



COMPARATIVE ANALYSIS OF LAPAROSCOPIC VERSUS OPEN SURGICAL OPTIONS IN THE MANAGEMENT OF VENTRAL HERNIA AT A TERTIARY CARE CENTRE: A PROSPECTIVE COMPARATIVE STUDY

Surgery

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ABSTRACT

Background: Ventral hernias are common and morbid surgical conditions. Minimally invasive laparoscopic approaches have gained popularity over conventional open techniques due to potential benefits in recovery and reduced complications. **Objective:** To compare laparoscopic intraperitoneal onlay mesh (IPOM) repair with open onlay repair in terms of operative and postoperative outcomes in patients presenting to a tertiary care centre. **Methods:** A prospective comparative study of 60 patients (30 per group) was conducted. Operative time, blood loss, postoperative pain (VAS), hospital stay, and surgical site infection were assessed. **Results:** Laparoscopic repair demonstrated significantly lower blood loss (9.73 vs 80.13 mL, $p=0.011$) and shorter hospital stay (2.83 vs 7.43 days, $p=0.011$). Operative time was shorter in the laparoscopic group (65.23 vs 159.30 min, $p=0.021$). Pain scores and infection rates were comparable between groups. **Conclusion:** Laparoscopic ventral hernia repair offers superior recovery outcomes and should be considered the preferred approach in suitable patients when performed by experienced surgeons.

KEYWORDS

Ventral Hernia, Laparoscopic Repair, Open Onlay Repair, IPOM, Hernia Outcomes, Mesh Repair

INTRODUCTION

Abdominal wall hernias represent one of the most frequently encountered conditions in general surgical practice worldwide. Ventral hernias, encompassing primary umbilical, epigastric, and incisional hernias, account for a significant proportion of elective surgical workload. Epidemiological data suggest that approximately 75% of ventral hernias are primary and 25% are incisional in nature, the latter arising as a consequence of prior abdominal surgery.¹

The clinical consequences of untreated ventral hernias range from chronic discomfort and cosmetic deformity to life-threatening complications such as bowel obstruction and strangulation, necessitating timely and definitive surgical intervention.^{2,3}

Historically, open repair with prosthetic mesh reinforcement has been the mainstay of treatment. The Rives-Stoppa technique and onlay mesh placement have demonstrated improved outcomes compared to primary suture repair alone, with significant reductions in recurrence rates.^{4,5}

Over the past three decades, laparoscopic ventral hernia repair, particularly using the intraperitoneal onlay mesh (IPOM) technique, has emerged as a viable and increasingly preferred alternative. The theoretical advantages of the minimally invasive approach include reduced wound morbidity, shorter hospital stay, lower surgical site infection rates, and earlier return to normal activity.^{6,7}

However, concerns regarding longer operative times, increased cost, and the steep learning curve associated with laparoscopic repair remain valid points of debate in the surgical literature. Furthermore, the superiority of laparoscopic over open repair has not been uniformly demonstrated across all patient populations and institutional settings.^{8,9}

Given this clinical equipoise, we conducted this prospective comparative study at our tertiary care institution to objectively evaluate and compare the intraoperative and postoperative outcomes of laparoscopic IPOM repair versus open onlay mesh repair for ventral hernias, with the aim of contributing institution-specific evidence to guide surgical decision-making.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective comparative study conducted in the Department of General Surgery at Command Hospital (Western Command), Chandimandir, India, from [Month Year] to [Month Year]. The study was approved by the Institutional Ethics Committee (IEC Approval No. [XXX/YYYY]) in accordance with the Declaration of

Helsinki. Written informed consent was obtained from all participants prior to enrollment.

Study Population

A total of 60 adult patients diagnosed with ventral hernia and admitted for elective surgical repair were enrolled and allocated into two groups of 30 each:

Group A (Laparoscopic): Underwent laparoscopic IPOM repair.

Group B (Open Onlay): Underwent conventional open onlay mesh repair.

Inclusion and Exclusion Criteria

Inclusion Criteria: Patients aged ≥ 18 years with primary or incisional ventral hernias, who were fit for general anaesthesia and elective surgery.

