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Retrospective comparison of laparoscopic and open surgery for obturator hernia: a single-center experience

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Abstract

Purpose This retrospective cohort study aims to compare perioperative outcomes between laparoscopic and open surgical repair of obturator hernia, a rare but clinically significant abdominal wall hernia.

Methods We analyzed 13 consecutive patients with CT-confirmed obturator hernia causing small bowel obstruction (2017–2023). Six underwent open repair and seven received laparoscopic transabdominal preperitoneal (TAPP) repair with mesh. Outcomes included operative time, blood loss, hospitalization duration, and CRP levels.

Results Laparoscopic repair significantly reduced hospitalization duration (median 7 vs. 13 days; $P=0.049$) and postoperative inflammation (CRP 10.66 vs. 79.07 mg/L; $P=0.003$), with less blood loss (10 vs. 30 mL; $P=0.001$). No recurrences occurred during 12-month follow-up.

Conclusions Laparoscopic obturator hernia repair demonstrates advantages in reducing hospital stay, minimizing surgical trauma, and attenuating systemic inflammatory response as compared to open approach. However, larger multicenter studies are warranted to validate these findings given the limited sample size.

Keywords Obturator hernia, Laparoscopic repair, Open repair, Intestinal obstruction, Surgical outcomes

Introduction

Obturator hernia, accounting for 0.07–1% of all abdominal wall hernias [1], represents a surgical challenge due to its anatomical complexity and nonspecific clinical presentation. Its incidence increases to 1.6% among elderly women with intestinal obstruction [2], underscoring its clinical significance in this demographic. Anatomically, the wider transverse diameter of the female obturator canal [3], combined with age-related tissue laxity, creates a predisposing pathway for hernia formation. Over 80% of obturator hernias present acutely with incarceration, and 30–40% progress to strangulation requiring bowel resection [4], highlighting the imperative for timely intervention.

Despite established surgical approaches, the optimal management strategy remains debated, particularly regarding laparoscopic versus open repair in emergency settings [5]. The current literature lacks comparative studies with standardized outcome measures for this rare condition. The'Howship–Romberg sign'is present in only 25–50% of cases [6], making radiological confirmation essential.

This study therefore seeks to provide a systematic comparison of laparoscopic and open approaches at a tertiary referral center, evaluating: (1) perioperative outcomes (operative time, blood loss), (2) systemic inflammatory response through serial CRP measurements, and (3)

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short-term recovery parameters (hospital stay, complication rates). Our findings aim to inform surgical decision making for this high-risk population.

Pathophysiology

Anatomical factors

The pathogenesis of obturator hernia is primarily determined by the anatomical configuration of the obturator foramen. The obturator foramen exhibits a greater transverse diameter in females, predisposing them to a sixfold higher incidence of obturator hernia compared to males [7]. Anatomically, the obturator foramen is bounded by the ischium and pubis, traversed by the obturator membrane and canal which transmits the obturator neurovascular bundle [8]. The obturator canal, situated at the anterosuperior margin of the obturator membrane, provides a 1–1.5 cm diameter conduit for the obturator nerve, artery, and vein [5, 8]. Progressive weakening of pelvic connective tissues permits herniation of intra-abdominal contents through the canal, leading to sac formation within the medial thigh compartment. In severe cases, this may result in strangulation of the herniated bowel segment, necessitating emergency surgical intervention [1].

Predisposing factors

Multiple risk factors contribute to the development of obturator hernia. Chronic elevation of intra-abdominal pressure caused by conditions such as chronic obstructive pulmonary disease (COPD), constipation, urinary obstruction, and ascites represents a major predisposing factor [9].Age-related degeneration of connective tissues, particularly in underweight elderly females, significantly reduces obturator membrane tension, facilitating hernia formation [1, 7]. Rapid weight loss (> 10% body mass within 6 months) may precipitate hernia development due to loss of preperitoneal fat padding [10]. Importantly, long-term smoking (≥ 20 pack-years) induces collagen degradation through matrix metalloproteinase activation, substantially weakening the obturator canal's structural integrity [3, 4]. The recent studies suggest that multiparity (≥ 3 vaginal deliveries) increases susceptibility through pelvic floor laxity and repeated mechanical stress on the obturator region [11].

3. Surgery.

Laparoscopic surgery

Laparoscopic surgery is a minimally invasive approach utilizing 3–5 trocar ports (5–12 mm diameter) to access the abdominal cavity. Standard pneumoperitoneum is established with carbon dioxide gas insufflation (intra-abdominal pressure maintained at 12–15 mmHg), providing optimal working space and visualization [12]. A 30° laparoscope is introduced through the umbilical port, complemented by two 5-mm working ports placed bilaterally along the rectus abdominis margin, allowing the surgeon to perform precise procedures within the abdominal cavity [13].

Laparoscopic hernia repair demonstrates significant clinical and economic advantages over open approaches. According to a multicenter randomized trial, this technique reduces 30-day complications by 42% and reoperation rates by 67% [14].The cost-effectiveness analysis by Ielpo et al. revealed:31% lower total healthcare costs(5217 *vs* 7589, $P < 0.001$) and 2.3-day shorter return-to-work time [15]. Notably, laparoscopic patients reported better quality of life outcomes (hernia-related QoL scores: 82.4 vs 71.6, $P = 0.01$) at 6-month follow-up [14].The transabdominal preperitoneal (TAPP) approach remains preferred, with 96% success rates in bilateral repairs[15].

