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Laparoscopic transabdominal preperitoneal repair for emergency groin hernia: A single-center experience

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Abstract

BACKGROUND: Laparoscopic transabdominal preperitoneal (TAPP) repair enables inspection of the entire peritoneal cavity and both inguinal regions without additional dissection. Although widely used electively, evidence on emergency strangulated or incarcerated groin hernias remains limited. We evaluated the feasibility, safety, and short-term outcomes of emergency TAPP repair in adults.

MATERIALS AND METHODS: We retrospectively reviewed adult patients who underwent emergency laparoscopic TAPP repair for incarcerated or strangulated groin hernias at our hospital from January 2022 to December 2024. Data collected included demographics, hernia type and contents, operative details, and postoperative outcomes.

RESULTS: Thirty-five patients underwent successful emergency TAPP repair, including 30 inguinal and five femoral hernias. Mean operative time was 96.9 ± 21.7 min (range: 75–135), and mean postoperative length of stay was 3.8 ± 1.3 days (range: 2–6). The small bowel was the most frequent hernia content (62.8%), followed by the omentum (31.4%). All incarcerated organs were preserved without bowel resection, and no conversion to open surgery was required. Early postoperative morbidity was low, with one case (2.86%) of urinary retention and no hematoma, vascular injury, or surgical site infection. At 1-month follow-up, three patients (8.6%) developed seroma and two (5.7%) reported groin pain; no mesh infection, ischemic orchitis, or hernia recurrence was observed.

CONCLUSIONS: In experienced hands, emergency laparoscopic TAPP repair for incarcerated and strangulated groin hernias in adults is feasible and safe, providing favorable short-term outcomes.

Keywords:

Emergency groin hernia repair, laparoscopic, TAPP

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Introduction

The use of minimally invasive surgery in the treatment of inguinal hernias has grown significantly in recent years. As surgical skills have improved and our understanding of the anatomy of the myopectineal orifice (MPO) has become more precise, the transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) methods have become the most popular minimally invasive approaches to fix an inguinal hernia. The use of TAPP and TEP has increased significantly in high-resource environments.[1-3]

In the TAPP method, the surgeon goes into the abdominal cavity to fix an inguinal hernia. This gives them a bigger area to work in. This method has a number of benefits, such as being able to accurately assess the viability of the intestines, less pain after surgery, a quicker return to work and daily activities, a lower risk of wound-related complications, and a lower risk of

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hernia recurrence by completely covering the MPO with mesh.[4,5]

In developed countries, 2.5%–7.7% of groin hernia repairs are done in an emergency. In developing countries, the number might be as high as 76.9%. In affluent countries, the death rate for emergency groin hernia repair is between 1.7% and 7.0%. If bowel resection is needed, the rate could go up to 6%–25%.[6] The 2021 study "Trends in emergent groin hernia repair" by Köckerling *et al*.[6] found that the number of TAPP repairs went up from 25.8% to 45.6% in patients who had emergency surgery after the contents of the hernia sac were reduced or moved. The number of Lichtenstein, Shouldice, and "other techniques" repairs went down. In emergency surgeries that didn't involve intestinal resection, the number of TAPP repairs went up a lot, while the number of Shouldice repairs and "other techniques" went down.[6]

Given the increasing prevalence of emergency groin hernia cases globally, the observed trends in emergent groin hernia repair, and our local clinical experience, we designed this study to assess the feasibility, safety, and outcomes of emergency TAPP repair in adult patients with strangulated inguinal and femoral hernias.

Materials and Methods

Study population

This retrospective analysis comprised 35 patients with severely strangulated inguinal and femoral hernias. Between January 2022 and December 2024, these patients had emergency TAPP repair at our hospital. An examination was performed regarding the patients' characteristics, surgery details, duration of hospitalization, incidence of complications, mortality rate, and recurrence rate.

The laparoscopic approach was assessed according to many criteria, including the mean length of the procedure, its efficacy in hernia reduction, the incidence of conversion to open surgery, and the precision in detecting contralateral inguinal hernias. The laparoscopic procedure was evaluated according to many criteria, including the mean length of hospitalization, mortality rate, complication morbidity rate, and hernia recurrence rate.