Exclusion Criteria: Emergency presentations with bowel obstruction or strangulation, patients with active infection, pregnancy, coagulopathy, or those unfit for general anaesthesia were excluded.

Sample Size

A convenience sampling technique was employed. Based on previously published data on hospital stay following laparoscopic versus open ventral hernia repair, a minimum sample size of 28 per group was estimated to achieve 80% power at a 5% level of significance. A sample of 30 per group (total $n=60$) was recruited to account for potential dropouts.

Surgical Technique

Laparoscopic IPOM (Group A): Under general anaesthesia, pneumoperitoneum was created using a Veress needle. Three to four ports were placed strategically. Adhesiolysis was performed as required. A composite mesh was deployed intraperitoneally with a minimum overlap of 3–5 cm beyond the defect margins and secured using tacks or transfascial sutures.¹⁰

Open Onlay Repair (Group B): Under general anaesthesia, a midline or transverse incision was made over the hernia. The hernial sac was dissected, and primary fascial closure was achieved. A polypropylene mesh was placed in the onlay position and fixed with interrupted sutures. A subcutaneous suction drain was placed routinely and removed when output fell below 30 mL/24 hours.¹¹

Postoperative Care and Rehabilitation

All patients received standardised postoperative analgesia, early oral feeding, and mobilisation protocols. Wound inspection was performed at 48 hours, and all patients were followed up at two weeks, one month, and three months postoperatively.

Outcome Measures

Primary outcomes included mean operative time (minutes) and blood

loss (mL). Secondary outcomes included postoperative pain assessed by the Visual Analogue Scale (VAS) on postoperative day 1, length of hospital stay (days), and surgical site infection (SSI) rate.

Statistical Analysis

All data were entered and analysed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were compared using the independent samples Student's t-test and expressed as mean $\pm$ standard deviation. Categorical variables were compared using the Chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic Data

The two groups were comparable in baseline characteristics as summarised in Table 1. The mean age was 48.17 ± 9.4 years in the laparoscopic group and 50.07 ± 10.2 years in the open group ($p=0.176$). A higher proportion of ASA Grade III patients were managed with open repair (46.7% vs 26.7%, $p=0.256$), though this difference was not statistically significant. Mean hernia defect size was comparable between groups (6.1 cm vs 6.6 cm, $p=0.417$).

Table 1: Baseline Demographic and Clinical Characteristics

Parameter	Laparoscopic (n=30)	Open Onlay (n=30)	P-value
Mean Age (years)	48.17 ± 9.4	50.07 ± 10.2	0.176
Sex (M:F)	18:12	17:13	0.798
BMI (kg/m ²)	26.4 ± 3.1	27.1 ± 3.4	0.389
ASA Grade III (%)	26.7%	46.7%	0.256
Mean Defect Size (cm)	6.1 ± 1.4	6.6 ± 1.7	0.417
Primary Hernia (%)	60%	56.7%	0.791
Incisional Hernia (%)	40%	43.3%	0.791

Table 1: Baseline characteristics were comparable between groups. No statistically significant differences were found ($p>0.05$ for all parameters).

Intraoperative and Postoperative Outcomes

The primary and secondary outcome measures are summarised in Table 2. Laparoscopic repair was associated with significantly shorter operative time, reduced blood loss, and shorter hospital stay compared to open repair.

Table 2: Intraoperative and Postoperative Outcomes

Parameter	Laparoscopic (n=30)	Open Onlay (n=30)	P-value
Mean Operative Time (min)	65.23 ± 21.07	159.30 ± 16.35	0.021*
Mean Blood Loss (mL)	9.73 ± 3.51	80.13 ± 21.19	0.011*
Hospital Stay (days)	2.83 ± 1.33	7.43 ± 2.23	0.011*
VAS Pain Score (POD 1)	5.07 ± 2.42	5.30 ± 1.68	0.666
Surgical Site Infection (%)	20.0%	36.7%	0.152

Table 2: * indicates statistical significance ($p<0.05$). POD = Postoperative Day; VAS = Visual Analogue Scale.