Open surgery

Open surgery remains the conventional approach, characterized by a larger abdominal incision that facilitates direct visualization of the surgical field. The incision size generally ranges from 5 to 10 cm, with the exact dimensions determined by the hernia characteristics and surgical requirements [16]. Open repair requires a 6–10 cm incision above the inguinal ligament, as standardized in the Lichtenstein technique [17]. Consequently, this approach carries higher risks of postoperative complications including surgical site bleeding (median 30 ml in our study) and infection, often resulting in prolonged hospitalization (mean 13 days in our cohort) [16, 18]. However, open surgery remains indispensable for complex cases requiring bowel resection or when managing compromised intestinal viability, particularly in emergency settings [8, 19]. The extensive surgical exposure enables direct visualization and manual manipulation of hernia contents, which is particularly advantageous in cases requiring bowel resection or dealing with necrotic tissue [8]. Furthermore, this technique benefits from being widely familiar to general surgeons, with established procedural protocols [16, 18].

Materials and methods

Study design

Between January 2017 and December 2023, we retrospectively analyzed 13 consecutive patients who underwent surgical intervention for intestinal obstruction secondary to obturator hernia in the Department of Vascular Hernia Surgery at Shaoxing People's Hospital. The study protocol was approved by the Institutional Review Board of Shaoxing People's Hospital (Approval No: 2024-Research 089–01) in compliance with the Declaration of Helsinki.

Patient selection

Patients were systematically screened based on clinical presentation and radiological confirmation of obturator hernia as the primary diagnosis. Intraoperative findings of concurrent abdominal wall hernias constituted exclusion criteria to ensure diagnostic homogeneity. Furthermore, cases with incomplete perioperative documentation or loss to follow-up were excluded from the final analysis.

Variables and data collection

Prospectively defined variables encompassed:

1. Demographic parameters (age, sex, body mass index);
2. Clinical characteristics (symptom duration, Howship–Romberg sign presence);
3. ASA physical status classification;
4. Radiological parameters (hernia laterality, bowel obstruction severity on CT);
5. Intraoperative variables (surgical approach, operative time in minutes, estimated blood loss in mL, mesh type);
6. Postoperative outcomes (C-reactive protein levels at 24 h, length of hospitalization in days, complication rates according to Clavien–Dindo classification).

All statistical analyses were conducted using SPSS Statistics (Version 18.0; IBM Corp., Armonk, NY). Continuous variables were expressed as median (interquartile range), while categorical variables were presented as frequencies (percentages). The Mann–Whitney *U* test and Fisher's exact test were employed for between-group comparisons, with two-tailed P values < 0.05 considered statistically significant.

Surgical techniques

Open Surgery Performed via a 10–15 cm midline incision; the hernia sac was reduced, and mesh was placed to close the defect.

Laparoscopic Surgery Utilized a transabdominal preperitoneal approach with smaller incisions and mesh repair.

Surgical options

The selection of surgical approach was nonrandomized and determined by: (1) surgeon's expertise in minimally invasive techniques, (2) institutional equipment availability during the treatment period, and (3) temporal evolution of surgical practice patterns at our center between 2017 and 2023. A temporal trend was observed wherein laparoscopic procedures predominated in later study years (2020–2023), reflecting the department's increasing adoption of minimally invasive techniques. Open conversion was mandatory for cases presenting with compromised bowel viability (n = 2) or hemodynamic instability, as determined by intraoperative findings of transmural necrosis or perforation. The open approach was preferentially selected for cases requiring bowel resection (n = 2) or when peritoneal contamination was suspected, based on predefined intraoperative decision-making protocols.

Ethics statement

Written informed consent for surgical intervention was obtained from all patients or their legal representatives prior to procedures, in accordance with institutional guidelines. Systematic data abstraction occurred from January to March 2024 by two independent investigators using a standardized case report form to ensure data integrity. Postoperative surveillance included scheduled clinical evaluations at 1, 3, 6 and 12 months to assess wound healing and hernia recurrence, with all patients completing minimum 12-month follow-up.

All patient identifiers were removed prior to analysis, and data were anonymized in compliance with China's Personal Information Protection Law and HIPAA-equivalent standards. The institutional review board granted waiver of informed consent for this retrospective analysis (Approval No: 2024-Research 089–01), determining that the study posed minimal risk while preserving participants'rights and welfare. This waiver was justified as the research involved no more than minimal risk, could not practicably be carried out without the waiver, and the waiver did not adversely affect subjects'rights.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Results

Patient characteristics and clinical presentation

During the six-year study period (2017–2023), our institution managed 4,200–4,800 abdominal wall hernia cases, with obturator hernia representing a rare subset (n = 13, 0.27–0.31% incidence). The cohort demonstrated marked female predominance (11 females vs. 2 males, ratio 5.5:1), consistent with established epidemiological patterns for obturator hernia. Both male patients had significant smoking histories (> 20 pack-years), suggesting potential tobacco-related connective tissue alterations as a contributing factor.

The study population was geriatric (mean age 82 ± 8.7 years, range 64–94), with 84.6% (11/13) aged ≥ 75 years. Acute presentations necessitated emergency transport,

precluding baseline anthropometric measurements; however, all available clinical records indicated chronic undernutrition (median estimated BMI 17.2, IQR 15.2–18.8). All patients manifested acute intestinal obstruction (complete in 84.6% [11/13], incomplete in 15.4% [2/13]), with universal presentation of acute abdominal pain (median duration 48 h, IQR 12–96). Symptom onset to presentation intervals varied widely (range 5 h–7 days), reflecting diagnostic challenges in this elderly population.

