

LAPAROSCOPIC VERSUS OPEN VENTRAL HERNIA MESH REPAIR: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT

Introduction: A ventral hernia (VH) is defined as a protrusion through the anterior abdominal wall fascia. Among various types of repairs proposed for ventral hernias, mesh repair has become most popular and acceptable. Different studies have shown benefit of laparoscopic ventral hernia repair over open ventral hernia repair on shorter hospital stay, early return to work, less wound infection and less incidence of recurrence.

Method: This is a prospective comparative observational study conducted at Bir Hospital, for a period of one year. A total of 84 patients were enrolled in the study comprising of 42 in LVHR group and 42 in OVHR group. Hospital ethical committee approval was taken and written. Informed consent was obtained from all patients enrolled in the study. Data was collected on a structured proforma and analyzed with SPSS version 23 and Microsoft excel 2010. Outcomes measured were association with BMI, length of hospital stay, operation time, postoperative time, wound infection and hernia recurrence rate within 1 year.

Results: Among total 84 cases, 54.8% were female. The mean age of patients for LVHR and OVHR group were 48.52 ± 12.793 years and 43.50 ± 14.920 years respectively. 58.61% patients had BMI >25 kg/m². LVHR group had significantly less postoperative pain than the OVHR group at 24, 48 hours and on 7th postoperative day (P value <0.05). The mean hospital stay after surgery was less for LVHR group (2.33 ± 0.52 vs 3.48 ± 1.31) which was statistically significant. ($p = <0.05$).

Conclusion: Laparoscopic ventral hernia repair has promising results in the repair of ventral hernia and the short-term results are encouraging with less post-operative pain, length of hospital stay, reduced post-operative complications and improved quality of life when compared to open repair.

Key Words: *Laparoscopic Ventral Hernia Repair (LVHR), Open Ventral Hernia Repair (OVHR), Ventral Hernia (VH).*

INTRODUCTION:

A ventral hernia (VH) is defined as a protrusion of intra-abdominal contents through the anterior abdominal wall fascia. These defects can be spontaneous (80-85%) or acquired (15-20%). According to the anatomical location they are termed as epigastric hernias, umbilical hernias and hypogastric hernias. Incisional hernias account for 15% to 20% of all abdominal wall hernias. (1) Diastasis recti can present as a midline bulge where the linea alba is stretched, resulting in bulging at the medial margins of the rectus muscles. (2)

Ventral hernia repair is one of the most commonly performed procedures in Nepal. In the past, most repairs were open. In recent years, laparoscopic repair for ventral hernias are becoming more popular. Ever since the first laparoscopic ventral hernia surgery by Le Blanc in 1993, it showed a lot of promise in the treatment of ventral hernias. However, unlike inguinal hernia, ventral hernia laparoscopic surgery is still not the standard treatment. The main reason for this is higher recurrence rates and duration of surgery in the early data. At present, with the advancement of technicality and better understanding of the laparoscopic anatomy, laparoscopic repair has emerged as a promising alternative to open repair. (3)

Previous studies show a lower incidence of postoperative complications and recurrence in hernias repaired laparoscopically. Based on comparative trials laparoscopic incisional hernia repair results in fewer postoperative complications, shorter hospital stay, early return to work, lower infection rate, and decreased hernia recurrence. (4-8)

Additionally, laparoscopic surgery has clear advantage in patients with obesity and has better postoperative cosmesis. Hence Laparoscopic surgery has gained paramount importance due to all these described benefits.

Despite there being, several have compared laparoscopic versus open mesh repair for ventral hernias. To date, there has been no published literature on the comparison of laparoscopic and open ventral hernia repair in Nepal. Therefore, this study aims to compare postoperative complications, pain, quality of life and early recurrence (within 1 year) between open and laparoscopic ventral hernia repair in a prospective observational study.

METHOD

This was an observational prospective study comparing postoperative outcomes and recurrence in adults who underwent laparoscopic versus open ventral hernia repair. Inclusion criteria were adult patients with epigastric, umbilical, paraumbilical and incisional hernias admitted to Department of General surgery, Bir Hospital, from July 2020 to February 2021 for elective surgical hernia repair. Exclusion criteria were hernias less than 1cm diameter (determined by physical exam and ultrasound), repairs that required bowel resection, patients who did not consent to the study or who were deemed unfit for anaesthesia at the pre-anaesthetic check.