DISCUSSION

This prospective comparative study evaluating laparoscopic IPOM repair versus open onlay mesh repair for ventral hernias demonstrates a clear advantage of the minimally invasive approach in terms of blood loss, hospital stay, and operative time. These findings are consistent with and contribute to the growing body of evidence supporting laparoscopic repair as the preferred approach in appropriately selected patients.^{12,13}

Regarding blood loss, our study found a significantly lower intraoperative blood loss in the laparoscopic group (9.73 mL vs 80.13 mL, $p=0.011$). This finding is well supported by existing literature. The laparoscopic approach avoids large skin flap dissection and subcutaneous tissue handling that is inherent to open repair, thereby minimising vascular disruption. Sauerland et al.¹⁴ and Forbes et al.¹⁵ similarly reported significantly reduced blood loss with laparoscopic techniques in their systematic reviews.

The hospital stay was significantly shorter in the laparoscopic group (2.83 days vs 7.43 days, $p=0.011$). This substantial reduction reflects the well-recognised benefits of minimally invasive surgery — smaller incisions, less postoperative pain, earlier ambulation, and faster restoration of bowel function. These benefits translate directly into

earlier discharge, reduced hospitalisation costs, and faster return to occupational and social activities.^{16,17}

Interestingly, our study demonstrated a shorter operative time in the laparoscopic group (65.23 min vs 159.30 min, $p=0.021$), which contrasts with the findings of several earlier studies. This finding can be attributed to multiple factors. First, all laparoscopic procedures were performed by surgeons with considerable expertise in minimally invasive techniques, effectively overcoming the well-documented learning curve associated with laparoscopic hernia repair. Second, careful patient selection — favouring those with moderate-sized defects and minimal adhesions — facilitated more efficient operative execution. Third, the use of standardised operative protocols and advanced mesh fixation devices further reduced procedural duration. Heniford et al.¹⁸ and Itani et al.¹⁹ reported similar operative efficiency in high-volume laparoscopic centres, underscoring the importance of institutional experience.

Postoperative pain scores on day 1 were comparable between the two groups (VAS 5.07 vs 5.30, $p=0.666$). While laparoscopic surgery generally results in lower pain scores, the requirement for multiple tack fixations and transfascial sutures in IPOM repair may contribute to equivalent early pain levels. It is likely that differences in pain would become more apparent at later postoperative time points and with broader follow-up, an area for future investigation.

Surgical site infection rates were higher in the open repair group (36.7% vs 20.0%), though this difference did not reach statistical significance ($p=0.152$), likely due to the limited sample size. The trend, however, is clinically meaningful and consistent with published literature demonstrating that larger wound surface area, subcutaneous dead space, and drain insertion in open repair predispose patients to wound infections.^{20,21}

From a mesh and fixation perspective, laparoscopic IPOM utilises composite meshes designed to be in direct contact with viscera, which carry their own considerations regarding bowel adhesion risk. Conversely, open onlay polypropylene mesh, while cost-effective, is associated with higher wound complication rates. The choice of mesh type and fixation strategy remains an evolving discussion in the hernia repair literature.^{22,23}

This study has several limitations. The relatively small sample size (30 per group) and single-centre design may limit the generalisability of our findings. The absence of long-term follow-up data beyond three months precludes assessment of recurrence rates, which is a critical outcome in hernia surgery. Future multicentre randomised controlled trials with larger cohorts and longer follow-up periods are warranted to validate and extend these findings.

CONCLUSION

This prospective comparative study demonstrates that laparoscopic ventral hernia repair is associated with significantly reduced intraoperative blood loss, shorter hospital stay, and shorter operative time compared to open onlay mesh repair, while maintaining comparable postoperative pain scores and infection rates. When performed by experienced surgeons with appropriate patient selection, laparoscopic IPOM repair not only matches but surpasses open techniques in operative efficiency and recovery profile. These findings support the ongoing paradigm shift towards minimally invasive approaches as the standard of care in elective ventral hernia management, particularly at institutions with established laparoscopic expertise.

Figure 1: Schematic diagram showing different anatomically defined methods for mesh placement in ventral hernia repair (onlay, sublay, IPOM).

Figure 2: Bar graph comparing mean duration of surgery (minutes) between the laparoscopic and open repair groups.

Figure 3: Bar graph comparing mean duration of hospitalisation (days) between the laparoscopic and open repair groups.

Conflict of Interest

The authors declare no conflict of interest. No funding was received for this study.

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