OUTCOMES OF INCISIONAL HERNIA USING LAPAROSCOPIC SUTURED ABDOMINAL WALL RECONSTRUCTION

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Incisional hernia (IH) is a common condition after major abdominal surgeries. To date, surgery particularly laparoscopic techniques is the primary treatment, offering several advantages. This study aims to describe the surgical technique and evaluate outcomes of laparoscopic sutured abdominal wall reconstruction for IH at Hanoi Medical University Hospital. A retrospective descriptive study was conducted on 11 patients treated from 2019 to 2024. The male-to-female ratio was 3:8, with a mean age of 57.4 ± 12.1 years old (range: 41 - 79 years old). The main symptom prompting medical consultation was the appearance of an abdominal mass at the site of a previous surgical incision, with no case of strangulation complications. The mean hernia defect width was 6.2 ± 1.8cm with the largest measuring 10cm and the smallest 4cm. The mean operative time was 69.1 ± 36.6 minutes (range: 30 - 120 minutes), with no recorded intraoperative complication. The average postoperative hospital stay was 1.8 ± 0.98 days (range: 1 - 4 days). No case of chronic pain or recurrence were reported during the follow-up period of 18 - 24 months. Laparoscopic sutured abdominal wall reconstruction for the treatment of IH is a safe and effective surgical method with minimal complications and a low recurrence rate.

Keywords: Incisional hernia, laparoscopic abdominal wall sutured reconstruction.

I. INTRODUCTION

Incisional hernia (IH) is a condition in which abdominal organs or tissues pass through a weakened area or defect in the abdominal wall at the site of a previous surgical incision. This is a late complication of surgery, which may occur due to incomplete wound healing, excessive abdominal wall tension, or other risk factors such as surgical wound infection, obesity, chronic coughing, or underlying disease which delay wound healing.[1] IH occurs in approximately 11 - 20% of patients with a history of open abdominal surgery, and up to 23 - 46% of patients experience recurrence.[2] It remains one of the most common and distressing complications in this patient population. Furthermore, IH can lead to severe complications such as pain, strangulated, bowel obstruction, and even bowel ischemia and necrosis.[3] Diagnosing and treating IH effectively remains a challenge for surgeons.

With advancements in laparoscopic surgery, several innovative surgical techniques have been introduced for IH treatment. In the early 1990s, LeBlanc and Booth reported the first laparoscopic repair of abdominal wall hernia using the intraperitoneal onlay mesh (IPOM) technique. However, this technique had several limitations, including challenges

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in managing large hernia defects, relatively extended operative time, high costs, complex instrumentation, chronic postoperative pain and an increased risk of mesh infection.[4,5] Over the past two decades, laparoscopic techniques for the treatment of IH have undergone significant improvements and have been widely adopted worldwide, to enhance patient recovery, minimizing complications, and reducing recurrence rates.[6]

At Hanoi Medical University Hospital, laparoscopic sutured abdominal wall reconstruction for IH has been routinely performed since 2019, yielding promising initial results. This study aims to describe the surgical technique and evaluate the treatment outcomes of this approach.

II. MATERIALS AND METHODS

1. Subject

Selection Criteria

All patients subjected to laparoscopic sutured abdominal wall reconstruction for IH at Hanoi Medical University Hospital from 2019 to 2024.

Exclusion criteria

- Patients with incisional hernia treated using various other surgical techniques, including: open repair, IPOM, and laparoscopically-assisted abdominal wall reconstruction…

- Patients diagnosed with primary abdominal wall hernias (without any history of prior abdominal surgery).

2. Methods

Study design

A retrospective descriptive. A convenience sampling method was employed, selecting all eligible patients who met the inclusion criteria within the study period. This method ensured the feasibility of data collection while maintaining a representative sample of the target population.

All patients were operated on based on a common protocol.

Annual follow-up for five years with clinical examination and abdominal ultrasound or computed tomography (CT) scan was planned for evaluation for possible recurrence.

Sample Size

The sample size was determined based on the total number of all patients undergoing laparoscopic sutured abdominal wall reconstruction for IH at Hanoi Medical University Hospital from 2019 to 2024. A preliminary review of hospital records was conducted to estimate the expected number of cases.

Research Site

Department of Coloproctology and Pelvic Floor Surgery, Hanoi Medical University Hospital, Vietnam.

Anesthesia Method: General anesthesia with endotracheal intubation.

Patient Positioning: Supine position.

Surgeons: The procedures were performed by surgeons with 3-5 years of experience in laparoscopic surgery.