ASA physical status classification differed between groups: open surgery cohort had 5 ASA II (83.3%) and 1 ASA III (16.7%), versus laparoscopic group with 4 ASA II (57.1%) and 3 ASA III (42.9%). Comorbidities included prior abdominal surgeries (1 inguinal hernia repair, 1 cholecystectomy), with the oldest patient (94 years) representing the extreme of our age spectrum. Intergroup analyses showed comparable baseline characteristics: age (P = 0.295) and comorbidity burden (P = 0.308) did not differ significantly between surgical approaches. The detailed results are summarized in Table 1.

Preoperative radiologic diagnosis

All 13 cases (100%) were preoperatively confirmed as obturator hernia through standardized imaging protocols. Imaging acquisition occurred at our institution in 84.6% (11/13) cases, with 15.4% (2/13) initially diagnosed by external CT scans that were subsequently reconfirmed by our radiologists. Diagnostic CT criteria included: (1) Herniated bowel segment between the obturator internus and externus muscles (Fig. 1), (2) Dilated proximal small bowel loops, and (3) The"obturator sign"– fat stranding around the hernial orifice. CT grading of obstruction severity showed complete obstruction in 84.6% (11/13) and partial obstruction in 15.4% (2/13).

Table 1 Baseline Demographic and Clinical Characteristics

	Open group (n = 6)	Lap group (n = 7)	*P* value
Age (years)	84(79–88)	80(67–94)	0.295
Sex			0.906
Male	1 (16.7%)	1 (14.3%)	
Female	5 (83.3%)	6 (85.7%)	
BMI (kg/m2)	17 (14–18.3)	17.2 (15.2–18.8)	0.742
Comorbidities*	1 (16.7%)	3 (42.9%)	0.308
Previous abdominal surgery	0 (0%)	2 (28.6%)	0.155
ASA classification			
II	5 (83.3%)	4 (57.1%)	
III	1 (16.7%)	3 (42.9%)	

1. Data presented as median (IQR) for continuous variables and n (%) for categorical variables

2. *Comorbidities included: hypertension (n = 2), COPD (n = 1), type 2 diabetes (n = 1)

3. BMI categories: Underweight (< 18.5), Normal (18.5–23.9), Overweight (24–27.9), Obese (≥ 28)—per Chinese criteria

4. P values calculated using nonparametric tests due to small sample size

Fig. 1 Preoperative CT examination of the patient. The circled notes in the figure indicate intraocclusal inlays

Operative findings and treatment

All 13 patients with radiologically confirmed obturator hernia received surgical management within 6 h of diagnosis (median time-to-surgery 3.2 h, IQR 1.8–4.5 h). The surgical approach selection was nonrandomized, with laparoscopic procedures performed in 53.8% (7/13) and open surgery in 46.2% (6/13) based on: (1) hemodynamic stability, (2) bowel viability concerns, and (3) surgeon expertise. Procedures were performed by 5 board-certified surgeons with > 5 years'hernia experience, utilizing standardized techniques, but individualized approach selection per patient pathophysiology.

Partial obstruction cases (15.4%, 2/13) included one omental hernia managed electively, whereas 84.6% (11/13) required emergency intervention for complete obstruction. Anatomical distribution was right-sided in 53.8% (7/13), left-sided in 38.5% (5/13), and bilateral in 7.7% (1/13), with all cases intraoperatively confirming the preoperative CT findings.

Laparoscopic technique employed: (1) 10-mm umbilical port for 30° laparoscope, (2) Two 5-mm working ports at bilateral rectus margins, and (3) Optional additional 3-mm assistant port when needed. Open procedures utilized midline laparotomy (10–15 cm) with: (1) Nerve-sparing rectus retraction, (2) systematic exploration of hernia contents, and (3) in situ mesh placement after viability assessment (Fig. 2).

Intraoperative findings revealed small bowel herniation in 92.3% (12/13), including 2 cases (15.4%) requiring bowel resection for confirmed strangulation (ischemic changes in > 5 cm segment). The remaining