The study included adult patients with incarcerated or strangulated groin hernias who were considered suitable for emergency laparoscopy and general anesthesia, without prior major abdominal surgery, abdominal wall infection, or severe cardiopulmonary comorbidities. The laparoscopic TAPP approach was selected when no contraindications to laparoscopy were present and an experienced laparoscopic surgeon was available. Exclusion criteria included contraindications to general anesthesia, clinical signs of peritonitis, confirmed intestinal perforation before surgery, and severe bowel distension precluding a laparoscopic approach.

Surgical technique

One surgeon performed all procedures, and TAPP repair was used in every case. After induction of general anesthesia, a 10-mm trocar was inserted via a supra- or infraumbilical incision to establish pneumoperitoneum (12 mmHg), and a 30° laparoscope was introduced. Two additional 5-mm trocars were placed under direct vision at the midclavicular lines, approximately 1–2 cm below the umbilicus [Figure 1]. The groin was inspected, and the hernia contents were assessed. Reduction was attempted with gentle traction, aided by external manual pressure when needed. If reduction was not possible or was considered unsafe because of the risk of bowel injury, we first created the peritoneal flap to expose the hernia neck, then carefully dissected the hernia ring and, when necessary, incised the ring under direct vision to facilitate atraumatic reduction.[7] After reduction, bowel viability was reassessed. A transverse peritoneal incision was made from the medial border of the ipsilateral medial umbilical ligament to the level of the anterior superior iliac spine. Dissection began medially in Retzius' retropubic (prevesical) space and then proceeded laterally in Bogros' space, exposing the symphysis pubis, Cooper's ligament, and the iliopubic tract. The hernia sac was dissected from the spermatic cord structures as appropriate. A 15 cm × 10 cm polypropylene mesh was introduced through the umbilical port and positioned to cover the femoral canal and the entire MPO. Mesh fixation was performed using a spiral tacker (ProTack) in safe zones, avoiding the triangles of pain and doom. The peritoneal flap was closed with a continuous absorbable suture. The fascial defect at the 10-mm port site was

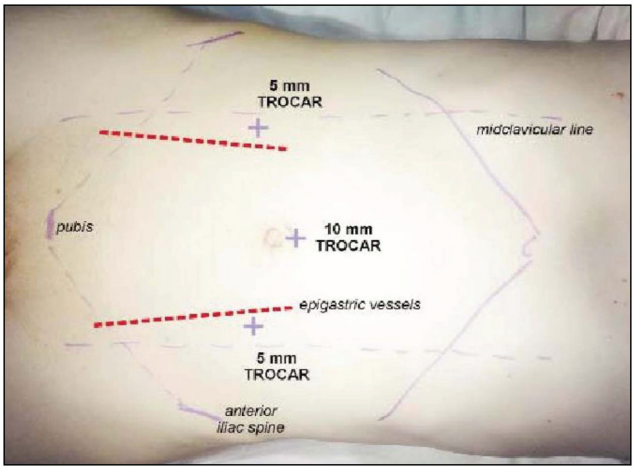


Figure 1: Port placement for laparoscopic transabdominal preperitoneal repair



Figure 2: Strangulated femoral hernia: clinical appearance and corresponding computed tomography image demonstrating an incarcerated hernia sac

closed with 2-0 Vicryl, and the skin was closed with 3-0 Prolene. A firm compressive dressing was applied over the operated groin for approximately 24 h to reduce dead space and postoperative fluid collection.

Preoperative evaluation included laboratory tests and imaging (ultrasonography and/or computed tomography [CT]) when clinically indicated to confirm the diagnosis, define the hernia type, and assess the hernia contents. All patients received prophylactic antibiotics before incision. Figure 2 shows a representative strangulated femoral hernia with the corresponding CT image from our series.

