



Original Article

Comparative Evaluation of Postoperative Pain Following Open versus Laparoscopic Ventral Hernia Repair

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ABSTRACT

Background: Postoperative pain is a major concern after ventral hernia repair and significantly affects recovery and quality of life. This study aimed to compare the intensity and duration of postoperative pain between open and laparoscopic ventral hernia repair using the Visual Analogue Scale (VAS).

Methods: This prospective observational study was conducted at Hindu Rao Hospital, Delhi, from June 2015 to May 2017. Two hundred consecutive patients undergoing elective ventral hernia repair were included (173 open mesh repair, 27 laparoscopic intraperitoneal onlay mesh repair – IPOM). Postoperative pain was assessed using a 0–4 Visual Analogue Scale at 6 hours, Day 1, Day 2, Day 3, and at discharge. Data were analyzed using appropriate statistical tests.

Results: Demographic parameters and hernia types were comparable between groups. All patients experienced pain at 6 hours postoperatively. Pain resolved significantly faster in the laparoscopic group. On postoperative Day 2, pain persisted in 124/173 (71.67%) patients in the open group versus 8/27 (29.62%) in the laparoscopic group ($p < 0.001$). Mean VAS scores were significantly lower in the laparoscopic group at 6 hours (1.89 ± 0.51 vs 2.14 ± 0.50 , $p = 0.017$), Day 1 (1.04 ± 0.76 vs 1.32 ± 0.52 , $p = 0.020$), Day 2 (0.41 ± 0.69 vs 0.86 ± 0.67 , $p < 0.001$), and Day 3 (0.11 ± 0.42 vs 0.45 ± 0.58 , $p = 0.001$). At discharge, no patient in the laparoscopic group had pain compared to 5.78% in the open group.

Conclusion: Laparoscopic ventral hernia repair is associated with significantly reduced postoperative pain intensity and faster pain resolution compared to open repair. These findings support the use of the laparoscopic approach when technically feasible.

Keywords: Ventral hernia, Incisional hernia, Laparoscopic hernia repair, Open hernia repair, Postoperative pain, Visual Analogue Scale, Seroma.

INTRODUCTION

Ventral hernias, encompassing primary and incisional (secondary) variants, constitute a prevalent surgical challenge. Tension-free mesh repair has established itself as the gold standard, substantially lowering recurrence rates relative to suture-only techniques.[1]

Although open mesh repair continues to be extensively utilized, laparoscopic ventral hernia repair—initially described by LeBlanc in 1993—has increased in adoption owing to advantages such as fewer wound complications, shorter hospital stays, and quicker return to normal activities [1,2]. Nonetheless, postoperative pain persists as a major concern. Although laparoscopic repair is often viewed by surgeons and patients as less painful, clinical observations and select studies indicate that early postoperative pain after LVHR—commonly linked to transfascial sutures and tacks—can be particularly severe [3].

Prospective studies directly comparing postoperative pain profiles between open and laparoscopic ventral hernia repairs using validated instruments such as the Visual Analogue Scale are scarce [4]. Accordingly, this investigation was designed to systematically assess and contrast the intensity and duration of postoperative pain following open versus laparoscopic ventral hernia repair. The primary aim was to compare postoperative pain outcomes between open and laparoscopic ventral hernia mesh repairs.

MATERIALS AND METHODS

A total of 200 consecutive patients undergoing elective ventral hernia repair were included.

Inclusion Criteria

- Patients aged 18–80 years
- Elective primary or recurrent ventral hernias
- Mesh reinforcement in both approaches

Exclusion Criteria

- Emergency surgery
- Infected mesh or active infection
- Chronic pain syndrome
- Decompensated liver cirrhosis
- Stoma patients
- Inability to provide consent or follow-up