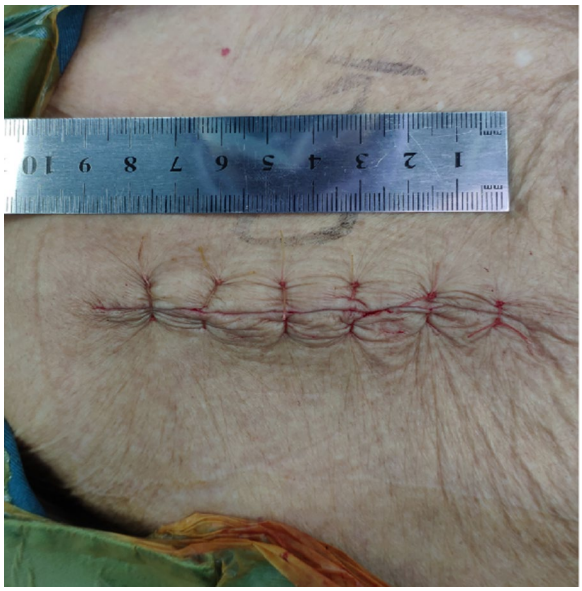

Fig. 2 Surgical incision for open surgery

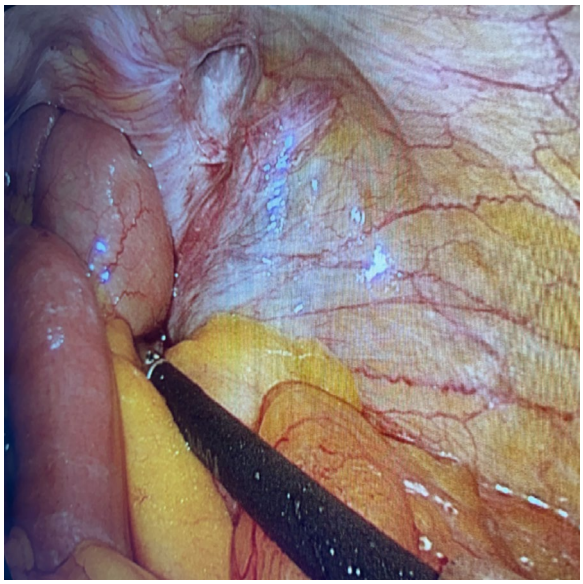

Fig. 4 Under laparoscopy, the obturator canal is visible

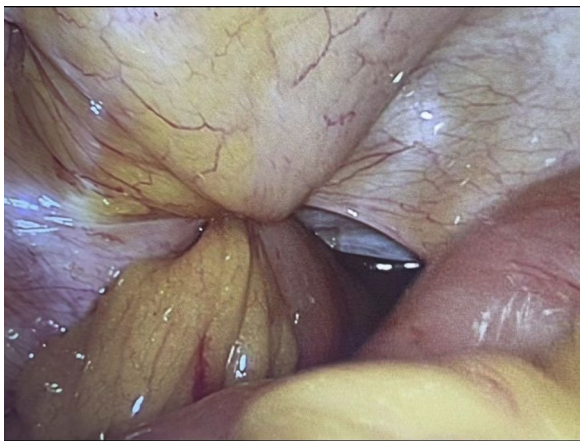

Fig. 3 Under laparoscopy, embedded small bowel seen

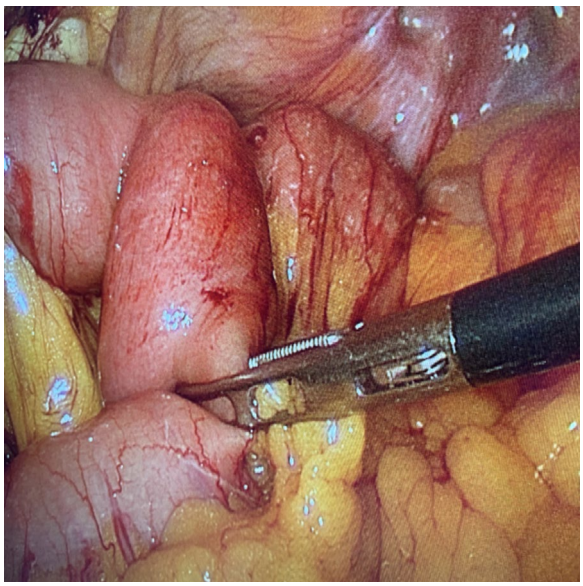

Fig. 5 Under laparoscopy, the reduced small intestine is visible

case (7.7%) demonstrated isolated omental herniation without bowel compromise, managed with elective omentectomy.

Laparoscopic visualization identified characteristic findings: (1)"Corkscrew"small bowel configuration at the obturator canal (Fig. 3), (2) Transition point with proximal dilatation, and (3) Reactive mesenteric hyperemia in strangulated cases. Successful laparoscopic reduction demonstrated: (1) Hernia sac inversion through the obturator canal (Fig. 4), (2) viable bowel restoration with preserved peristalsis (Fig. 5), and (3) Definitive identification of the hernial orifice (mean diameter 1.8 ± 0.4 cm).

Open laparotomy findings included: tense hernia sac protruding through the obturator foramen (Fig. 6),"Diving"small bowel loop into the pelvic canal, and characteristic peritoneal traction folds (Fig. 7). Sac dissection exposed the incarcerated bowel segment (Fig. 8), fibrinous exudate in strangulated cases, and viability assessment by Doppler signal and capillary ref ill.

Mesh placement consistently covered the myopectineal orifice with 5 cm overlap, fixed using: interrupted nonabsorbable sutures in open cases (Fig. 9).

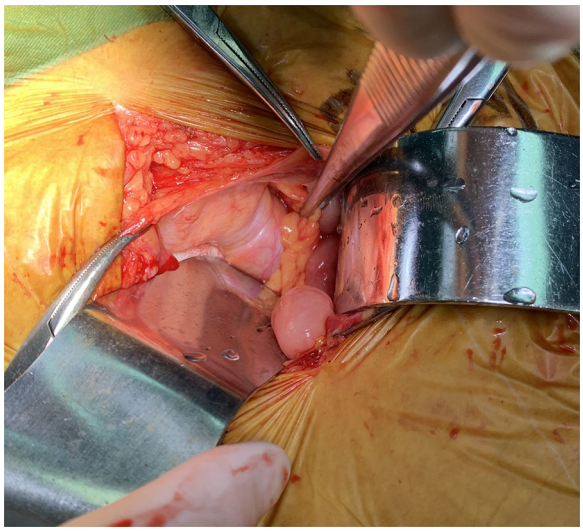

Fig. 6 In the open surgical, hernia found

Prosthetic mesh reinforcement was utilized in 92.3% (12/13) of cases, with defect closure achieved via: preperitoneal polypropylene mesh (n = 6), biologic mesh (Biodesign Surgisis, n = 6), and primary suture repair (n = 1). Biologic mesh was preferentially selected for open cases (83.3%, 5/6) due to perceived infection risk, whereas synthetic mesh predominated in laparoscopic repairs (71.4%, 5/7). Mesh selection followed institutional protocols incorporating: (1) wound class classification, (2) bowel contamination status, and (3) evidence-based guidelines. The single case requiring bowel resection underwent primary tissue repair due to: (1) frank peritoneal contamination, (2) hemodynamic instability, and (3) contraindications to prosthetic material. At median 12-month follow-up (range 6–36 months), no recurrences were observed irrespective of repair technique (0% recurrence rate).