Surgical Technique (Figure 1)

Step 1: Trocar placement

A 10-mm trocar was inserted to visualize the abdominal cavity using a laparoscopic camera. The trocar position varied depending on the hernia location:

For supraumbilical and bilateral subcostal incisions: The trocar is placed below the umbilicus.

For infra umbilical and bilateral iliac fossa incisions: The trocar is placed 5 cm above the umbilicus.

An additional one 10-mm trocar and one to two 5-mm trocars was inserted, depending on the hernia site.

Step 2: Hernia sac exposure

The hernia sac was dissected, and adhesions

involving abdominal organs or hernia contents (if present) were carefully released.

Step 3: Primary closure of the hernia defect.

A 1 - 2mm skin incision was made over the previous surgical scar.

A suture passer needle **(***Figure 2***)** was used to pass Vicryl 1.0 sutures through all layers of the abdominal wall along both edges of the hernia defect. The sutures were retrieved outside the body.

This process was repeated along the entire length of the incision, with each stitch placed 5 - 10mm apart.

Step 4: Fascial and peritoneal closure.

The sutures were tied securely to approximate the fascia and peritoneum, closing the hernia defect.

Step 5: Closure of trocar sites

The trocar incisions are closed in layers.

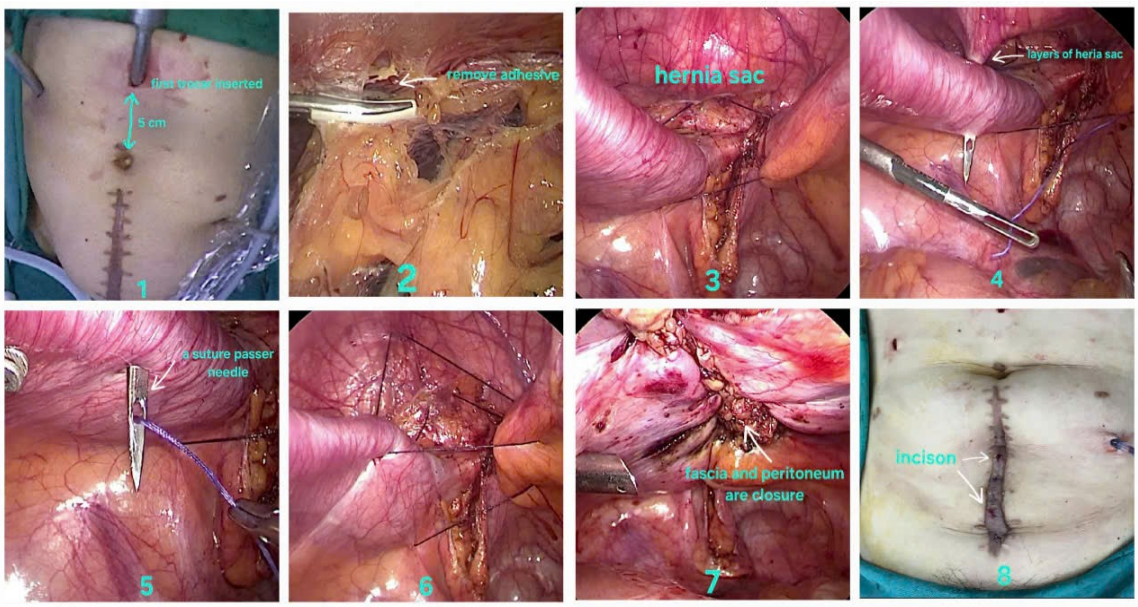

Figure 1. Laparoscopic Sutured Abdominal Wall Reconstruction Technique for IH
(Patient: Doan Thi D, 42 years old, incisional hernial)

Figure 2. A suture passer needle

Data Processing

Qualitative variables were presented as frequencies and percentages. Quantitative variables were presented as mean ± standard deviation. Data were processed using SPSS 20.0 software.

3. Research Ethics

This study adheres to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Hanoi Medical University Hospital before data collection. Patient confidentiality and data security was strictly maintained, and informed consent was obtained from all participants before their inclusion in the study.