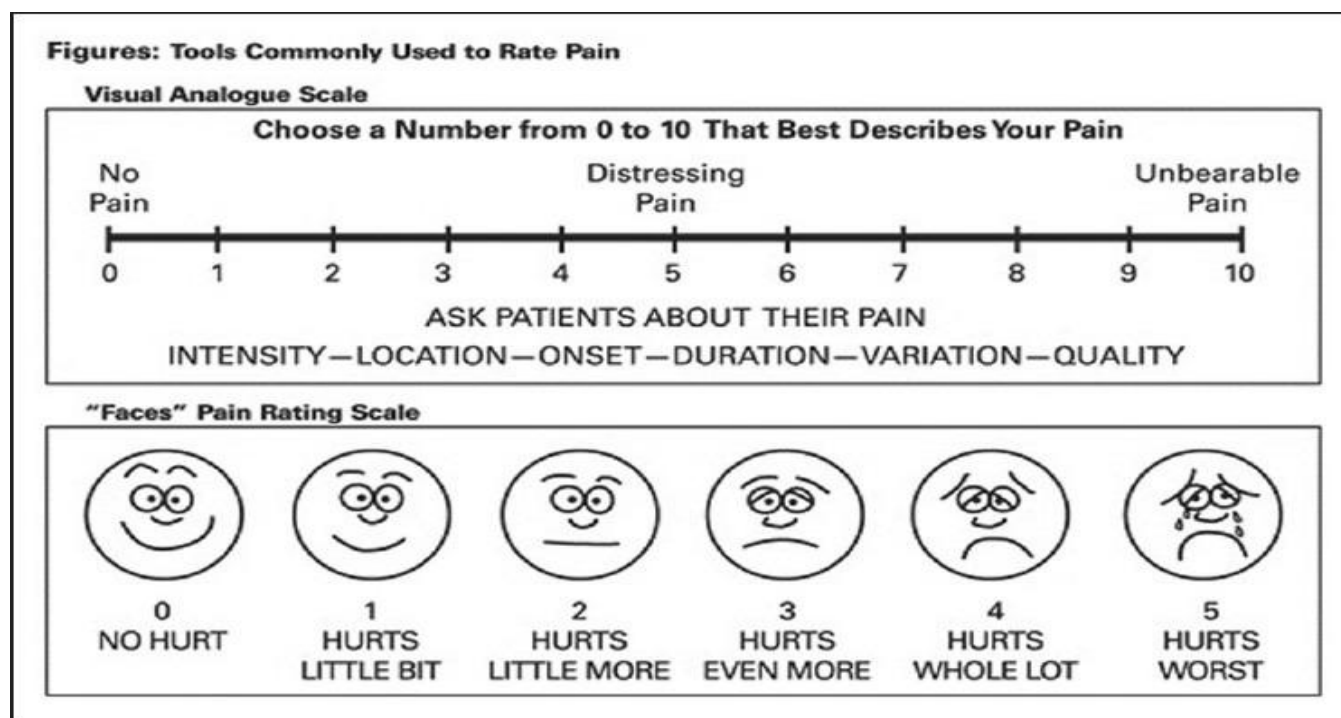
Surgical Techniques

Open Group: Most procedures were performed under spinal or combined spinal-epidural anesthesia. Onlay or inlay polypropylene mesh repair was performed after reduction or excision of the hernia sac. Drains were used selectively.

Laparoscopic Group: All procedures were performed under general anesthesia using the IPOM technique with macroporous polypropylene composite mesh. The mesh was fixed using transfascial sutures and/or tracks. Postoperatively, compression dressing and abdominal binder were applied. Postoperative pain management protocols were standardized across both cohorts, utilizing a multimodal analgesic regimen comprising non-steroidal anti-inflammatory drugs and opioids as required.

Pain Assessment

Postoperative pain was assessed using a 0–4 point Visual Analogue Scale (VAS):



0–4 Visual Analogue Scale:

0 = No pain

1 = Mild pain

2 = Moderate pain

3 = Severe pain

4 = Worst imaginable pain

Assessments were performed at 6 hours postoperatively, on postoperative days 1, 2, and 3, and at discharge. The duration of postoperative pain was also recorded.

The study was conducted following approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants. Categorical variables were analyzed using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the Mann-Whitney U test. A p-value < 0.05 was considered statistically significant. Data analysis was performed using appropriate statistical software.

RESULTS

Table 1: Age Distribution of Patients Studied

Age in years	Open group		Laparoscopy group	
	n=173		n=27	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)
21 - 30	28	16.20	2	7.40
31- 40	30	17.30	10	37.00
41-50	47	27.20	8	29.60
51-60	44	25.40	3	11.10
61-70	24	13.90	4	17.80
Mean age [#]	46.54 ± 12.48		45.04 ± 11.47	

#p = 0.558; Not significant

Most common age group in open group is 41 – 50 yrs contributing to 27.2% and in laparoscopy group is 31 – 40 yrs contributing to 37%. Mean age was 46.54 ± 12.48 years (open) vs 45.04 ± 11.47 years (laparoscopic, p = 0.558).