Operative duration showed comparable outcomes between approaches: laparoscopic median 67.5 min (IQR 55–82.5) vs. open median 60 min (IQR 45–75) (P = 0.388, Mann–Whitney U test). Bowel resection rates differed nonsignificantly: 33.3% (2/6) in open vs. 0% (0/7) in laparoscopic group (P = 0.097, Fisher's exact test), reflecting case selection bias toward complex cases in open surgery. Estimated blood loss significantly favored laparoscopy: median 10 mL (IQR 5–20) vs. open 30 mL (IQR 20–50) (P = 0.001, Mann–Whitney U test), representing a 66.7% reduction in hemorrhage.

Outcome

The open group required significantly longer hospitalization (median 13 days, IQR 9–18) versus laparoscopy (median 7 days, IQR 6–8) (P = 0.049, Mann–Whitney U test), representing a 46.2% reduction in hospital stay. Two patients (15.4%, 1 per group) required transient ICU monitoring (≤ 24 h) for hemodynamic stabilization, both being octogenarians with ASA III status. The outlier case (36-day stay) developed surgical site infection (SSI) requiring: serial debridements, negative-pressure wound therapy, and delayed primary closure, accounting for 23.1% of all complications.

Postoperative inflammation differed markedly: POD1 CRP was 3.1-fold higher in open cases (median 68.5 mg/L, IQR 45–112) versus laparoscopy (median 22 mg/L, IQR 15–28) (P = 0.003, Mann–Whitney U test). Time to first bowel movement showed nonsignificant variation: open median 2 days (IQR 1–3) vs. laparoscopic 1 day (IQR 1–2) (P = 0.159, Mann–Whitney U test).

Structured follow-up occurred at 1, 3, 6, and 12 months postoperatively, with: (1) Clinical examination for recurrence, (2) Visual Analog Scale (VAS) pain scoring, (3) Quality-of-life assessment using the Carolinas Comfort Scale. With minimum 6-month follow-up (median 12

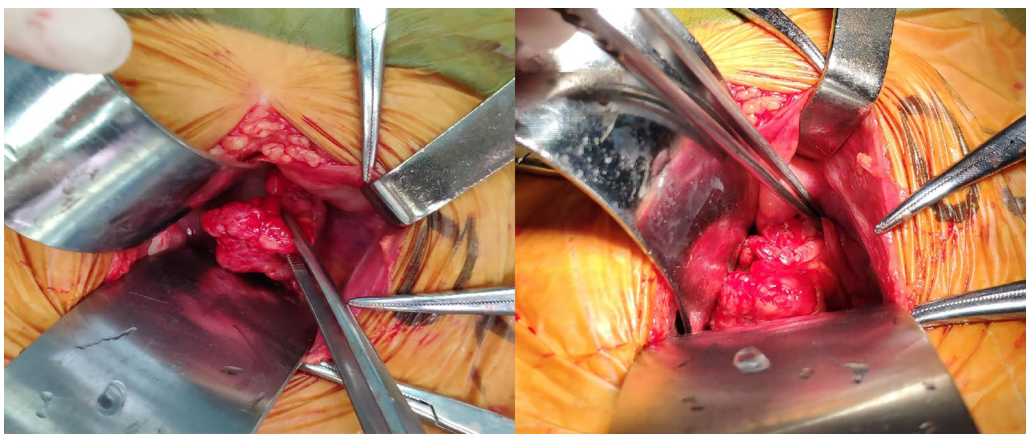

Fig. 7 Open the hernia sac and see the incarcerated contents

Fig. 8 Exposure of the obturator after retraction of the hernia sac

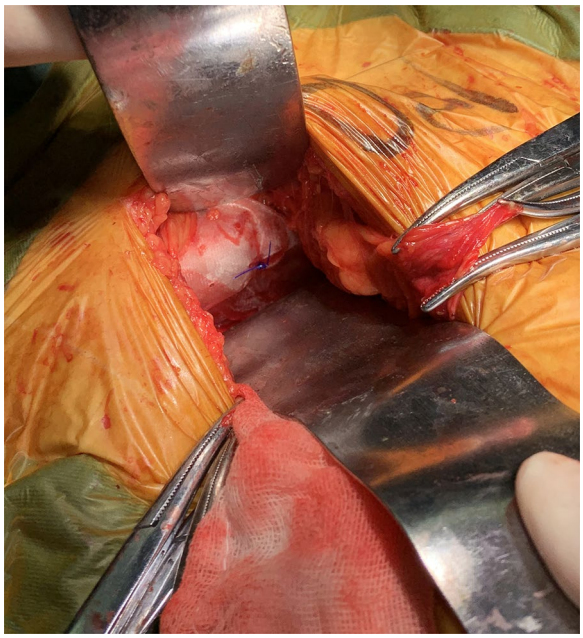

Fig. 9 Place the mesh in front of the obturator

months, range 6–36), all patients remained recurrence-free, and no mortality occurred during the study period. The intraoperative and postoperative results are summarized statistically in Table 2.