Statistical analysis

We used Statistical Package for Social Sciences (SPSS) software (IBM SPSS Statistics, version 20.0; IBM Corp., Armonk, NY, USA) to do the statistical analysis. Continuous variables were represented as mean ± standard deviation or median with interquartile range (IQR), contingent upon data distribution. Frequencies and percentages were used to show categorical variables. Since this was a descriptive retrospective study lacking a comparison group, inferential statistical tests were not utilized. All analyses were performed for descriptive objectives to encapsulate patient characteristics, operational results, and postoperative outcomes.

Clinical trial registry

This work is a retrospective analytical study. No clinical trials were involved.

Results

Thirty-five adult patients received laparoscopic TAPP repair for emergency groin hernia. Table 1 shows a summary of the basic demographic and hernia features. There were mostly men in the group (33 out of 35, OR 94.3%), and their average age was 63.7 ± 15.7, years and their average body mass index was 19.1 ± 2.4 kg/m^2. Indirect inguinal hernias accounted for the majority of cases (26/35, 74.3%), followed by direct inguinal hernias (4/35, 11.4%) and femoral hernias (5/35, 14.3%). The hernia was more frequently right-sided (24/35, 68.6%) than left-sided (11/35, 31.4%). The hernia defect size was < 1.5 cm in 14 patients (40.0%), 1.5–3 cm in 18 patients (51.4%), and >3 cm in 3 patients (8.6%; Table 1).

Table 1: Baseline demographic, anthropometric, and hernia features of patients having emergency laparoscopic transabdominal preperitoneal (TAPP) repair

Variables	TAPP
Sex	
Male	33 (94.3%)
Female	2 (5.7%)
BMI (mean ± SD)	19.1 ± 2.4 kg/m^2
Age (mean ± SD)	63.7 ± 15.7
Type of hernia	
Indirect, *n* (%)	26 (74.30%)
Direct, *n* (%)	4 (11.40%)
Femoral, *n* (%)	5 (14.30%)
Hernia side	
Right, *n* (%)	24 (68.60%)
Left, *n* (%)	11 (31.40%)
Hernia size	
< 1.5 cm, *n* (%)	14(40.0%)
1.5–3 cm, *n* (%)	18 (51.40%)
> 3 cm, *n* (%)	3 (8.60%)

BMI = body mass index

Operative findings and postoperative outcomes are shown in Table 2. The mean operative time was 96.9 ± 21.7 min (range: 75–135 min), and the median number of tacks used for mesh fixation was 6 (IQR: 3–10). The most common hernia sac content was small intestine (22/35, 62.8%), followed by omentum (11/35, 31.4%); one patient (2.86%) had combined small intestine and

Table 2: Intraoperative findings and early and 1-month postoperative outcomes after emergency laparoscopic transabdominal preperitoneal (TAPP) repair for strangulated groin hernia

Variables	TAPP
Operation time (in min; mean ± SD)	96.9 ± 21.7 (75–135 min)
Number of tacks used for mesh fixation (median-IQR)	6 (3–10)
Contents of sac	
Small intestine	22 (62.8%)
Omentum	11 (31.4%)
Small intestine and omentum	1 (2.86%)
Colon	1 (2.86%)
Postoperative complications	
Hematoma, *n* %	0
Urine retention, *n* %	1 (2.86%)
Infection, *n* %	0
Injuries vascular, *n* %	0
The length of hospital stay	3.8 ± 1.3 days (range: 2–6 days)
One month complications	
Seroma, *n* %	3 (8.6%)
Pain, *n* %	2 (5.7%)
Ischemic orchitis, *n* %	0
Recurrence, *n* %	0

SD = standard deviation, IQR = interquartile range

omentum in the sac, and one patient (2.86%) had colon involvement. Representative intraoperative appearances of strangulated inguinal and femoral hernias are illustrated in Figures 3 and 4. No intraoperative vascular injuries, hematomas, or surgical site infections (SSIs) were recorded. One patient (2.86%) developed postoperative urinary retention. The mean length of postoperative hospital stay was 3.8 ± 1.3 days (range: 2–6 days; Table 2).

