

A Comparative Study on Effects of Defect Closure versus Non-Closure on Outcomes of Laparoscopic Direct Inguinal Hernia Repair

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ABSTRACT

Introduction: Laparoscopic direct inguinal hernia repair is a common surgical procedure with varying approaches to defect management. This study investigates the impact of defect closure versus non-closure on postoperative outcomes in this procedure. Defect closure, involving suturing the hernia defect, is often debated against non-closure, where the defect is left open. Understanding the differences in outcomes such as recurrence rates, postoperative pain, and recovery times is crucial for optimizing surgical techniques. This comparative analysis aims to provide insights into which method offers superior results, potentially guiding best practices in laparoscopic hernia repair and improving patient outcomes.

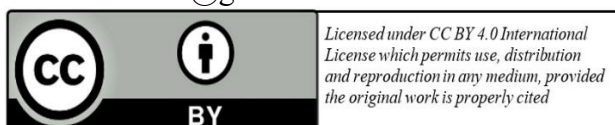
Methods: It was a cross-sectional descriptive study conducted in B. P. Koirala Institute of Health Sciences, Dharan. Two groups were created using purposive alternate number sampling technique with 44 in each defect closure and non-closure group.

Results: Forty-four patients were enrolled in each cohort. No significant differences were observed between the two patient populations' demographic information and the mean operative time. Compared to the group that did not undergo direct defect closure, the group that had direct defect closure demonstrated reduced seroma formation (24% versus 33%, $p = 0.225$) at 1st week, though it resolved in both groups on 6 months follow-up. The mean difference in postoperative hospital stay between these two groups was not statistically significant (1.16 ± 0.420 and 1.2 ± 0.447 , $p = 0.661$). There was no evidence of recurrence in either group during 1 year follow up and also there was no significant chronic pain in either of the group.

Conclusions: Our study shows that there was no statistical difference between defect closure and non-closure groups with regard to postoperative pain, vessel injury, vascular injury, peritoneal tear, seroma formation, chronic pain and recurrence rate. Randomized controlled trials will be required to further evaluate these outcomes.

Keywords: Hernia; Inguinal repair; Laparoscopy; Seroma.

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INTRODUCTION

Laparoscopic approach to inguinal hernia repair is the recommended approach for both bilateral inguinal hernias including recurrent inguinal hernia after anterior approach with open repair. Based on expertise available and resources provided it is also been recommended for patients with primary unilateral inguinal hernia due to a lower incidence of post-operative pain and chronic pain [1]. Totally extra peritoneal (TEP) and transabdominal preperitoneal (TAPP) repair are two commonly practiced laparoscopic procedures.

In spite of the basic advantages of laparoscopic surgery, the incidence of recurrence rates and seroma formation still remains high (5% and 12% respectively) in laparoscopic treatment.[2] Risk factors associated with recurrence include a high BMI, the presence of a direct defect, large defects, smoking, and post-operative surgical site infections.[3] Similarly, the presence of a medial defect, a large defect size, mesh fixation with glue, inguinoscrotal hernia and a residual hernia sac are associated with seroma formation.[4]

We plan to study the technical aspect of direct defect closure in laparoscopic inguinal hernia repair and evaluate its effect on the outcome of Surgery in terms of seroma formation, chronic pain and recurrence. Furthermore, it could potentially be the inaugural instance of its kind in our country.

METHODS

This was a non-randomized cohort study, which compares outcomes between patients who underwent laparoscopic inguinal hernia repair with or without closure of their direct defect in the Department of General Surgery of B.P. Koirala Institute of Health Sciences (BPKIHS), Dharan, from September 2020 to August 2021. Ethical clearance was taken from Institutional Review Committee (IRC) of BPKIHS before performing the study.

A total of 88 cases were divided in two cohort of defect closure and non-closure group, each comprising of 44. A purposive alternate number sampling technique was used to categorize in either of the groups. Written informed consent was taken before including them in the study.

The surgeries were performed under general anaesthesia as per the institutions' standard protocols. All hernia repairs were carried out using a standard 3-port technique using a 10×15 cm polypropylene steer mesh and fixation of the mesh was performed with tackers. All cases of age greater than 18 years with direct hernia defects equal to or larger than M2 (defect size of 2 finger breath as per European Hernia Society) were selected into either the closure group or the non-closure group.[1]

The patients were reviewed in the outpatient clinic at intervals of 1–2 weeks post-operation, a one month post-operation, with subsequent reviews at 3 months and 6 months from the previous follow-up session. The minimum duration of follow-up was 12 months postoperatively for evaluation of recurrences. The patients were evaluated for operative time, hospital stay, post-operative pain using Visual Analog Scale (VAS), seroma formation, and recurrence.

