total for the extraction side. A wound retractor was placed for the resection of the ischemic small bowel, followed by a side-to-side anti-peristaltic stapled anastomosis performed using a modified Barcelona technique.

RESULTS

The duration of surgery was 60 min, and the blood loss was <50 mL. The patient was discharged uneventfully on post-operative day 9 for social reasons. Histopathologic

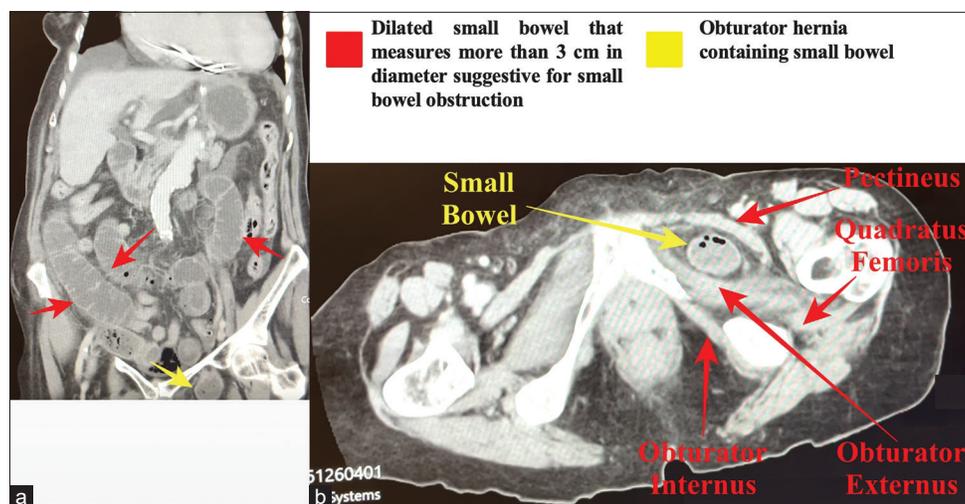


Figure 1: 74-year-old female patient who presented with symptoms suggesting bowel obstruction secondary to a strangulated left-sided Obturator hernia (OH). (a) A sagittal slice of contrast-enhanced computed tomography image shows small bowel dilation (red arrows) with caliber change in the left lower quadrant (yellow arrow) (b) Axial image is suggestive of mechanical small bowel obstruction due to an intestine segment strangulated through the obturator left foramen (yellow arrow) trapped between the pectineus and obturator externus muscles (red arrows).

examination of the specimen revealed no other abnormality apart from ischemic small bowel tissue.

DISCUSSION

Due to its rarity, OH often presents diagnostic challenges. Prompt suspicion based on nonspecific symptoms is crucial for timely diagnosis. CT scans exhibit superior sensitivity compared to other radiological modalities, aiding in accurate diagnosis. Surgical management forms the mainstay of treatment, and early diagnosis is paramount for successful surgical intervention. In the management of OH complicated by BO, a meticulous surgical approach balancing minimally invasive benefits and definitive intervention is crucial. Although traditional laparotomy remains the mainstay for complex cases, the potential integration of diagnostic laparoscopy within the repair procedure offers promising benefits.

For carefully selected patients, particularly those with early presentation and minimal bowel compromise, surgeons skilled in advanced laparoscopy can leverage this minimally invasive technique to explore the abdominal cavity before committing to a full laparotomy. This approach has several potential benefits. It can minimize invasive interventions: by avoiding unnecessary midline incisions, diagnostic laparoscopy can expedite recovery and decrease the risk of postoperative complications associated with larger incisions. It can also enhance visualization. Laparoscopic optics provide magnified views of the peritoneum, bowel loops, and OH, facilitating accurate assessment of viability and strangulation. This approach can also identify concurrent hernias. The comprehensive visualization allows for simultaneous detection and management of other potentially overlooked groin or abdominal wall hernias, optimizing surgical outcomes.

However, the potential advantages of laparoscopy must be weighed against its limitations. In cases of late presentation,



Video 1: This video vignette showcases a 74-year-old female with symptoms suggesting bowel obstruction due to a strangulated left obturator hernia. It further comprehensively explores the clinical presentation, diagnosis, and management of obturator hernias in general.

severe BO, distended abdomen, bowel necrosis, or peritonitis, the open approach remains preferred due to its ability to definitively address both the hernia and potential bowel ischemia.