Discussion

Obturator hernia is a rare condition predominantly observed in elderly, thin women, hence its colloquial designation as"the little old lady's hernia."The incidence

Table 2 Comparative surgical outcomes: laparoscopic vs. open repair

	Open group(n = 6)	Lap group(n = 7)	*P* value
Intraoperative outcomes			
Small bowel resection			0.097
Operative time (min)*	76 (45–140)	63 (40–110)	0.388
Estimated blood loss (ml)*	30 (20–50)	10 (5–20)	
Bowel resection	2 (33.3%)	0 (0%)	0.097
Prosthetic reinforcement			
Biologic mesh	5 (83.3%)	1 (14.3%)	0.015
Polypropylene mesh	1 (16.7%)	5 (71.4%)	0.070
Postoperative outcomes			
Hospital stay (days)*	13 (7–36)	7 (6–11)	0.049
CRP POD1 (mg/L)*	79.1 (20.3–131.6)	10.7 (4.2–20.2)	0.003
Time to flatus (days)*	1.8 (1–4)	1.1 (1–2)	0.159
Major complications†	2 (33.3%)	0 (0%)	0.097

1.*Data presented as median (interquartile range)

2. †Major complications defined as Clavien–Dindo grade ≥ III

3. Statistical significance set at $P < 0.05$ (two-tailed)

in females is approximately sixfold higher than in males [1, 11, 20]. This disparity arises from multiple anatomical and physiological factors: First, the female pelvis has a wider transverse diameter, enlarging the obturator canal's anatomical dimensions [1]. Second, age-related tissue laxity, low body mass index (BMI), and multiparity are established risk factors [4, 7]. Furthermore, conditions increasing intra-abdominal pressure—including chronic obstructive pulmonary disease, multiparity, and ascites—are well-documented predisposing factors [1, 4, 11].

The obturator foramen, one of the largest natural openings in the pelvic anatomy, is bounded by the ischium and pubis. Although the obturator foramen is largely covered by the obturator membrane, its superolateral aspect contains a small canal—the obturator canal—which permits neurovascular passage [1]. Herniation typically occurs through this canal when intra-abdominal pressure increases and pelvic tissues weaken [7]. The pathogenesis involves three sequential stages: (1) extraperitoneal fat protrusion through the obturator canal; (2) peritoneal invagination forming a hernia sac; and (3) incarceration of abdominal contents, typically small bowel [1, 8]. In advanced cases, the sac may contain omentum or

incarcerated bowel, leading to obstruction or strangulation [4].

Obturator hernias are anatomically classified into three variants based on their relationship to the obturator externus muscle and neurovascular bundle [1]. Type I (anterior) hernias, the most prevalent variant, protrude along the anterior branch of the obturator nerve, passing anterior to the obturator externus muscle [21]. The hernial sac in this variant lies between the pectineus and obturator externus muscles, inferior to the pubic ramus [1]. Type II (posterior) hernias traverse between the external obturator muscle fascicles, posterior to the adductor brevis muscle [21]. Type III (interstitial) hernias, the rarest form, develop between the obturator membranes and muscles [22].

Preoperative diagnosis of obturator hernia remains clinically challenging, with up to 50% of cases diagnosed intraoperatively [23]. The pathognomonic Howship–Romberg sign, observed in 25–50% of cases, presents as medial thigh pain exacerbated by hip extension or internal rotation, caused by obturator nerve compression [6]. Referred pain may radiate to the buttocks and is consistently aggravated by maneuvers increasing intra-abdominal pressure (coughing/Valsalva) or hip movement [22]. Notably, none of our patients demonstrated the Howship–Romberg sign, consistent with reports suggesting its absence in 50–75% of cases [4]. Consequently, we relied on CT imaging for definitive diagnosis, which demonstrates >95% sensitivity for identifying obturator hernias [24, 25].

The diagnostic utility of CT for obturator hernia was first established by Cubillo (1983), who demonstrated its ability to visualize hernial contents within the obturator canal. Subsequent advances in CT technology have elevated preoperative diagnostic accuracy to >90%, revolutionizing the management of this condition [25]. CT typically reveals a pathognomonic fat-density mass traversing the obturator canal between the pectineus and obturator externus muscles, often containing bowel loops (Fig. 1) [8]. Contemporary practice mandates CT as the gold-standard preoperative modality, enabling simultaneous evaluation of hernia characteristics, intestinal viability, and comorbid abdominal pathology [5]. This multimodal assessment significantly enhances surgical preparedness and approach selection [26].

Open surgical approach remains the gold standard for complicated obturator hernias requiring bowel resection or presenting with strangulation. The midline laparotomy provides direct visualization of the hernia contents and enables thorough exploration of the abdominal cavity, which is particularly crucial in cases of suspected bowel ischemia [10]. The recent evidence suggests that open repair with mesh placement demonstrates superior long-term outcomes in emergency settings, with recurrence rates <5% at 5-year follow-up [18]. However, this approach carries significant morbidity, including wound infection rates of 15–20% and prolonged ileus in 30% of elderly patients [4].

Laparoscopic techniques have emerged as the preferred approach for elective cases and selected emergency presentations. The transabdominal preperitoneal (TAPP) approach offers three distinct advantages: (1) magnified visualization of the obturator canal's neuroanatomy, (2) simultaneous bilateral exploration, and (3) reduced postoperative pain (mean VAS score 2.1 vs. 5.3 in open surgery) [26]. A 2023 meta-analysis of 142 cases revealed laparoscopic repair achieves comparable recurrence rates (2.1% vs. 3.8%) with significantly shorter hospital stays (3.2 vs. 7.5 days) compared to open approaches [14]. Notably, the laparoscopic view facilitates identification and preservation of the obturator nerve, reducing postoperative neuralgia incidence from 12% to <2% [3].

