

Comparison of Port-site Complications in Laparoscopic Procedures with and without Rectus Sheath Closure: A Prospective Observational Study

DIVYA SAINI¹, RAJKUMAR VERMA², PANKAJ SAUNAKIYA³

ABSTRACT

Introduction: Port-site complications remain an important concern following laparoscopic surgery. The necessity of routine rectus sheath closure at 10-12 mm trocar sites to prevent such complications remains controversial.

Aim: To compare port-site complications and postoperative pain in patients undergoing laparoscopic surgery with and without rectus sheath closure.

Materials and Methods: This prospective observational study was conducted in the Department of General Surgery at Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India, from May 2023 to June 2024. A total of 112 patients undergoing elective laparoscopic procedures were included and divided into two groups: a Closure Group (rectus sheath closed) and a Non-Closure Group (rectus sheath not closed). Port-site complications, postoperative pain assessed using the Visual Analog Scale (VAS), duration of hospital stay, and time to return to normal activity were evaluated over a six-week follow-up period. Continuous variables were analysed using the independent Student's t-test, while categorical variables were compared using the Chi-square test or Fisher's exact test.

Results: A total of 112 patients were included, with 56 patients in each group. The mean age was 41.82 ± 11.24 years in the closure group and 40.37 ± 10.96 years in the non-closure group. Baseline demographic variables, including age, sex distribution, hypertension, and diabetes mellitus, were comparable between the groups except for Body Mass Index (BMI), which was significantly higher in the closure group. The incidence of port-site hernia was identical in both groups (1.79%). Port-site infection occurred in 16.07% of patients in the closure group and 14.29% in the non-closure group, while wound dehiscence occurred only in the non-closure group. Postoperative pain scores were significantly lower in the non-closure group at all assessed time points. No statistically significant difference was observed in duration of hospital stay or time to return to normal activity.

Conclusion: Routine rectus sheath closure at 10-12 mm laparoscopic port-sites did not significantly reduce early port-site complications and was associated with higher postoperative pain scores. A selective, patient-specific approach to rectus sheath closure may therefore be preferable in elective laparoscopic procedures.

Keywords: Fascial closure, Minimally invasive surgery, Postoperative pain score, Postoperative recovery, Trocar site hernia, Trocar wound complications

INTRODUCTION

Laparoscopic techniques have revolutionised the field of surgery. Benefits include decreased postoperative pain, quicker return to normal activity, and fewer postoperative complications [1,2]. Port-site complications can be grouped into access-related complications and postoperative complications, and have been reported in all age groups and in both genders [3].

The necessity of routine fascial closure at 10-12 mm laparoscopic ports remains a topic of ongoing debate. Traditional surgical principles advocate fascial closure to prevent herniation. However, recent evidence suggests that port-site hernia is multifactorial, with patient-related factors such as elevated BMI, diabetes, and age; technical factors including trocar design, torque movement, and extraction of large specimens; and postoperative factors such as coughing and wound stress playing important roles [4,5]. Several studies have proposed that routine closure may not be required in all patients and, in some cases, may increase operative time, tissue manipulation, postoperative discomfort, or infection risk [5,6].

However, prospective comparative data evaluating port-site outcomes with and without rectus sheath closure in routine laparoscopic procedures remain limited.

This prospective study was designed to directly compare port-site complications between patients undergoing laparoscopic procedures with and without rectus sheath closure.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of General Surgery at Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India, from May 2023 to June 2024. Ethical approval for the study was obtained from the Institutional Ethics Committee of the participating institution (IEC No. 2273/IEC/I/2022-2023), and written informed consent was obtained from all participants prior to enrolment.

Inclusion criteria: All patients undergoing elective laparoscopic surgery, irrespective of age or sex, were included in the study.

Exclusion criteria: Patients in whom laparoscopic procedures were converted to open surgery, those who were terminally ill, and patients with known tuberculosis, human immunodeficiency virus infection, hepatitis, or other chronic infective conditions were excluded from the study.

