Dasgupta *et al. Mini-invasive Surg.* 2025;9:5
DOI: 10.20517/2574-1225.2024.69

Mini-invasive Surgery

Original Article

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Laparoscopic preperitoneal repair of lateral hernia - our experience

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How to cite this article: Dasgupta P, Ponnusamy R, Pai A, Ravuri N. Laparoscopic preperitoneal repair of lateral hernia - our experience. *Mini-invasive Surg.* 2025;9:5. https://dx.doi.org/10.20517/2574-1225.2024.69

Received: 23 Aug 2024 **First Decision:** 6 Dec 2024 **Revised:** 20 Jan 2025 **Accepted:** 25 Jan 2025 **Published:** 11 Feb 2025

Academic Editor: Giulio Belli **Copy Editor:** Ting-Ting Hu **Production Editor:** Ting-Ting Hu

Abstract

Aim: Lateral hernias are quite uncommon as compared to other ventral abdominal hernias. This study aims to show the feasibility and technical details of laparoscopic preperitoneal repair of lateral hernia.

Methods: This was a retrospective study performed from April 2016 to March 2024 involving patients with lateral hernia who underwent laparoscopic preperitoneal repair. The data regarding patient demographics, operative details, outcomes and follow-up were analyzed.

Results: A total of 57 patients who underwent laparoscopic preperitoneal repair for lateral hernia were identified. The mean age was 57.4 years (range 35-74), with a male preponderance in the ratio of 1.28:1 (males-32:females-25) and body mass index of 28.7 kg/m^2 (range 22.3-34.8). Most of the hernias were of postsurgical etiology (53, 92.9%), while the remaining were post-traumatic (4, 7.0%). No recurrent hernias were observed. The mean hernia defect width was 6.8 cm (range 3-12). The mean operative time was 178 min (range 145-242). There was no conversion to open. There have been no major complications noted. The mean hospital stay was 2.64 days (range 1-4). No recurrences have been reported in 24 months.

Conclusion: Lateral hernia is a rare entity. Based on our experience, the laparoscopic preperitoneal approach is a safe, feasible and effective choice for lateral hernia repair.

Keywords: Lateral hernia, flank hernia, lumbar hernia, iliac hernia, laparoscopy, preperitoneal repair

INTRODUCTION

There have only been 350 cases of lateral hernia reported in the literature, making it a rare condition[1]. Because of their anatomic location and close proximity to important neurovascular structures, lateral hernias pose a challenge to repair because they occur in a semi-rigid space bounded by the costal margin superiorly, the iliac crest inferiorly, the linea semilunaris medially and paraspinal muscles posteriorly[2].

Incisional abdominal wall hernias are classified into four zones: subcostal (L1), flank (L2), iliac (L3), and lumbar (L4), according to the European Hernia Society (EHS). The location of flank hernias is lateral to the rectus sheath, approximately 3 cm above or below the umbilicus; subcostal hernias are superior to the flank hernia and situated below the subcostal margin; iliac hernias are inferior to the flank hernias and situated above the inguinal region; and lumbar hernias are laterodorsal to the anterior axillary line [Figure 1]. A coded taxonomy was selected to categorize the size of hernia defects (W1 < 4 cm; W2 ≥ 4-10 cm; W3 ≥ 10 cm)[3].

Most of the lateral hernias are acquired while the congenital defects are rare. Superior (Grynfeltt-Lesshaft triangle) and inferior (Petit triangle) lumbar hernias are two types of congenital abnormalities that affect the lumbar region. Postsurgical causes include open nephrectomy, open adrenalectomy, iliac crest bone graft, open hepatic resection, abdominal aortic aneurysm repair, and open cholecystectomy. Other causes are trauma, infection and abdominal wall nerve injury[4,5,6].

In certain cases, these lateral hernias do not have obvious defects and present as a flank bulge. The pathology involves iatrogenic intercostal nerve injury occurring during flank incision. Along with postoperative paresthesia and neuralgic pain, the injury to the nerves may cause denervation of the lateral abdominal wall, which could result in irreversible muscular laxity and atrophy[7].

It is not advised to use ultrasound scanning for diagnosis since it is operator-dependent and less effective in identifying the surrounding landmark structures, leading to the misdiagnosis of lumbar herniated fat as subcutaneous lipomas. Hence, a computed tomography (CT) scan of the abdomen is the imaging modality of choice in lateral hernias[8].