In our cohort, one open surgery patient developed a surgical site infection, resulting in seroma formation and impaired wound healing. This complication necessitated repeated debridement and vacuum-assisted closure (VAC) therapy, extending hospitalization. Owing to its minimally invasive nature, laparoscopy shortens hospital stays, decreases perioperative morbidity, and attenuates systemic inflammatory responses. Consistent with prior studies (Kohga et al., 2018), our data demonstrated a significantly shorter mean hospital stay in the laparoscopic group (7 days vs. 13 days; $P = 0.049$). Furthermore, laparoscopic patients had significantly lower postoperative CRP levels (10.66 vs. 79.07 mg/L; $P = 0.003$), indicating a milder inflammatory reaction.

Kohga et al. reported significantly fewer short-term complications with laparoscopic versus open surgery in a cohort of 29 patients ($P < 0.05$). Their study also emphasized laparoscopic surgery's advantage in identifying and repairing contralateral occult obturator hernias [10]. Notably, laparoscopic repair remains feasible for obturator hernia cases requiring bowel resection [26]. Although technically demanding, this approach yields superior outcomes when performed by experienced surgeons on carefully selected patients. Wang et al. documented successful laparoscopic TEP repair in cirrhotic patients with ascites, though this technique requires careful patient selection [27].

Regardless of surgical approach (open or laparoscopic), mesh reinforcement is generally recommended during obturator hernia repair. This is supported by evidence demonstrating that mesh repair significantly reduces recurrence rates [18] and enhances long-term quality of life [8]. Emerging evidence proposes that obturator hernia may represent a bilateral pathology [3]. Therefore,

intraoperative assessment of the contralateral obturator canal is advised, with bilateral mesh coverage considered when indicated [3]. Mesh selection (size and material composition) should be individualized based on patient anatomy and intraoperative findings.

Several limitations must be acknowledged in this study: (1) the small sample size (n = 13) limits statistical power; (2) the single-center, retrospective design introduces potential selection bias. Future investigations should prioritize prospective, multicenter designs with adequate sample sizes to validate these findings. In addition, cross-regional collaborations would enable assessment of geographical/ethnic variations in treatment outcomes, improving external validity. Extended follow-up (> 5 years) is also warranted to evaluate long-term recurrence rates and mesh-related complications.

Future studies should employ prospective, multicenter designs with standardized protocols to enhance statistical power and minimize selection bias. International collaborations may further improve external validity by assessing geographical/ethnic variations in treatment efficacy. In addition, extended follow-up periods (minimum 5 years) are essential to evaluate long-term outcomes, including hernia recurrence rates (primary endpoint) and mesh-related complications (secondary endpoints).

Conclusions

In conclusion, while obturator hernia remains a rare clinical entity, our retrospective analysis demonstrates superior clinical outcomes with laparoscopic versus open repair. The laparoscopic approach was associated with statistically significant reductions in intraoperative blood loss, hospitalization duration, and postoperative CRP levels. These findings should be interpreted cautiously given the study's limitations (small sample size, retrospective design), necessitating validation through multicenter prospective trials. Notwithstanding these limitations, our results support laparoscopic repair as a viable first-line option for select obturator hernia cases, particularly in elderly patients with comorbidities.

Author contributions

Zhaokun Sun wrote the main manuscript text and prepared Figs. 1 and Table 1, 2. Miaojun Xu, Liming Tang and Gengyuan Hu review and editing manuscript and prepared Figs. 2, 3, 4, 5, 6, 7, 8, 9 and 10. Zhifeng Wu performed a software analysis. All authors reviewed the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The confidentiality of patients'personal information was strictly maintained throughout the article, with only condition-related data being reported. The research poses no more than minimal risk to the subjects and the waiver or partial waiver of informed consent does not affect the rights and health of the subjects. Therefore, no further consent from the subject is required. The study was approved by the Academic Ethics Committee of Shaoxing People's Hospital (Approval No: 2024-Research 089-01).

Competing interests

The authors declare no competing interests.