Study Procedure

A total of 112 patients fulfilling the eligibility criteria were included and divided into two groups of 56 patients each based on rectus sheath management at 10-12 mm trocar sites. The closure group consisted of patients in whom rectus sheath closure was performed using standard absorbable sutures, while the non-closure group included patients in whom the rectus sheath was not closed. Allocation to either group was based on the operating surgeon's routine practice.

Baseline demographic data, including age, sex, BMI, and associated co-morbidities such as hypertension and diabetes mellitus, were recorded. All surgical procedures were performed by experienced surgeons using standard laparoscopic techniques. Trocar size, port placement, and postoperative care protocols were uniform across both groups to minimise procedural variability.

Patients were evaluated postoperatively for port-site complications, including port-site hernia, surgical site infection, wound dehiscence, seroma, and haematoma. Postoperative pain was assessed using the VAS, in which pain intensity was graded on a scale from 0 (no pain) to 10 (worst imaginable pain), at 24 hours, 48 hours, one week, and one month following surgery. Additional outcome measures included duration of hospital stay and time to return to normal daily activity. Follow-up assessments were conducted at one week and six weeks postoperatively.

STATISTICAL ANALYSIS

Data were entered into a structured proforma and analysed using Statistical Package for the Social Sciences (SPSS) software version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean±standard deviation, while categorical variables were expressed as frequency and percentage. The independent Student’s t-test was used for comparison of continuous variables, while the Chi-square test or Fisher’s exact test was used for categorical variables. A p-value of <0.05 was considered statistically significant.

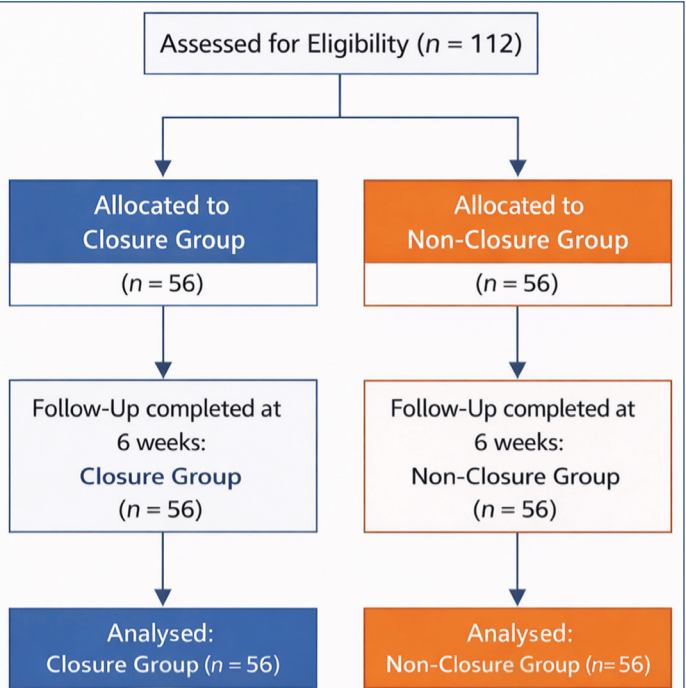
RESULTS

All patients completed the planned follow-up at one week and six weeks, and no patient was lost to follow-up. The study enrollment process, group allocation, and follow-up are illustrated in [Table/Fig-1].

The mean Body Mass Index (BMI) was significantly higher in the closure group compared with the non-closure group (p-value <0.05) [Table/Fig-2].

Port-site infection was observed in nine patients (16.07%) in the closure group and eight patients (14.29%) in the non-closure group. No cases of seroma or haematoma were observed in either group [Table/Fig-3].

Postoperative pain was assessed using the VAS at 24 hours, 48 hours, one week, and one month. At all evaluated time points, the



[Table/Fig-1]: Study flow diagram showing patient enrollment, allocation, and follow-up.

Variable	Closure group (n=56)	Non-closure group (n=56)	p-value
Age (years), mean±SD	41.82±11.24	40.37±10.96	0.48
Sex (Male), n (%)	32 (57.1)	24 (42.9)	0.13
Sex (Female), n (%)	24 (42.9)	32 (57.1)	0.13
Body Mass Index (BMI) (kg/m²), mean±SD	26.76±3.21	24.19±2.84	0.03*
Hypertension, n (%)	11 (19.6)	10 (17.9)	0.81
Diabetes Mellitus, n (%)	6 (10.7)	5 (8.9)	0.75

[Table/Fig-2]: Baseline characteristics of the study population.