These lateral hernias are generally not confined and involve more than one zone. The patient's symptoms are the primary factor determining whether surgery is warranted. If a hernia is entirely asymptomatic, repair is not recommended. The repair is challenging because of its anatomy, location, and the difficulties of mesh attachment due to the presence of neurovascular structures and bony landmarks[9].

This study aims to demonstrate the feasibility and technical details of laparoscopic preperitoneal lateral hernia repair.

METHODS

Study type

This was a retrospective study performed between April 2016 and March 2024 following approval by the institutional review board. The study was conducted at two centers, GEM Hospital, Chennai and Coimbatore.

Inclusion criteria

All patients who had lateral hernia repaired with laparoscopic preperitoneal surgery.

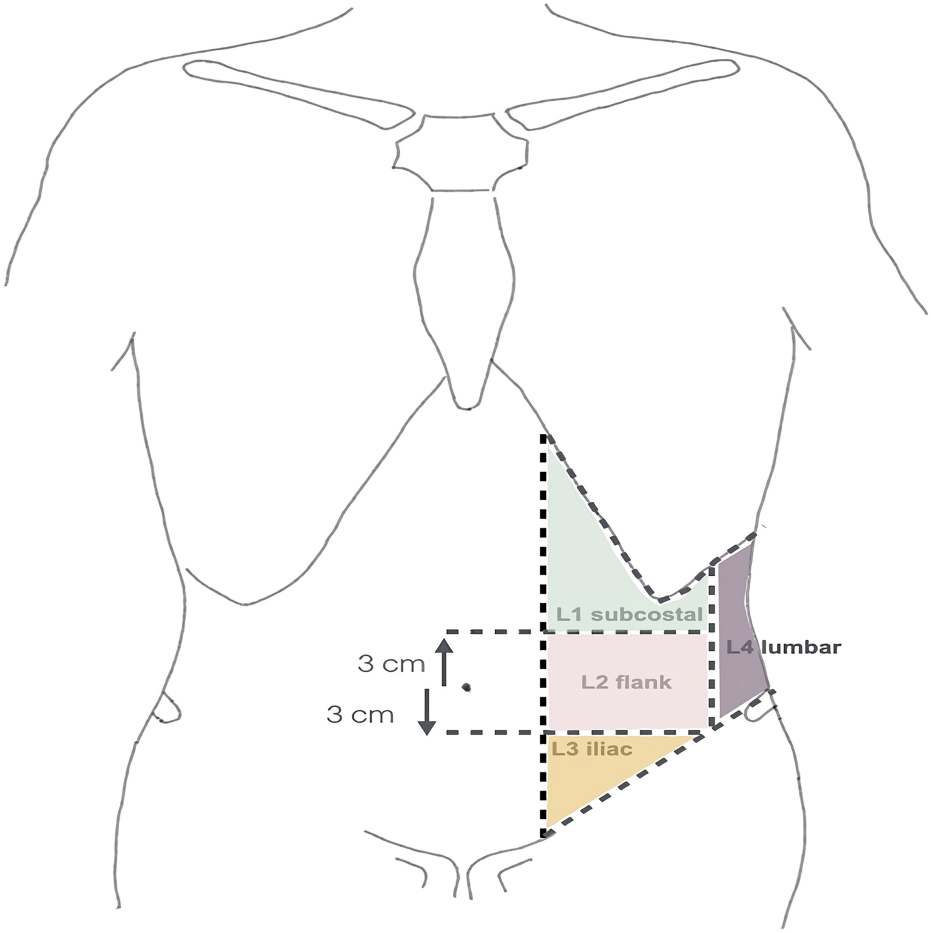

Figure 1. Lateral incisional hernia classification.

Exclusion criteria

Patients with congenital (primary) lateral hernia - Grynfeltt-Lesshaft hernia and Petit hernia, and subcostal (L1) hernia were not included due to differing surgical approaches. Patients with less than two years of follow-up were also excluded.