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References

1. Petrie A, Shane Tubbs R, Matusz P, Shaffer K, Loukas M. Obturator hernia: anatomy, embryology, diagnosis, and treatment. Clin Anat. 2011;24:562–9.
2. Lo CY, Lorentz TG, Lau PWK. Obturator hernia presenting as small bowel obstruction. The American Journal of Surgery. 1994;167:396–8.
3. Yasukawa D, Aisu Y, Hori T. Crucial anatomy and technical cues for laparoscopic transabdominal preperitoneal repair: advanced manipulation for groin hernias in adults. WJGS. 2020;12(7):307–25. https://doi.org/10.4240/wjgs.v12.i7.307.
4. Rodríguez-Hermosa JI, Codina-Cazador A, Maroto-Genover A, Puig-Alcántara J, Sirvent-Calvera JM, Garsot-Savall E, Roig-García J. Obturator hernia: clinical analysis of 16 cases and algorithm for its diagnosis and treatment. Hernia. 2008;12(3):289–97. https://doi.org/10.1007/s10029-007-0328-y.
5. Schizas D, Apostolou K, Hasemaki N, Kanavidis P, Tsapralis D, Garmpis N, Damaskos C, Alexandrou A, Filippou D, Kontzoglou K. Obturator hernias: a systematic review of the literature. Hernia. 2021;25(1):193–204. https://doi.org/10.1007/s10029-020-02282-8.
6. Yale SH, Tekiner H, Yale ES. Role of the signs of obturator hernia in clinical practice. Hernia. 2021;25(1):235–6. https://doi.org/10.1007/s10029-020-02296-2.
7. Mahendran B, Lopez PP. Obturator Hernia. 2023 Jan 30. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. PMID: 32119416.
8. Diab J, Badiani S, Berney CR. A decade review of emergency obturator hernia repairs. ANZ J Surg. 2021;91(7–8):1596–603. https://doi.org/10.1111/ans.17011.
9. Henriksen NA. Systemic and local collagen turnover in hernia patients. Dan Med J. 2016;63(7):B5265.
10. Kohga A, Kawabe A, Okumura T, Yamashita K, Isogaki J, Suzuki K. Laparoscopic repair is a treatment of choice for selected patients with incarcerated obturator hernia. Hernia. 2018;22(5):887–95. https://doi.org/10.1007/s10029-018-1747-7.
11. Park J. Obturator hernia: clinical analysis of 11 patients and review of the literature. Medicin. 2020;99(34): e21701. https://doi.org/10.1097/MD.0000000000021701.
12. Bittner R, Arregui ME, Bisgaard T, Dudai M, Ferzli GS, Fitzgibbons RJ, Fortelny RH, Klinge U, Kockerling F, Kuhry E, Kukleta J, Lomanto D, Misra MC, Montgomery A, Morales-Conde S, Reinpold W, Rosenberg J, Sauerland S, Schug-Pass C, Singh K, Timoney M, Weyhe D, Chowbey P. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [international endohernia society (IEHS)]. Surg Endosc. 2011;25(9):2773–843. https://doi.org/10.1007/s00464-011-1799-6.
13. Begos DG, Modlin IM. Laparoscopic cholecystectomy: from gimmick to gold standard. J Clin Gastroenterol. 1994;19(4):325–30. https://doi.org/10.1097/00004836-199412000-00015.
14. Meier J, Stevens A, Berger M, Makris KI, Bramos A, Reisch J, Cullum CM, Lee SC, Sugg Skinner C, Zeh H, Brown CJ, Balentine CJ. Comparison of postoperative outcomes of laparoscopic vs open inguinal hernia repair. JAMA Surg. 2023;158(2):172–80. https://doi.org/10.1001/jamasurg.2022.6616.PMID:36542394;PMCID:PMC9857280.

15. Ielpo B, Nuñez-Alfonsel J, Duran H, Diaz E, Fabra I, Caruso R, Malavé L, Ferri V, Barzola E, Quijano Y, Vicente E. Cost-effectiveness of randomized study of laparoscopic versus open bilateral inguinal hernia repair. Ann Surg. 2018;268(5):725–30. https://doi.org/10.1097/SLA.0000000000002894.
16. Fitzgibbons RJ Jr, Forse RA. Clinical practice. Groin hernias in adults. N Engl J Med. 2015;372(8):756–63. https://doi.org/10.1056/NEJMcp1404068
17. HerniaSurge Group. International guidelines for groin hernia management. Hernia. 2018;22(1):1–165. https://doi.org/10.1007/s10029-017-1668-x.
18. Karasaki T, Nomura Y, Tanaka N. Long-term outcomes after obturator hernia repair: retrospective analysis of 80 operations at a single institution. Hernia. 2014;18(3):393–7. https://doi.org/10.1007/s10029-013-1159-7.
19. Ferzli G, Shapiro K, Chaudry G, Patel S. Laparoscopic extraperitoneal approach to acutely incarcerated inguinal hernia. Surg Endosc. 2004;18(2):228–31. https://doi.org/10.1007/s00464-003-8185-y.
20. Ng DC, Tung KL, Tang CN, Li MK. Fifteen-year experience in managing obturator hernia: from open to laparoscopic approach. Hernia. 2014;18(3):381–6. https://doi.org/10.1007/s10029-013-1080-0.
21. Losanoff JE, Richman BW, Jones JW. Obturator hernia. J Am Coll Surg. 2002;194(5):657–63. https://doi.org/10.1016/s1072-7515(02)01137-7.
22. Kammori M, Mafune K, Hirashima T, Kawahara M, Hashimoto M, Ogawa T, Ohta H, Hashimoto H, Kaminishi M. Forty-three cases of obturator hernia. Am J Surg. 2004;187(4):549–52. https://doi.org/10.1016/j.amjsurg.2003.12.041.
23. Kulkarni SR, Punamiya AR, Naniwadekar RG, Janugade HB, Chotai TD, Vimal Singh T, Natchair A. Obturator hernia: a diagnostic challenge. Int J Surg Case Rep. 2013;4(7):606–8. https://doi.org/10.1016/j.ijscr.2013.02.023.
24. Cubillo E. Obturator hernia diagnosed by computed tomography. AJR Am J Roentgenol. 1983;140(4):735–6. https://doi.org/10.2214/ajr.140.4.735.
25. Munoz-Forner E, Garcia-Botello S, Lopez-Mozos F, Marti-Obiol R, Martinez-Lloret A, Lledó S. Computed tomographic diagnosis of obturator hernia and its surgical management: a case series. Int J Surg. 2007;5(3):139–42. https://doi.org/10.1016/j.ijsu.2006.10.001.
26. Liu J, Zhu Y, Shen Y, Liu S, Wang M, Zhao X, Nie Y, Chen J. The feasibility of laparoscopic management of incarcerated obturator hernia. Surg Endosc. 2017;31(2):656–60. https://doi.org/10.1007/s00464-016-5016-5.
27. Wang H, Fu J, Qi X, Sun J, Chen Y. Laparoscopic totally extraperitoneal (TEP) inguinal hernia repair in patients with liver cirrhosis accompanied by ascites. Medicine. 2019;98(43): e17078. https://doi.org/10.1097/MD.0000000000017078.PMID:31651835;PMCID:PMC6824811.

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