Abbreviations: SD: Standard deviation.

*Statistically significant (p-value <0.05).

Complication	Closure group (n=56)	Non-closure group (n=56)	p-value
Port-site hernia, n (%)	1 (1.79)	1 (1.79)	1.00
Port-site infection, n (%)	9 (16.07)	8 (14.29)	0.79
Wound dehiscence, n (%)	0	5 (8.93%)	0.02*
Seroma / haematoma, n (%)	0	0	Not applicable

[Table/Fig-3]: Port-site complications in the study groups.

*Statistically significant (p-value <0.05).

non-closure group demonstrated significantly lower pain scores compared with the closure group [Table/Fig-4], with all differences reaching statistical significance (p-value <0.05).

The mean time to return to normal daily activity was marginally longer in the non-closure group, but the difference did not reach statistical significance [Table/Fig-5].

Time point	Closure group (mean±SD)	Non-closure group (mean±SD)	p-value
24 hours	5.12±1.08	4.31±0.96	0.01*
48 hours	4.21±0.94	3.36±0.88	0.008*
1 week	2.46±0.72	1.71±0.64	0.004*
1 month	0.96±0.38	0.32±0.29	0.001*

[Table/Fig-4]: Comparison of postoperative Pain Scores (VAS) between groups.

*Statistically significant (p-value <0.05).

Abbreviation: VAS: Visual analog scale.

Parameter	Closure group (mean±SD)	Non-closure group (mean±SD)	p-value
Duration of hospital stay (days)	5.79±1.12	6.16±1.28	0.18
Time to return to normal activity (days)	11.34±2.41	12.43±2.67	0.09

[Table/Fig-5]: Postoperative recovery parameters in the study groups.

At the six-week follow-up, no additional port-site complications were identified in either group. No patient required re-intervention for port-site-related morbidity during the study period.

DISCUSSION

Port-site hernia remains an important complication following laparoscopic surgery despite its relatively low incidence. In the present study, port-site hernia occurred in one patient (1.79%) in each group, demonstrating no significant difference between rectus sheath closure and non-closure. These findings are consistent with those of Singal R et al., who observed that port-site hernia was not present in either group, with no statistically significant difference (p-value=1.0) [5]. Gupta SB et al., reported that Port-site hernia was observed in three patients (3%) overall: one patient in the closure group and two in the non-closure group (p-value=1.0) [7]. Port-site infection occurred in 10 patients: six in the closure group (12%) and four in the non-closure group (8%) (p-value=0.688) [7]. Yacoub M et al., also demonstrated that port-site complications-bleeding (8.6% vs 2.9%, p-value=0.303), infection (11.4% vs 14.3%, p-value=0.721), and hernia (11.4% vs 2.9%, p-value=0.178) were statistically comparable [8].

Postoperative pain scores were significantly lower in the non-closure group at all assessed time points in the present study. A comparable trend was described by Yacoub M et al., who reported significantly higher postoperative pain in the closure group, where 85.7% of patients experienced moderate pain, and 14.3% experienced severe pain, compared with 5.7% and 2.9%, respectively, in the non-closure group (p-value <0.001) [8]. The higher pain scores observed in the closure group may be related to additional tissue handling, fascial suturing, and local inflammatory response at the trocar site.

Recovery outcomes, including duration of hospital stay and time to return to normal activity, were comparable between the two groups in the present study (5.79±1.12 vs 6.16±1.28 days, p-value=0.18; and 11.34±2.41 vs 12.43±2.67 days, p-value=0.09, respectively). Consistent with the present study findings Singal R et al., reported no significant difference in hospital stay between closure and non-closure groups [5]. Gupta SB et al., likewise reported comparable hospital stay durations between closure and non-closure groups (2.06±0.70 vs 2.01±0.10 days, p-value=0.618) [7]. These findings suggest that routine rectus sheath closure may have limited influence on overall postoperative recovery in patients undergoing elective laparoscopic procedures.