Data collection

Records were reviewed from the computerized database, and pertinent data were collected, including patient demographics, comorbidities, clinical presentation, duration of symptoms, history of previous surgery, history of previous hernia repair, and hernia classification. Operative details included the operative time, defect size, mesh type and size, additional procedures and intraoperative complications. The duration of hospital stay and postoperative complications were included in the postoperative data. Following discharge, the patients were followed up at one and six months, and subsequently every year up to five years with an average follow-up duration of two years (the last patient included in our current study was operated on in February 2022). Continuous variables were expressed as mean or median (range). Categorical data were described as frequencies and percentages. The follow-up review included a thorough clinical examination and an ultrasound scan as the first choice for suspected hernia recurrence (symptoms and/or bulge). In uncertain cases, a CT scan was performed for confirmation.

Preoperative evaluation

The preoperative evaluation comprises blood tests, electrocardiogram (ECG), chest X-ray, and anesthesia assessment. A routine plain CT scan was performed in all cases of lateral hernia in order to assess the muscle layers and determine the size, position, and proximity of the defect to the bony structures [Figure 2].

Surgery technique

The procedure was performed under general anesthesia, with prophylaxis against venous thromboembolism and preoperative antibiotics administered to the patient. A nasogastric tube and Foley catheter were placed. The patient was positioned in the left lateral decubitus position at a 60° angle (for right lateral hernia), appropriately padded, with both arms tucked close to the body and secured to the table. The table was inclined downward at the head end by 15°-20° in the Trendlenburg position [Figure 3]. The surgeon and assistant stood on the opposite side of the defect.

Access and port position

After establishing pneumoperitoneum with a Veress needle at 12 mm Hg, the port positions for a right lateral hernia were as follows: a 10 mm camera port to the left and above the umbilicus, a 5 mm working port below and to the left of the umbilicus, and another 5 mm working port in the right upper quadrant, following the concept of triangulation of target area. Port positions may vary in cases of a left lateral hernia or a history of previous abdominal surgery [Figure 4].

Before dissection

Once the ports are placed, if the hernial defect contains contents [Figure 5], these must be gently released using a combination of direct reduction by grasping and external manual pressure over the abdominal wall. In the case of dense adhesions, we do not attempt to do adhesiolysis as it may cause multiple peritoneal rents. Instead, a peritoneal incision should be made to reduce the herniated contents en masse.

Peritoneal flap creation

The flap is generally raised about 7 cm from the upper limit of hernia defect for adequate mesh placement. The incision of the peritoneal flap is initially marked with a diathermy hook. Once the peritoneal incision is made, CO_2 is allowed to enter the pre-peritoneal space, allowing pneumodissection and plane separation. The peritoneum is transected longitudinally, about 12-15 cm [Figure 6]. The hernia sac is fully reduced, the peritoneal flap is lifted and preperitoneal space is opened up until the psoas muscle is exposed. Adequate peritoneal dissection of 7 cm from the defect margin should be performed in all directions [Figure 7]. Using the retromuscular plane initially and then accessing the preperitoneal plane laterally, where there is ample preperitoneal fat to facilitate easier dissection, is an option if the peritoneum is exceedingly thin and the peritoneal flap cannot be raised.

Defect closure

The defect is closed transversely or horizontally as per the orientation of the defect. Tension-free defect closure is done with nonabsorbable barbed suture 1 V-Loc PBT (Polybutester). In cases of iliac bone graft, the muscle has to be fixed to the periosteum of the bone [Figure 8].

Mesh placement and fixation

A monofilament, nonabsorbable polypropylene mesh of adequate size and weight (90-110 gm/m^2) is placed to cover the defect, extending 5-7 cm beyond it on all sides [Figure 9]. The mesh was fixed using tackers, and applied at least 2 cm apart, ensuring the safety of the ilioinguinal and iliohypogastric nerves over the psoas muscle [Figure 10]. The mesh size is adjusted according to the defect size. The principle behind using a heavier mesh is that the lateral abdominal wall, being a weak area surrounded by bony structures, can

Figure 2. Plain CT abdomen with right lateral hernia with small and large bowel loops as content. CT: Computed tomography.