At 1-month follow-up, three patients (8.6%) developed a postoperative seroma, and two patients (5.7%) reported groin pain, while no cases of ischemic orchitis or hernia recurrence were observed [Table 2].

Discussion

The TAPP approach is a minimally invasive technique that facilitates faster postoperative recovery compared to conventional open repair. It is particularly advantageous for simultaneous bilateral hernia repair and direct intra-abdominal assessment of hernia contents. In our institution, the TAPP technique has been adopted for emergency management of incarcerated groin hernias due to its superior capability in evaluating bowel viability.[3,8,9]

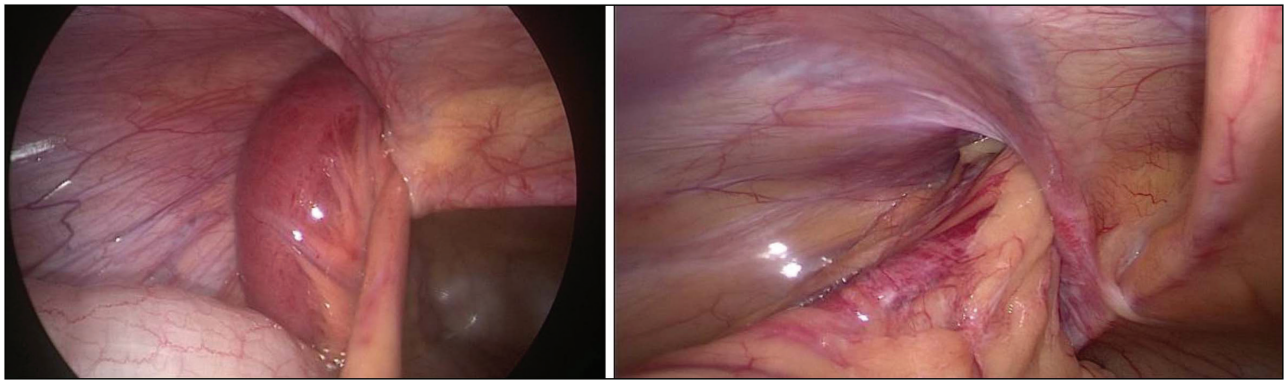


Figure 3: Laparoscopic view of a strangulated inguinal hernia containing incarcerated small intestine and omentum during emergency transabdominal preperitoneal repair

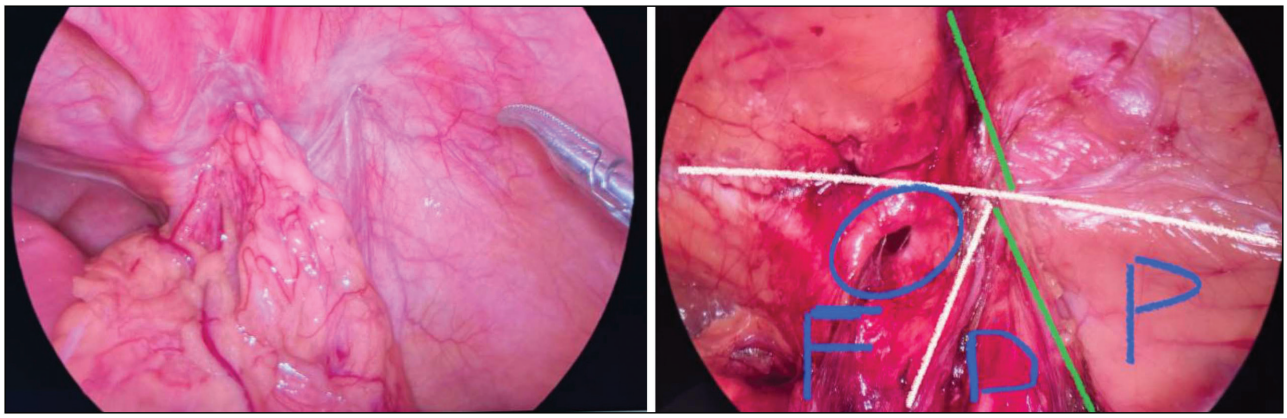


Figure 4: Laparoscopic view of a strangulated femoral hernia with incarcerated omentum during emergency transabdominal preperitoneal repair