Table 2: Sex Distribution of Patients Studied

SEX	Open group		Laparoscopy group	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)
MALE	46	26.60	9	33.30
FEMALE	127	73.40	18	66.70

p = 0.465; Not significant

Females are most common in both open and laparoscopic group compared to male contributing to 73.4% in open group and 66.7% in laparoscopy group. Females predominated in both groups (73.4% open vs 66.7% laparoscopic, p = 0.465).

Table 3: Etiological Distribution of Ventral Hernias in Open Group

Type of hernia	Number of patients (n)	Percentage (%)
Epigastric	19	11.00
Umbilical	24	13.90
Paraumbilical	49	28.30
Incisional	81	46.80
Total	173	100

Most common type of hernia which requires open surgery is incisional hernia corresponding to 46.8% followed by paraumbilical hernia corresponding to 28.3%.

Table 4: Etiological Distribution of Ventral Hernias in Laparoscopic Group

Type of Hernia	Number of Patients (n)	Percentage (%)
Epigastric	2	7.4
Umbilical	10	37.0
Paraumbilical	8	29.6
Incisional	7	25.9
Total	27	100

Most common type of hernia which requires laparoscopic surgery is umbilical hernia corresponding to 37% followed by paraumbilical hernia corresponding to 29.6%.

Table 5: Distribution of Duration of Surgery

Duration of Surgery (mins)		Open Group (N=173)		Laparoscopy Group (N=27)	
		Number (n)	Percentage (%)	Number (n)	Percentage (%)
40	– 60	40	23.12	3	11.11
61	– 80	54	31.213	5	18.51
81	– 100	34	19.653	13	48.14
101	– 120	27	15.606	4	14.81
	>120	18	10.404	2	7.407
Mean duration of surgery [#]		84.48 ± 27.54		90.00 ± 21.88	

#p = 0.322; Not significant

In most of the patients it took 61 to 80 min for open surgery and 81 to 100 minutes to complete surgery in laparoscopy group. Mean duration was 84.48 ± 27.54 minutes in open group vs 90.00 ± 21.88 minutes in laparoscopic group (p = 0.322) not statistically significant.

Table 6: Distribution of Duration of Postoperative Pain

Duration (at days)	Open group		Laparoscopy group		p value
	Number (n=173)	Percentage (%)	Number (n=27)	Percentage (%)	
6hrs	173	100%	27	100%	-
Day 1	173	100%	21	77.77%	-
Day 2	124	71.67%	8	29.62%	<0.001**
Day 3	72	41.61%	2	7.4%	0.001*
At Discharge	10	5.78	0	0%	0.200 ^{NS}

NS: p > 0.05; Not significant; *p<0.05; Significant; **p<0.001; Highly significant

All patients in open and laparoscopic group have pain 6hrs after surgery. As the postoperative day increases pain subsides rapidly in laparoscopic group compared to open group with no pain at discharge in laparoscopic group (0%) compared to little number of patients (5.78%) with pain in open group.

Table 7: Showing Mean VAS for pain

Time	Open Group		Lap Group		p value [#]
	Mean	± SD	Mean	± SD	
At 6 hrs	2.14	0.50	1.89	0.51	0.017*
Day 1	1.32	0.52	1.04	0.76	0.020*
Day 2	0.86	0.67	0.41	0.69	<0.001**
Day 3	0.45	0.58	0.11	0.42	0.001*
At discharge	0.06	0.23	0.00	0.00	0.201 ^{NS}

#Mann-Whitney U Test

NS: p > 0.05; Not significant; *p<0.05; Significant; **p<0.001; Highly significant

As the duration of postoperative period increases VAS Score decreases in both open and laparoscopic surgeries.

Table 8: Distribution of Length of Hospital Stay

Length of hospital stay	Open group N=173		Laparoscopy group n=27	
	Number	Percentage	Number	Percentage
1-5	49	28.32	20	74.07
6-10	113		6	22.22
11-13	9		1	3.7
>15	2		-	-
mean				

Most of the patients in open group (46.82%) have taken 6 to 10 days to get discharged whereas in laparoscopy group (74.07%) only 1 to 5 days. Length of hospital stay was shorter in the laparoscopic group (mean $\approx$ 4.07 days vs 5.06 days).