III. RESULTS

1. General Characteristics of the Study Group

Table 1. General Characteristics of the Study Group

Patient Characteristics	Results
Mean Age (years)	57.4 ± 12.1 (41 - 79)
Gender	
Male/ Female	3 (27.2%)/ 8 (72.8%)
Medical History	
Previous abdominal surgery	11
Chronic diseases (cardiovascular, respiratory, etc.)	4
History of gynecological surgery	5
Mean BMI (kg/m^2)	22.6 ± 3.5 (18.5 - 28.5)
Symptoms	
Protruding mass at previous surgical scar	11 (100%)
Strangulated Hernia	0 (0%)
Hernia Location	
Infraumbilical midline	7
Bilateral iliac fossa	2
Subcostal/supraumbilical region	2
Mean Hernia Defect Width (cm)	6.2 ± 1.8 (4 - 10)
Number of Hernia Defects	
Single defect	9 (81.8%)
Two or more defects	2 (18.2%)

In our study, the male-to-female ratio was 3:8, with a mean age of 57.4 ± 12.1 years old (range: 41 - 79 years). Four out of eleven patients (4/11) had significant systemic diseases. Five patients (5/11) had a history of gynecological surgery, and six patients (6/11) having undergone surgery two or more times.

The most common symptom was the

presence of a protruding mass in the abdominal wall at the site of the previous surgical scar. No case of strangulated hernia was observed.

The most frequently affected location was the infraumbilical midline (6/11). The mean hernia defect width was 6.2 ± 1.8cm, with the largest measuring 10cm and the smallest 4cm. Most patients had a single hernia defect, while two patients had two or more defects.

2. Intraoperative and Postoperative Outcomes

All patients underwent general anesthesia with endotracheal intubation.

The mean operative time was 69.01 ± 36.66 minutes, with the shortest being 30 minutes and the longest 120 minutes. No intraoperative complication was recorded. Postoperative Pain Assessment: 9 out of 11 patients had a VAS score < 4, requiring only paracetamol for pain management. 2 out of 11 patients had a VAS score between 4 and 7, requiring a combination of paracetamol and NSAIDs. No patient had a VAS score > 7. The mean postoperative hospital stay was 1.8 ± 0.98 days (range: 1 - 4 days).

Table 2. Intraoperative and Postoperative Outcomes

Patient Characteristics	Results
Anesthesia Method	
Endotracheal intubation	11 (100%)
Mean Operative Time (minutes)	69.01 ± 36.66 minutes
Intraoperative Complications	0 patients
Postoperative Pain (VAS Score)	
VAS < 4 (Paracetamol only)	9/11 patients
VAS 4 - 7 (Paracetamol + NSAIDs)	2/11 patients
Mean Postoperative Hospital Stay (days)	1.8 ± 0.98 (1 - 4)
Time to Resume Normal Activities	7 days
Postoperative Complications	0 patient
Chronic Postoperative Pain	0 patient
Hernia Recurrence for 5 years	0 patient

IV. DISCUSSION

In our study, the incidence of IH was 27.3% in males and 72.7% in females, indicating a higher prevalence in females compared to males. The mean age of the patients was 57.4 ± 12.1 years old, with the youngest being 41 and the oldest 79 years old. This result is also consistent with the study by Wei Zheng et al. (2019), who reported a mean age of 51.0 years old (range: 34 - 71 years old) with 70.6% female patients in a study of 57 patients, and with Chelala et al. (2016), who found that among 1,326 patients, 52.57% were female with a mean age of 52.2 years old.[6,7] This is consistent with the general trend in medical literature, as IH tends to occur more frequently in older adults due to collagen degradation and decreased abdominal wall elasticity over time, particularly in patients with multiple chronic diseases such as cardiovascular

disease, chronic obstructive pulmonary disease (COPD), or diabetes. The higher incidence of the disease in women can be explained by the frequent surgical procedures for gynecological conditions, which are very common in older women, such as: cesarean sections, uterine fibroids, and ovarian cysts-which accounted for up to 45.5% (5/11) in our study. This indicates that treating IH with the laparoscopic sutured abdominal wall reconstruction technique can be performed safely and effectively in elderly patients with multiple complex comorbidities.

In our study, all patients presented with a protruding mass at the site of the previous surgical incision, but no case of strangulated hernia was observed. This is a noteworthy characteristic, because strangulated hernias can lead to serious complications such as bowel obstruction, bowel necrosis, or infection. The rate of strangulated hernia in IH varies across different studies. According to Luijendijk et al. (2000), the rate of strangulation in IH cases can reach 10% - 15%.[2] Similarly, Breuing et al. (2010) reported a strangulated rate ranging from 5% to 17%, depending on the size of the defect and the patient's condition.[8] However, this incidence may be lower in patients who receive early monitoring and timely intervention. Thus, most patients in our study were treated early and had not developed complications.