Figure 3. Patient position (Right lateral hernia).

frequently be associated with denervation injuries leading to recurrent hernias. In situations where muscle-to-muscle approximation is not possible through suture closure, a smaller polypropylene mesh is first

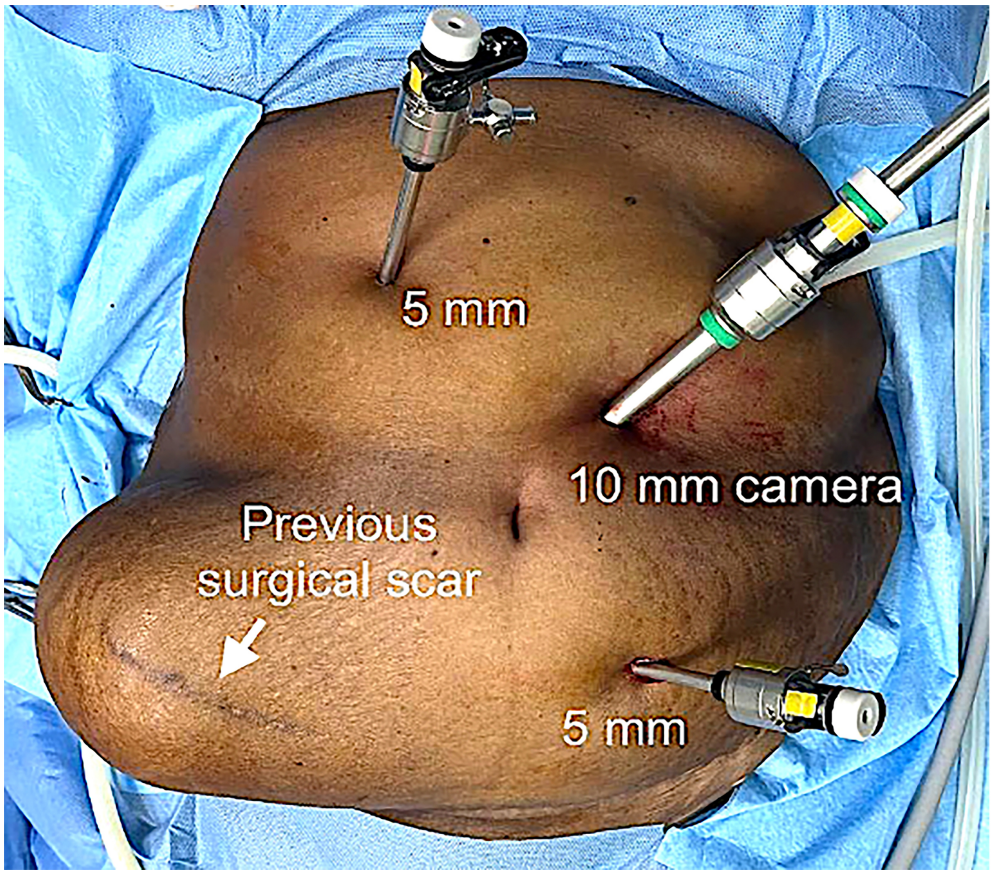

Figure 4. Port position.

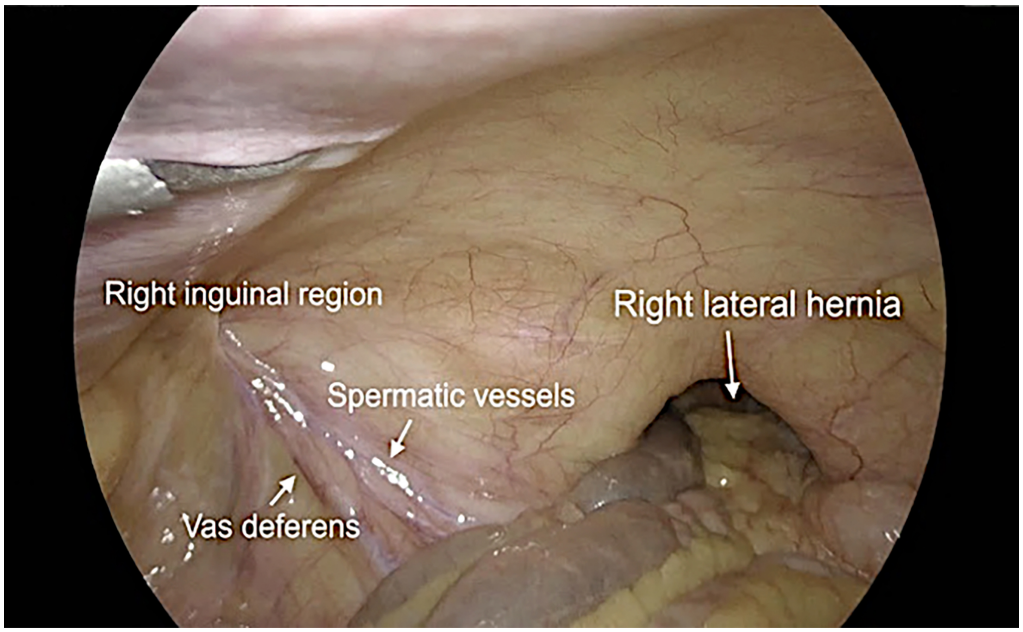

Figure 5. Right lateral hernia.