DISCUSSION

The observed findings underscore the clinical advantages of minimally invasive ventral hernia repair, particularly concerning postoperative morbidity and recovery time. The significantly lower Visual Analogue Scale scores observed in the laparoscopic cohort on postoperative days 1 through 3 corroborate the efficacy of this approach in minimizing patient discomfort compared to open techniques [5,6]. Furthermore, the data regarding length of hospital stay indicates that laparoscopic intervention facilitates an expedited recovery, with a clear majority of patients discharged within five days [7,8]. These findings align with prior research demonstrating that laparoscopic ventral hernia repair provides significant improvements in patient-reported outcomes and reduced convalescence compared to conventional open mesh repair [9,10]. Moreover, the observed reduction in hospital duration for the laparoscopic group is consistent with studies identifying shorter convalescence periods as a primary benefit of minimally invasive strategies [11]. Specifically, the laparoscopic approach demonstrates a statistically significant reduction in both the intensity and duration of postoperative pain, as evidenced by consistent decreases in VAS scores across the early recovery period [12–14]. Despite these advantages, clinicians must consider that pain perception remains subjective and can be influenced by varied cultural and environmental factors, potentially introducing bias in self-reported assessments [15]. Additionally, while operative times in the present study were comparable between both surgical approaches, some literature indicates that laparoscopic techniques can be associated with increased operative duration and a steep learning curve [16]. Conversely, other comparative investigations have reported that laparoscopic procedures may involve shorter hospital stays and a lower requirement for postoperative analgesics, reinforcing the feasibility of this method [17]. Future studies should prioritize standardizing mesh fixation techniques and defect closure methods to further evaluate their impact on long-term recurrence rates and chronic pain outcomes [18,19]. Considering these findings, further prospective randomized trials are warranted to address the nuances of technique-specific pain and to confirm the long-term quality of life following these interventions [20,21]. Moreover, integrating advanced technologies such as fibrin sealant for mesh fixation may offer a pathway to further reduce early postoperative pain while maintaining established safety profiles [22]. Additionally, shifting toward robot-assisted laparoscopy may provide further gains in atraumatic tissue dissection, potentially lowering the prevalence of persistent postoperative discomfort. Furthermore, the adoption of standardized international registries could mitigate current inconsistencies in pain assessment metrics, facilitating more robust meta-analytical comparisons of long-term recovery trajectories [23,24]. Ultimately, clarifying the socio-economic implications of these surgical choices, including the specific impact on postoperative sick leave duration, remains a critical area for future investigation [25]. Such research proved particularly valuable in verifying whether the accelerated recovery observed in minimally invasive cohorts translates into significant long-term reductions in healthcare utilization and overall treatment costs [26]. Additionally, addressing the potential for selection bias and the inherent limitations of convenience sampling in surgical cohorts will be essential for enhancing the generalizability of future research findings [27]. Furthermore, future clinical trials must prioritize the inclusion of more representative patient populations, particularly women, who face a higher risk of chronic postoperative inguinal pain but remain historically underrepresented in surgical studies [28]. Furthermore, implementing standardized preoperative pain assessment protocols and conducting rigorous non-respondent analyses are essential to improve the quality of future data and minimize attrition bias [29]. Building upon these methodological refinements, large-scale registry-based studies are uniquely positioned to leverage expansive datasets that offer higher external validity regarding contemporary chronic pain rates [30].

CONCLUSION

The present findings confirm that laparoscopic inguinal hernia repair offers superior short-term recovery metrics and reduced hospital stay compared to open techniques, though long-term efficacy remains dependent on the optimization of surgical fixation methods. Consequently, clinicians should adopt a comprehensive approach that integrates patient-specific factors, such as defect size and comorbidities, to personalize the choice of mesh and fixation strategy. Continued efforts to harmonize surgical protocols and outcome reporting will be vital to standardizing clinical practices and ensuring that patient-centered recovery objectives are consistently met. Future research should also focus on long-term data regarding rare, serious complications to ensure that the immediate gains in convalescence do not come at the expense of long-term safety.

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Conflict of Interest: None declared

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