In studies worldwide, ventral hernias below the umbilicus are more common because this area has a higher frequency of previous surgeries, especially gynecological surgeries (cesarean sections, hysterectomies), digestive surgeries (appendectomies, colon surgeries), or laparoscopic procedures. Burger et al. (2004) highlighted that transverse infra umbilical incisions pose a higher risk of herniation due to increased intra-abdominal pressure and mechanical stress on this area during daily activities like coughing, straining, and heavy lifting.[9] This biomechanical vulnerability makes infraumbilical hernias a common postoperative complication. Our study found that 63.6% of patients had ventral hernias below the umbilicus, a result that aligns with studies by the aforementioned authors.

Regarding the number of hernia defects, our study found that 81.8% of patients had a single hernia defect, while 18.2% had two defects. This result is consistent with the findings of Köckerling et al. (2018), which reported that the majority of IH cases had a single defect.[10] However, multiple hernia defects tend to occur more frequently in patients with a history of surgical site infections or multiple prior abdominal surgeries. In our study, 54.5% of patients had previously undergone at least one IH repair, and one patient had undergone two prior repairs. However, patients with multiple hernia defects did not have a history of previous IH surgery, suggesting that our sample size may be too small to provide an accurate ratio. Chelala et al. (2016), analyzing 1,326 patients, found that infraumbilical hernias were more prevalent than supraumbilical ones.[7] Additionally, Bower et al. (2004) reported that approximately 70% of IH cases had a single defect, while the remaining cases had multiple defects or extensive herniation.[11]

In our study, the average hernia defect width was 6.2 ± 1.8cm. This size reflects the extent of the abdominal wall defect and is of significant importance in choosing the appropriate surgical plan as well as predicting the risk of recurrence. According to the European Hernia Society (EHS) classification, ventral hernias are categorized based on defect width[12]:

Small (< 4cm).

Medium (4 - 10cm).

Large (> 10cm).

In our study, the average hernia defect width was 6.2 ± 1.8cm, ranging from 4cm to 10cm. Although most patients had hernia defects of moderate size, the largest defect measuring up to 10 cm indicates the presence of potentially complex hernias. These cases may pose challenges in achieving adequate fascial closure and carry a higher risk of recurrence if not properly managed. However, careful consideration is needed when selecting the optimal surgical approach, particularly for patients with defects in the 8 - 10cm range and those with significant comorbidities. Chelala et al. (2016), in a study of 1,326 patients, reported an average hernia defect ranging from 20 to 35cm, which aligns with our results. Burger et al. (2004) observed that defects larger than 25 cm had twice the recurrence rate compared to smaller hernias when simple suturing was used.[7,9] Köckerling et al. (2018) emphasized that for defects > 25cm, mesh reinforcement is essential to minimize recurrence.[10] Luijendijk et al. (2000) found that larger abdominal wall defects were associated with a significantly higher recurrence risk if mesh reinforcement was not applied.[2] With the average defect width of 6.2 ± 1.8cm, a laparoscopic hybrid technique (IPOM Plus), combining suturing and mesh reinforcement or eTEP (Enhanced View Totally Extraperitoneal), is often recommended to ensure long-term abdominal wall stability.[3] However, in this study, we chose the method of simple total abdominal muscle closure via laparoscopy to minimize the drawbacks of synthetic mesh, such as mesh infection, prolonged surgery time, high cost and the surgical technique was approved and consented to by the patient. In addition, to minimize myofascial tension that may cause significant postoperative pain and increase the risk of recurrence, all patients were instructed to wear an abdominal support belt immediately after surgery and to continue its use for up to one month postoperatively. Despite not using mesh and performing fascioplasty, our results have been satisfactory, suggesting that in carefully selected cases, laparoscopic sutured abdominal wall reconstruction may be a viable alternative for small-moderate class of IH, particularly in resource-limited settings or when mesh-related complications are a concern.

Regarding anesthesia, the treatment of IH typically requires laparoscopic abdominal exploration and adhesion release of organs, as such endotracheal general anesthesia was the optimal choice. This necessitates careful preoperative screening and patient selection, particularly for elderly patients with multiple comorbidities and those who have undergone multiple prior abdominal surgeries. Close collaboration between the surgical and anesthetic teams is crucial in such cases.

In our study, all patients underwent endotracheal general anesthesia, and only enhanced local anesthesia was required at the surgical site immediately after the procedure. All cases reported low postoperative pain levels (VAS: 2 - 3 points) and were able to engage in light movement shortly after surgery. This demonstrates that this surgical technique is minimally invasive, causes little postoperative pain, and is suitable for most surgical units across the country.