The findings of the present study support a selective rather than routine approach to rectus sheath closure at 10-12 mm trocar sites.

Limitation(s)

As a single-centre study, the findings may not be generalisable to all surgical settings. The follow-up duration of six weeks, although sufficient to identify early port-site complications, may not have been sufficient to detect late-onset trocar-site hernias. Allocation of patients to the closure or non-closure group was based on the operating surgeon's routine practice rather than randomisation, which may have introduced selection bias. Additionally, BMI was significantly higher in the closure group and may have influenced postoperative outcomes.

Certain operative variables that could potentially influence postoperative pain and trocar-site hernia risk were not separately analysed in the present study. These included duration of surgery, trocar type (bladed versus non-bladed), degree of port manipulation,

specimen extraction techniques, surgeon-related variability, and specific fascial closure techniques or suture materials used. Although standard institutional laparoscopic protocols were followed, the influence of these variables on postoperative outcomes cannot be entirely excluded. Larger multicentric randomised studies with longer follow-up duration and detailed operative variable analysis are required to further validate these findings.

CONCLUSION(S)

In this prospective observational study with surgeon-preference allocation, routine rectus sheath closure was not associated with a significant reduction in port-site complications; however, randomised evidence is required to confirm these findings. A selective, patient-specific approach to rectus sheath closure may therefore be more appropriate than routine closure for all patients undergoing elective laparoscopic procedures.

REFERENCES

- [1] Ahmad G, Duffy JM, Phillips K, Watson A. Laparoscopic entry techniques. *Cochrane Database Syst Rev*. 2008;2:CD006583. Doi: 10.1002/14651858.CD006583.
- [2] Jansen FW, Kolkman W, Bakkm EA, de Kroon CD, Trimbo-Kemper TC, Trimbo JB. Complications of laparoscopy: An inquiry about closed- versus open-entry technique. *Am J Obstet Gynecol*. 2004;190(3):634-38. Doi: 10.1016/j.ajog.2003.09.035. PMID: 15041992.
- [3] Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. *J Minim Access Surg*. 2013;9(2):59-64. Doi: 10.4103/0972-9941.110964. PMID: 23741110; PMCID: PMC3673575.
- [4] Mudgal MM, Kothiya PK, Kushwah N, Singh R. Port site complications following laparoscopic surgeries: A prospective study. *Int Surg J*. 2018;5(2):598-601. <https://doi.org/10.18203/2349-2902.isj20180360>.
- [5] Singal R, Zaman M, Mittal A, Singal S, Sandhu K, Mittal A. No need of fascial closure to reduce trocar site hernia rate in laparoscopic surgery: A prospective study of 200 non-obese patients. *Gastroenterology Res*. 2016;9(4-5):70-73. Doi: 10.14740/gr715w. Epub 2016 Sep 20. PMID: 27785329; PMCID: PMC5040548.
- [6] Ravindranath GG, Reddy SVRM. Laparoscopic port-site complications: A study in a tertiary care centre. *Int Surg J*. 2016;3(3):1121-24.
- [7] Gupta SB, Mitra A, Gupta BB, Nighot G. A prospective randomized comparative study of umbilical port site complications following fascial sheath closure versus non-closure in laparoscopic surgeries at a tertiary care centre in central India. *Int Surg J*. [Internet]. 2025 Sep. 25 [cited 2026 Jul. 7];12(10):1682-88. Available from: <https://www.ijurgery.com/index.php/ij/article/view/11342>.
- [8] Yacoub M, Nashed GA, Khalifa AY, Hassan AM. Fascial closure vs. non-closure of right working port sites in laparoscopic bariatric surgery: A randomized clinical trial. *Obes Surg*. 2025;35(7):2578-87. Doi: 10.1007/s11695-025-07917-2. Epub 2025 May 23. PMID: 40407981; PMCID: PMC12271237.

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India.
2. Professor, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India.
3. Associate Professor, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Divya Saini,
Senior Resident, Department of General Surgery, Maharani Laxmi Bai Medical College, Jhansi-284128, Uttar Pradesh, India.
E-mail: saini_divya@yahoo.com

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