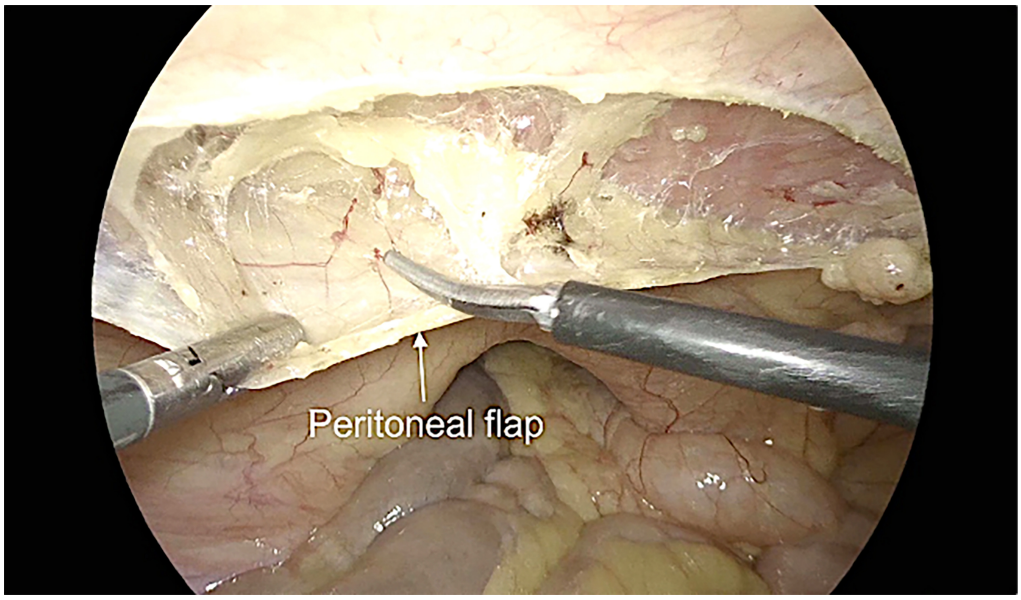

Figure 6. Preperitoneal flap with posterior rectus sheath laterally.

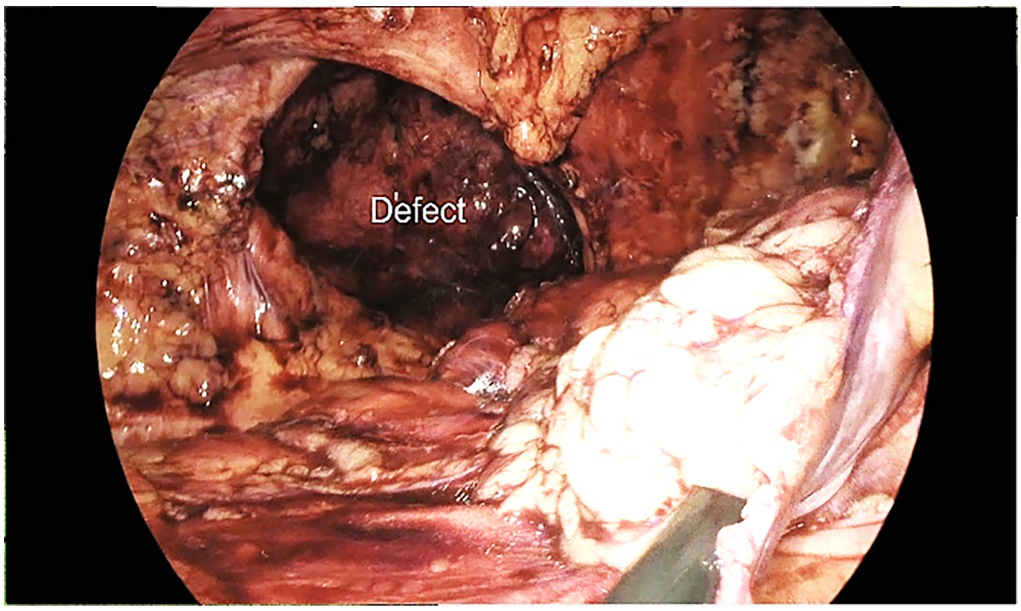

Figure 7. Preperitoneal plane.