The average surgical time for this technique was 69.01 ± 36.66 minutes. This is longer than the 45 - 60 minutes reported in the study by Luijendijk et al. (2000) for open surgery without mesh placement.[2] However, it is comparable to other mesh-based surgical techniques, such as the IPOM procedure in Chelala's (2016) study, which ranged from 60 - 120 minutes, and the IPOM-plus technique in Köckerling's (2018) study, which ranged from 90 - 150

minutes.[7,10] The difference in surgical time is mainly due to the additional steps required for peritoneal dissection, mesh placement, and fixation. Nevertheless, laparoscopic sutured abdominal wall repair for IH remains a relatively short procedure, making it a suitable option for elderly patients with significant comorbidities, as it helps minimize complications associated with prolonged operative times.

Regarding intraoperative injuries, our study recorded no caseof vascular, nerve, or organ damage during surgery. Similarly, Chelala (2016) reported that the IPOM technique for incisional hernia repair had an intraoperative complication rate of up to 3.8%, including bleeding and bowel injury.[7] These results highlight the safety of our laparoscopic repair technique, but further studies with larger sample sizes are necessary to provide more definitive conclusions about its overall risk profile.

In our study, most patients experienced mild postoperative pain, 9 out of 11 patients (81.8%) had a VAS score < 4 and required only a single first-line analgesic (paracetamol), 2 patients (18.2%) with VAS ≥ 4 needed a combination of paracetamol and NSAIDs, no patient required second-line analgesics (opioids). The average hospital stay was 1.8 ± 0.98 days (range: 1 - 4 days), and the mean time to return to normal activities was 7 days. Luijendijk et al. (2000) and Burger et al. (2004) reported hospital stays of 5 - 7 days and return-to-activity times of 14 - 21 days for open surgery, and IPOM technique had hospital stays of 2 - 3 days and return-to-activity times of 7 - 10 days.[2,9] Thus, our laparoscopic suture repair method offers faster recovery and shorter hospital stays than open surgery, while being comparable to the IPOM technique but at a lower cost (due to the absence of mesh fixation devices). This minimally invasive approach reduces soft tissue trauma, minimizes postoperative pain, and enables quicker mobilization, which is particularly beneficial for elderly patients. Early mobilization also helps reduce postoperative complications such as pneumonia and venous thrombosis, reinforcing the advantages of this technique. With these benefits, surgeons should consider patient-specific factors when selecting the optimal surgical approach.

In our study, all patients were followed up regularly once a month initially, then every three months for the following year and 6 months to 1 year for five years thereafter, by using clinical examination and abdominal ultrasound. To date, no case of hernia recurrence or late postoperative complications such as chronic pain or bowel obstruction have been reported. According to studies by Luijendijk et al. (2000) and Burger et al. (2004), the recurrence rate of open surgery through old incisions is as high as 23 - 46%, mainly due to the large surgical wound, which increases the risk of infection, bleeding, and significant swelling, leading to suture failure when patients resume physical activity.[2,9]primary incisional hernia occurred in 11 to 20 percent of patients who had undergone laparotomy.1–3 Such hernias can cause serious morbidity, such as incarceration (in 6 to 15 percent of cases In contrast, studies on laparoscopic surgery indicate a recurrence rate of only 2 - 5%, or even lower, depending on the patient and the surgical technique used. In practice, our method appears to be more suitable for patients with small to medium-sized hernia defects according to the EHS classification, those who are not obese or suffering from severe systemic diseases, and those without excessive scar tissue from previous surgeries.[12] In our study, patients with multiple comorbidities did not experience significant impairment in their postoperative recovery. This may be attributed

to the minimally invasive nature of laparoscopic surgery, which involves smaller incisions and avoids the need for larger abdominal wounds as seen in other open surgical approaches. As a result, the postoperative course was generally more favorable, with a reduced risk of bleeding or wound infection, ultimately contributing to a lower likelihood of hernia recurrence. However, due to the limited number of patients in our study, we are unable to fully assess long-term recurrence outcomes, and further in-depth research is needed to confirm the lasting effectiveness of this approach.

V. CONCLUSION

Incisional hernia (IH) is a common condition in patients who have undergone major abdominal surgery. Surgery is the primary treatment for IH. The laparoscopic sutured abdominal wall repair technique is a safe and effective surgical method that shortens hospital stays, reduces complications and recurrence rates, is cost-effective. This technique may be considered for small to medium incisional hernias (< 10cm), particularly in situations where mesh placement is not feasible (e.g., contamination, contraindications to mesh, or limited resources), or when the defect can be closed without tension and the abdominal wall tissue quality is adequate, and can be performed at surgical centers by experienced laparoscopic surgeons.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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