A critical advantage of the TAPP approach lies in its ability to fully visualize the MPO—a key anatomical region described by Dr. Fruchaud, a French researcher, in 1956, through which all groin hernias occur.[10] The MPO is bounded superiorly by the arching fibers of the internal oblique and transversus abdominis muscles, medially by the lateral border of the rectus sheath, laterally by the iliopsoas muscle, and inferiorly by the pectineal ligament. It is subdivided into the inguinal region, the origin of direct and indirect inguinal hernias, and the femoral canal, where femoral hernias develop. This panoramic view in TAPP not only reduces the risk of missed femoral hernias but also addresses a significant limitation in open repairs—especially among younger surgeons with limited exposure to femoral hernia cases due to their lower incidence and less frequent inclusion in surgical training.

Groin hernias, encompassing both inguinal and femoral types, are frequent in the lower abdominal region. In this study, 30 cases were inguinal, and 5 were femoral hernias, with inguinal hernias remaining the predominant presentation across genders. Both types occurred more commonly on the right side, likely attributable to delayed closure of the processus vaginalis following the slower descent of the right testis during fetal development. Additionally, the anatomical position of the sigmoid colon exerts a tamponade effect on the left femoral canal, reducing the incidence of left-sided femoral hernias.[11]

Herniated contents comprised the small intestine in 62.8% of cases and the greater omentum in 31.4%. In all intestinal cases, laparoscopic reduction was achieved without the need for bowel resection. For omental hernias, partial resection was performed when inflammatory adhesions or bulkiness hindered reduction into the peritoneal cavity.

Confirmation of bowel viability is mandatory in any emergency repair of incarcerated or strangulated groin hernias. Following successful reduction of the incarcerated hernia contents during TAPP, careful assessment of bowel viability is essential to guide intraoperative decision-making.[12] Laparoscopic visualization allows direct inspection of color, peristaltic activity, mesenteric pulsations, and the presence of serosal injury. In doubtful cases, warm saline irrigation and short-term observation within the peritoneal cavity can help determine recovery potential before proceeding to resection. This minimally invasive approach facilitates comprehensive evaluation without additional incisions, supporting organ preservation and optimal postoperative outcomes.

Comparative series of emergency strangulated groin hernia repair have reported that laparoscopic approaches are associated with a significantly lower rate of SSI than open repair, likely because a groin incision is avoided and soft-tissue dissection is minimized.[13]

In addition, laparoscopic TAPP enables intra-abdominal inspection and repeated reassessment of bowel perfusion, which may reduce the frequency of bowel resection in selected patients with incarcerated or strangulated hernias.[14] In our cohort, no bowel resection was required; however, this finding should be interpreted cautiously given the retrospective design and patient selection.

Seroma remains the most frequent postoperative complication following laparoscopic groin hernia repair, particularly in cases of strangulated hernias with large sacs requiring extensive dissection. In our series, seroma was identified in three patients (8.6%) at the first postoperative follow-up, confirmed by clinical examination and ultrasonography.

Hematomas and seromas typically present as palpable or visible masses in the groin, occasionally extending into the scrotum. Ultrasonography remains the preferred diagnostic modality, with most cases resolving spontaneously without intervention. In indirect inguinal hernia repairs, complete dissection of the distal sac can be technically challenging, sometimes leaving residual dead space, thereby increasing the risk of postoperative fluid collection. This observation likely explains the relatively high incidence of seroma or hematoma in our cohort.

To minimize these complications, meticulous hemostasis, limited dissection of the distal sac, and avoidance of unnecessary peritoneal trauma are essential. In our practice, we routinely apply a firm compressive dressing over the operated inguinal canal for approximately 24 h postoperatively to obliterate potential dead space and limit postoperative fluid accumulation.