placed, followed by a larger polypropylene mesh[10]. Double mesh reinforcement, with a smaller mesh to cover the sutured area and later a larger mesh for wider defect coverage, was used in all our post-iliac bone graft cases without any morbidity during follow-up.

Peritoneal flap closure

Closure of the peritoneal flap is done using a 2-0 V-Loc absorbable barbed suture [Figure 11].

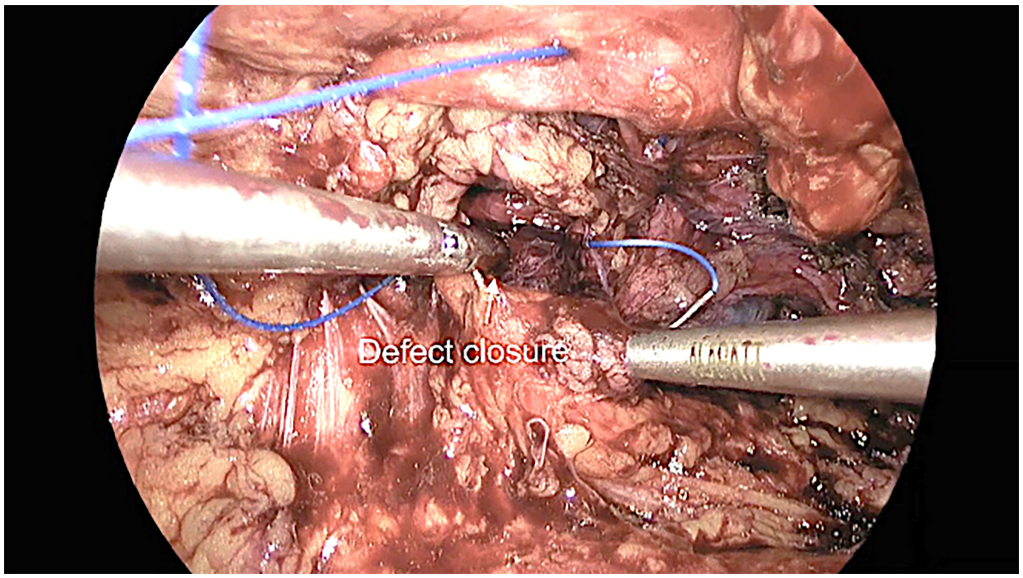

Figure 8. Defect closure.

Figure 9. Mesh placement.

Fascia and skin closure

Port closure is performed for 10 mm ports with 1-0 ethilon. The port site skin is closed using 3-0 vicryl in a subcuticular fashion.

Following the procedure, a compressive dressing is applied and left on for a day, and the patient is instructed to wear an abdominal binder for one month.

Figure 10. Post mesh placement.