Data entry was done in Microsoft Excel and was converted to SPSS Version 16 software where statistical analysis was made using relevant statistical tests for descriptive statistics percentage, mean, standard, minimum, maximum was calculated along with graphical and tabular presentation. For inferential statistics chi square, independent t-test, Mann-Whitney U Test was applied to find out the significant difference between defect closure Vs defect non closure group and other selected clinical and demographic variables at 95% confidence interval, where level of significance was considered as $P < 0.05$.



Figure 1. Laparoscopic view of a direct defect during inguinal hernia repair



Figure 2. Closure of direct defect with barbed suture with incorporation of pseudosac



Figure 3. Completion of direct defect closure prior to mesh insertion

RESULTS

A comparison of patient demographic information is summarized in Table 1; there were no significant differences observed between the two groups. In both groups, the patients were predominantly male. The mean age was 40.13 (± 19.65) years in the closure group and 45.35 (± 18.33) years in the non-closure group ($p=0.153$). The mean operative time was 56.5 (± 4.3) minutes for the closure group and 45.7 (± 3.6) minutes in the non-closure group ($p=0.621$). Intraoperative events including vessel tear and peritoneal tear were noted.

Five patients had inferior epigastric artery injury which was controlled with ligaclip of energy devices. There was no statistically significant difference ($p=0.500$) in number of patients in either of the group. Sixteen percent of patient in defect closure group had peritoneal tear and 11% in non-closure group had peritoneal tear ($P\text{-value}=0.580$), which showed no significant statistical difference between two groups. They were closed with endoloops made of polydioxanone.

Table 1. Patient demographic information

	Defect closure (n=44)	Non-closure (n=44)	<i>p-value</i>
Gender			
Male	42(96.4%)	41(94.5%)	1.000
Female	2(3.6%)	3(5.5%)	
Mean Age (Years)	40.13	45.35	0.152
Operative time(min)			
Unilateral	56.3(±4.3)	45.7(±3.6)	0.631
Bilateral	62.3(±4.1)	48.3(±3.7)	0.513

Table 2. Post-operative outcomes for all hernia-repaired.

	Defect closure (n=44)	Non-closure (n=44)	<i>p-value</i>
Pain (in VAS score)			
At 1 week	1.55(±0.571)	1.380(±0.527)	0.121
At 1 month	1.25(±0.615)	1.20(±0.447)	0.596
At 3 months	1.24(±0.607)	1.11(±0.369)	0.188
At 6 months	1.20(0.524)	1.16(±0.424)	0.689
Seroma			
At 1 week	13(24%)	18(33%)	0.225
At 1 month	6(11%)	10(18%)	1.000
At 3 months	0(0%)	1(1%)	0.500
At 6 months	0(0%)	0(0%)	0
Length of hospital stay (days)	1.16(±0.420)	1.2(±0.447)	0.661
Days to resume normal activities and work	7.15(±1.129)	7.18(±1.565)	0.889
Recurrence (at 6 month follow up)	0	0	0.000

Data on post-operative outcomes and recurrence are summarized in Table 2. Post-operative seromas were noted in 13 (24%) hernia in the closure group and 18 (33%) hernia in the non-closure group at 1 week following operation and this was not statistically significant ($p=0.225$). Seroma was asymptomatic in all cases and treated conservatively. Recurrence was observed in none of the patient at six months of follow up in either of the group. Lower rates of post-operative pain up to 6 months postoperatively noted in the non-closure group, however, these

results were not statistically significant. Length of postoperative hospital stay and return to normal activities was also not statistically significant in either of the group.