The incidence of SSI in elective inguinal or femoral hernia repairs is reported to be approximately 2%–4%. In the emergency setting, particularly with strangulated hernias, the risk of infection increases proportionally with the degree of intestinal ischemia and the level of contamination. In cases of severe ischemia with bowel perforation or gross contamination, mesh implantation should be avoided.

The susceptibility of prosthetic material to infection is influenced by its filament structure and pore size. Monofilament meshes demonstrate lower infection rates compared with multifilament designs.[15] Lightweight meshes with large pore sizes offer several advantages, including reduced tissue reaction, decreased inflammation, enhanced elasticity, improved flexibility, less postoperative discomfort, and lower

rates of shrinkage.[16] Based on these characteristics, we recommend the use of lightweight, large-pore monofilament polypropylene mesh for TAPP repair whenever mesh placement is appropriate. In our series, all patients received such meshes, and no cases of mesh infection were observed. Postoperative antibiotics may be warranted for 24–48 h in contaminated cases, as supported by randomized controlled trials showing a reduction in SSI rates in emergency hernia surgery.

Overall, the minimally invasive approach may facilitate earlier mobilization and recovery compared with conventional open repair. In our cohort, the mean postoperative length of stay was 3.8 ± 1.3 days.

In most circumstances, a rigorous physical exam and a thorough study of the patient's medical history will help doctors figure out if they have an inguinal hernia. However, in situations where the clinical examination is limited—such as in obese patients, individuals with significant groin pain, or when hernia content is small and reducible—adjunctive imaging plays a crucial role.

Postoperative pain after laparoscopic TAPP repair is usually mild and transient and should not be considered inevitable. Most patients experience short-lived groin discomfort that resolves within days to a few weeks. However, persistent, intense, sharp, burning, or electric-like pain may indicate complications such as neural irritation or injury and warrants prompt evaluation. Chronic postoperative pain after inguinal hernia repair is primarily neuropathic in nature, resulting from nerve trauma, traction, or entrapment, although nociceptive mechanisms—such as inflammation, fibrotic reaction, mesh-related stiffness, or spermatic cord compression—may also contribute.[17] Clinically, neuropathic pain is widely recognized as presenting with burning, electric shock-like, stabbing, or tingling sensations, often associated with radiating discomfort, numbness, or abnormal sensory perceptions such as dysesthesia.[18] Nociceptive pain is typically described as dull, throbbing, aching, or pulsating in nature and is usually localized rather than radiating.[19] In our practice, mesh fixation was limited (typically at three key points), and the peritoneum was closed with absorbable sutures, aiming to minimize nerve-related injury while maintaining mesh stability.

Our study has some limitations: This was a single-center retrospective study without a comparative open-surgery cohort, and the operative approach was applied to patients considered suitable for laparoscopy. All operations were performed by a single experienced surgeon, which improves procedural consistency but limits generalizability and may introduce performance bias. The sample size was modest, and follow-up was short; therefore, longer-term outcomes such as recurrence and chronic pain could not be fully evaluated. Future prospective multicenter studies with longer follow-up and standardized selection criteria are warranted.

Conclusion

Laparoscopic TAPP repair appears to be a safe and effective option for emergency management of incarcerated and strangulated groin hernias, as all procedures in our series were completed laparoscopically without bowel resection, with low postoperative morbidity and no early recurrence. These results support the use of TAPP in appropriately selected patients operated on by experienced laparoscopic surgeons, although larger prospective studies with longer follow-up are needed to further confirm its role in emergency groin hernia repair.

Author contributions

TXN: study design, data collection, and manuscript drafting. DAL and NHP: statistical analysis and critical revision. TXN, DAL, and NHP: surgical procedures. TXN: supervision.

Ethical policy and Institutional Review Board statement

This study was performed in accordance with the Declaration of Helsinki and approved by the institutional ethical review board of Hue Central Hospital, approval number 2025/07 (January 05, 2025).

Declaration of patient consent

All the patients had given their written informed consent.

Data availability statement

The data that support the findings of this study are not publicly available due to their containing information that could compromise the privacy of research participants but are available from the corresponding author upon reasonable request.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Acknowledgments

Nil.

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