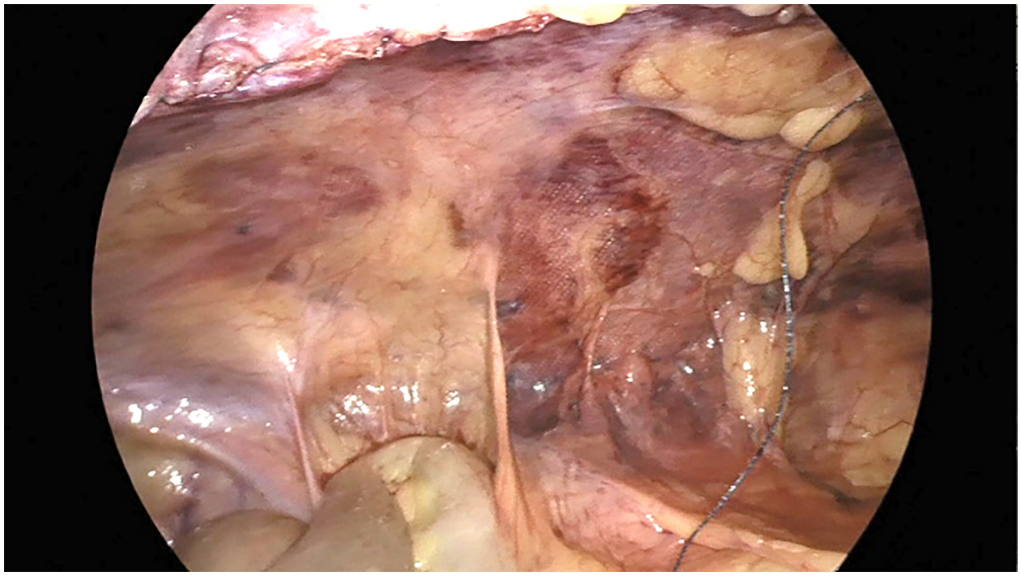

Figure 11. After peritoneal flap closure.

RESULTS

In the course of the study period from April 2016 to March 2024, 57 patients, comprising 32 males and 25 females, with a mean age of 57.4 years (range 35-74) had undergone laparoscopic preperitoneal repair of lateral hernia. Before surgery, their average body mass index (BMI) was 28.7 kg/m^2 (range 22.3-34.8). Tables 1 and 2 summarize the patient demographics, hernia and operative details and postoperative outcomes.

Table 1. Patient characteristics

Demographics	Mean (range)
Age	57.4 (35-74)
Male: female	32:25
BMI (kg/m^2)	28.7 (22.3-34.8)
Comorbidities	Number (%)
Diabetes	18 (31.6)
Immunosuppression	Nil
Tobacco use	4 (7.0)
Hernia details	Number (%)
Postsurgical etiology	53 (93)
Traumatic etiology	4 (7.0)
Recurrent	Nil
Incarcerated hernia	9 (15.7)
Musculoaponeurotic defect associated with bulge	38 (66.7)
Only musculoaponeurotic defect	8 (14.0)
Only lateral abdominal wall bulge	11 (19.3)
Hernia classification	Number (%)
L2	7 (12.3)
L3	13 (22.8)
L4	9 (15.8)
Defect involving more than one area among L2, L3 and L4	28 (49.1)
Width	Number (%)
W1 (< 4 cm)	9 (15.8)
W2 (≥ 4-10 cm)	43 (75.4)
W3 (≥ 10 cm)	5 (8.8)

Table 2. Operative details and postoperative outcomes

Operative details	Mean (range)
Operative time (min)	178 (145-242)
Conversion to open	Nil
Conversion to other techniques	4 (7.0%)
Intraoperative blood loss (mL)	14 (5-50)
Postoperative outcomes	**Mean (range)**
Duration of hospital stay (days)	2.64 (1-4)
Complications	Nil
Recurrence	Nil

Most of the patients (53 out of 57) presented with postsurgical hernias, of which 26 were due to open nephrectomy, 14 had open appendicectomy, 11 had iliac bone graft, and two had open adrenalectomy. Four patients had post-traumatic lateral hernia. None of the patients had previously undergone hernia repair. Incarcerated hernias occurred in 9 (15.7%). A true defect with associated bulge was noted in 38 (66.7%), while 8 (14.0%) patients presented with a true defect without bulging and 11 (19.3%) patients presented with only bulge with no obvious defect.

The hernia locations, according to the EHS guidelines, were confined to L2 (n = 7), L3 (n = 13) and L4 (n = 9). A combination of more than one zone occurred in 16 patients. The width of hernia defect varied with 9 (15.8%) patients having W1 (< 4 cm) defects, 43 (75.4%) had W2 (≥ 4-10 cm) defect and 5 (8.8.1%) had W3

(≥ 10 cm) defect. The mean hernia defect width was 6.8 cm (range 3-12).

The average operative time was 178 min (range 145-242). There was no conversion of any case to open but 4 (7%) cases were converted to IPOM +. The intraoperative blood loss was 14 mL (5-50). There were no reported intraoperative complications.

The mean duration of hospitalization was 2.64 days (range 1-4). The follow-up was done accordingly, of which 38 patients were reviewed in the hospital and 19 were followed by telephone with no loss of follow-up till two years. After 24 months of follow-up, there were no recurrences.