The successful implementation of diagnostic laparoscopy in OH repair thus necessitates individualized patient selection. Careful consideration of the clinical presentation, severity of bowel involvement, and patient comorbidities is paramount to determine the suitability of the minimally invasive approach. Surgeon expertise is also a critical factor. Successful laparoscopic interventions require surgeons proficient in advanced laparoscopic techniques to ensure safe and effective exploration and potential repair. The availability of resources is also crucial. Appropriate hospital infrastructure and equipment are essential for the seamless integration of laparoscopy in the operating room. We follow Pawlak *et al.*'s algorithm in the management of acute inguinal hernia which is presented below [Figure 2].^[11]

Despite its recent introduction, the integration of robotic technology into hernia surgery warrants further exploration to determine its optimal utility across diverse clinical contexts. While minimally invasive surgery for elective groin hernias is well-established, its application in incarcerated cases particularly using robotic platforms remains debated. Robotic TAPP emerges as a natural evolution, addressing the limitations of conventional TAPP in centers equipped with platforms and skilled surgeons. Enhanced visualization, ergonomic access, and intuitive instrument control

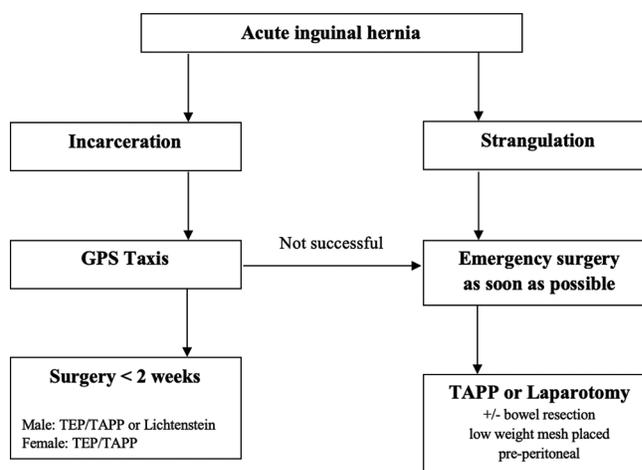


Figure 2: Algorithm of management of the acute incarcerated inguinal hernia in adults GPS Taxis: G be gentle. A constant, steady pressure over the hernia for 5–15 min, avoiding forceful pushing. An appropriate environment with oxygen therapy, oxygen saturation and pulse monitoring, and opioid and benzodiazepine antagonists at the bedside. S be safe. Careful titration of intravenous opioids and benzodiazepines. GPS: G-gentle, P-prepared, S-safe, TEP: Totally extraperitoneal hernia repair, TAPP: Transabdominal Preperitoneal hernia repair.

empower surgeons with unprecedented dexterity in tissue manipulation, suturing, and knot tying, surpassing previous achievements in minimally invasive approaches. Notably, posterior wall reconstruction and transversalis fascia suture, previously bypassed in laparoscopy, are now feasible and standard practice except in where the defect is smaller than 2 cm. The expertise gained in robotic TAPP suggests the potential for easier learning curves in other complex visceral surgeries. Addressing challenges such as prolonged operative time, and substantial learning curve, as well as equipped and training staff, will be crucial to unlock the full potential of robotic technology in hernia surgery in both elective and emergency settings.

Ultimately, Diab *et al.*'s findings on the crucial role of symptom duration in OH-related mortality underscore the importance of prompt intervention.^[12] Individualized surgical strategies, tailored to each patient's unique presentation and the surgeon's expertise, can play a significant role in minimizing invasive procedures, optimizing recovery, and ultimately improving patient survival.

This multimedia article aims to demonstrate the successful management of small BO using a laparoscopic-assisted approach with simultaneous hernia repair using mesh and small bowel resection anastomosis in a non-contaminated acute setting. The video vignette shows a detailed description of the technique, anatomical landmarks, and important steps for a successful procedure and good outcomes.

CONCLUSION

We have described a step-by-step strategy for the management of a strangulated OH through a laparoscopic-assisted TAPP approach with small bowel resection and anastomosis. OH is rare and often misdiagnosed, requiring early diagnosis and surgical repair to avoid complications and mortality. CT scan with contrast is the gold standard for diagnosis, and laparoscopic repair is the preferred surgical approach. Early diagnosis and surgical intervention are crucial for favorable long-term outcomes. This case demonstrates the feasibility of minimally invasive techniques in the management of mechanical small BO secondary to OH in an acute non-contaminated setting.

Authors' contributions

AM and VB: Conceptualization. AM, VB, MWA, ME, DO, FD: Data curation. AM, VB, MWA, ME, DO, and FD: Formal analysis. Funding acquisition: N/A. RB, SHS, and SK: Methodology. RB, SHS, and SK: Project administration. AM, VB, MWA, ME, DO, FD, RB, SHS, and SK: Visualization. AM, VB, MWA, ME, DO, and FD: Writing—original draft. RB, SHS, and SK: Writing—review and editing. All authors:

Investigation. All authors read and approved the final manuscript.

Ethical approval

The review article does not contain experimental studies with the patient. This study is in accordance with the ethical standards of institutional research and the Declaration of Helsinki.

Declaration of patient consent

A procedure-specific informed consent was obtained from the patient including the video recording and video publication.

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Conflicts of Interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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