DISCUSSION

The closure versus non-closure of defects in laparoscopic hernia surgery has been a subject of ongoing debate among surgeons seeking to optimize outcomes for their patient.[4]

The demographic variables were not significantly different in either of the group. This was similar to study proposed by Rutkow

in 2003.[5] The mean operation time slightly more in defect closure group owing to time taken during suturing the defect which but was similar study done by Zhu et.al in 2018.[6]

The seroma formation was one of the complications of laparoscopic inguinal hernia repair. The incidence of seroma formation was slightly higher in number in non-closure group as compare to defect closure group, although it was non-significant statistically. The reason behind this finding was a large defect size with huge dead space, wider dissection area, inguinoscrotal hernia, and a residual hernia sac. The study by Daes et al. [7] in 2014 illustrates that fixing the distal sac high and laterally to the posterior inguinal wall can lower the risk of developing clinically significant seromas. There are other alternative techniques that have been proposed to reduce the risk of seroma formation. Berney et al. [8] described primary closure of the direct inguinal hernia defect during endoscopic TEP approach with the use of pre-tied Endoloop (PDS) to plicate the attenuated transversalis fascia. This technique demonstrated a 1.3% seroma rate and no recurrence in 79 patients who underwent a total of 94 direct hernia repairs. But our study shows no statistically differences in seroma formation in between defect closure versus non-closure.

Pain was another important end point in our study. Our study did not find any difference in pain scores at 1 week, 1 month, 3 months and 6 months postoperatively, indicating that defect closure does not have any problems with postoperative pain. A study by Erica et al. in 2020[9] found that patients undergoing non-closure techniques reported lower pain scores in the immediate postoperative period compared to those who underwent defect closure. The size and type of hernia may also influence the impact of closure on postoperative pain. Larger hernias or those with extensive defects may benefit from closure to prevent mesh displacement or recurrence,

potentially leading to improved long-term pain outcomes. [10]

CONCLUSIONS

While the debate between defect closure and non-closure in laparoscopic hernia surgery continues, current evidence suggests that both approaches have their merits and limitations. The decision-making process should be guided by hernia characteristics, patient-specific factors, and surgical expertise. Ongoing research focusing on outcomes such as recurrence rates, postoperative pain management, and quality of life measures will further refine our understanding of the optimal approach for individual patients.

Ultimately, the choice between defect closure and non-closure should be tailored to each patient's unique clinical scenario, emphasizing shared decision-making and personalized care to achieve the best possible surgical outcomes and patient satisfaction. Future research focusing on long-term outcomes and patient-reported measures will further clarify the optimal approach for different patient populations.

CONFLICT OF INTEREST

None

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None

REFERENCES

1. The HerniaSurge Group. International guidelines for groin hernia management. *Hernia*. 2018;22(1):1–165. [\[DOI\]](#)
2. Dedemadi G, Sgourakis G, Radtke A, et al. Laparoscopic versus open mesh repair for recurrent inguinal hernia: a meta-analysis of outcomes. *Am J Surg*. 2010;200(2):291–7. [\[DOI\]](#)
3. Burcharth J. The epidemiology and risk factors for recurrence after inguinal

- hernia surgery. *Dan Med J*.2014;61(5). [\[DOI\]](#)
4. Köckerling F, Bittner R, Adolf D, Fortelny R, Niebuhr H, Mayer F, et al. Seroma following transabdominal preperitoneal patch plasty (TAPP): incidence, risk factors, and preventive measures. *Surg Endosc*. 2018;32(5):2222–31. [\[DOI\]](#)
 5. Rutkow IM. Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *Surg Clin North Am* [Internet]. 2003;83(5):1045–51. [\[DOI\]](#)
 6. Zhu Y, Liu M, Li J, Wang M. Closure of direct inguinal hernia defect in laparoscopic hernioplasty to prevent seroma formation: A prospective double-blind randomized controlled trial. *Surg Laparosc Endosc Percutan Tech*. 2019;29(1):18–21. [\[DOI\]](#)
 7. Daes J. Endoscopic repair of large inguinoscrotal hernias: management of the distal sac to avoid seroma formation. *Hernia*. 2014;18(1):119–22. [\[DOI\]](#)
 8. Berney CR. The Endoloop technique for the primary closure of direct inguinal hernia defect during the endoscopic totally extraperitoneal approach. *Hernia*. 2012;16(3):301–5. [\[DOI\]](#)
 9. Erica D Kane, Marc Leduc, Kathryn Schlosser et al. Comparison of peritoneal closure versus non-closure in laparoscopic trans-abdominal preperitoneal inguinal hernia repair with coated mesh. *Surg Endosc*. 2020;34(9):4031-4037. [\[DOI\]](#)
 10. A Tandon , S Pathak , NJR Lyons et al. Meta-analysis of Closure of fascial defect during laparoscopic ventral and incisional hernia repair: A meta-analysis. *Hernia*. 2018; 22(5):661-672. [\[DOI\]](#)