DISCUSSION

Lateral hernias are quite rare, with only few case reports, case series and retrospective studies reported in the literature. The anatomical location, bony boundaries, and close proximity to neurovascular structures make the repair of lateral hernias very complex. EHS guidelines recommend CT or magnetic resonance imaging (MRI) for patients with incisional hernia. Since most of our cases were incisional hernias, CT abdomen was conducted for diagnosis and preoperative planning[11]. Once lateral hernias are diagnosed, surgical repair is recommended. Most of the cases in our study involved aponeurotic defects along with a bulge, while in certain cases, there was only a flank bulge without obvious defects. In such cases, surgery has been indicated only for cosmesis or in symptomatic patients[7]. With open, laparoscopic and robotic approaches available for the repair of lateral hernia, no standardized technique has been described.

Laparoscopic surgery is now considered to be as safe and effective as open surgery for ventral hernia repair, despite studies indicating longer operative times[12]. The procedure also yields better outcomes, including shorter recovery times, shorter hospital stays, and an earlier return to normal activity[12]. Various laparoscopic techniques have been developed for lateral hernia repair, including the traditional Intra-Peritoneal On-lay Mesh repair (IPOM), the trans-abdominal pre-peritoneal (TAPP), the extended totally extra-peritoneal (eTEP) repair, and endoscopic retro-muscular repair[13]. The lateral subcostal (L1) hernias were not included in this study because it focuses on preperitoneal repair, while creating a preperitoneal flap in the subcostal region is demanding and difficult. Hence, this technique might not be suitable for all subcostal hernias. A previously described technique from our institution for laparoscopic transperitoneal repair of lumbar incisional hernias involves a combined suture and "double-mesh" approach[10].

Regardless of mesh placement techniques, the mesh size must be greater than the defect size. There must be a minimum of 5 cm of overlap in all directions and medium- or heavy-weight polypropylene meshes were used for lateral hernia repair[14,15,16]. In our case, we preferred an overlap of 7 cm in all directions, and considering the difficulty in overlap in cases of bony landmarks, we used a heavy-weight monofilament nonabsorbable polypropylene mesh > 90 gm/m^2.

In our study we have described preperitoneal repair. Since most of the lateral hernias in our cohort were postsurgical, we encountered difficulty in raising the flaps due to previous adhesions. In four (7%) cases where flaps could not be raised due to dense adhesions or thin peritoneal flaps, we had to resort to IPOM +. No conversions to open were made. The operative details, such as blood loss, operating time and intraoperative complications, were similar to those of other minimally invasive procedures described[12].

A higher incidence of surgical site occurrences, such as hematoma, seroma formation and skin dehiscence, were described in patients who underwent open repair for lateral hernia[16]. In our study, no such postoperative complications were observed. The most common problem encountered was pain, as the

defect was closed with some tension, and these patients needed analgesic support for longer durations.

The length of hospital stay reported in our study was comparable to the two-day average reported for other minimally invasive procedures. Differences in recurrence and reoperation rates were observed when comparing the long-term results of open repair and other minimally invasive techniques[12,17]. Nevertheless, during a 24-month follow-up period, no recurrences were observed in our study.

Our study has limitations, including being conducted at a single institution with a single surgical team and a smaller patient population. To better understand the viability of our technique, we propose a multi-institutional study with a bigger patient population and multiple surgeons. However, based on the successful results obtained from our experience, the laparoscopic preperitoneal approach seems to be a safe, feasible and effective choice for lateral hernia repair.

DECLARATIONS

Authors' contributions

Study conception and design: Dasgupta P
Data collection and draft manuscript preparation: Ponnusamy R
Contributed to discussion and editing: Pai A, Ravuri N
All authors reviewed the results and approved the final version of the manuscript.
All authors contributed to the conception/design of the workthe acquisition, analysis, and interpretation of data.
All authors revising the work critically for important intellectual content.
All authors approving the final version to be published.

Availability of data and materials

The data is the property of the institution and is not available for sharing as per institutional policy.

Financial support and sponsorship

None.

Conflicts of interest

All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate

This study was reviewed and approved by the Institutional Review Board of Chettinad Academy of Research and Education & Gem Hospital and Research Centre (IHEC-I/0053/16). Informed consent was obtained from all patients.

Consent for publication

Informed consent was obtained from all patients.

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