For a study power of 80% and a risk of Type I error at 5%, it was calculated that 76 participants were required (38 in each arm) based on previous data indicating rates of incisional infection of 24% and 3% in open versus laparoscopic ventral hernia repair respectively. With a 10% attrition rate it was noted that 84 patients would be required so this was the recruited number.

Data was collected on a structured proforma by trained members of the surgical team, both surgeons and the ward in-charge for admitted patients, who underwent a detailed orientation of the study and enrolment systems. Patients who fulfilled the inclusion criteria were given thorough information, assured of anonymization of data and then informed written consent was obtained.

A detailed clinical history and examination was performed. Demographic data collected included the age, sex, and occupation. Pre-operative investigation were completed including a complete blood count, urine routine, blood sugar, blood urea, serum creatinine, serum electrolytes, chest X-ray and ECG. Ultrasonography was performed to note the number and size of the defect of hernia.

84 patients were randomized as per the computed randomization sequence into two groups to undergo open ventral hernia repair (Group 1, n=42) or laparoscopic ventral hernia repair (Group 2, n=42). A sealed envelope was provided to each patient to determine which group they were allocated.

84 patients were enrolled in the study based on the inclusion criteria. Patients were given information on the details of the two procedures and associated costs and chose their preferred procedure based on personal preference. Group 1 were those who chose to undergo open ventral hernia repair (OVHR) and Group 2 chose to undergo laparoscopic ventral hernia repair. (LVHR) Recruitment continued until 42 patients were in each group.

The surgical techniques of the two compared procedures are described in detail in Appendix 1. Laparoscopic methods are carried out under general anaesthesia while patients undergoing open repair had regional (spinal)

anaesthesia. For open repair, defects less than 2cm were repaired with polypropylene sutures and those greater than 2cm were repaired with a prosthetic mesh. For laparoscopic repair intraperitoneal composite meshes were used.

The intraoperative findings were recorded including the number and size of the defect, Swiss cheese patterns and so on. Additional operative time and any complications were noted including bleeding and bowel injury.

Postoperatively data was collected at 24 hrs, 48 hrs, 7 days, 1 month, 6 months and one year on follow-up. Pain assessment with a Visual Analogue Score (VAS) from 0 to 10 was carried out at all follow up points, as well as if any postoperative complications such as hematoma, seroma or wound infection. Early recurrence of hernia and chronic neuralgia was inquired about at 6 month and 1 year. Follow up was done at the patient's visit to surgery OPD, or by telephone if this was not possible.

RESULTS:

The total number of participants was 84, with 42 individuals in each group. Table 1 shows the demographic data of the patients in the study and the site of hernia repair, divided by surgical procedure undertaken and total. The total age range was 21 to 84 years old. The mean age was 48.52 ± 12.793 years for the laparoscopic group and 43.50 ± 14.920 years for female. Body mass index was similar in both groups with no statistically significant difference ($p = 0.379$).

Intraoperative data showed that the operative time for LVHR was significantly longer than OVHR (mean 128 vs 76.1 minutes respectively, $p < 0.001$). However, the mean hospital stay after surgery was less for LVHR group (2.33 vs 3.48 days) compared to OVHR, which was statistically significant ($P < 0.05$). Intraoperative complication rates are shown in table 2. Absolute figures are very low in both groups with no statistically significant difference but it is notable that bleeding occurred in three patients in the OVHR group whereas did not occur in any patients in the LVHR group.

Table - 1 : The demographics (sex, age and BMI) and hernia sites of participants in this study, separated by surgical intervention

		Open Ventral Hernia Repair n (%)	Laparoscopic Ventral Hernia Repair n (%)	Total n (%)
Sex	Male	24 (57.1%)	14 (33.3%)	38 (45.2)
	Female	18 (42.9%)	28 (66.7%)	46 (54.8)
Age (years)	20-29	Not collected	Not collected	8 (9.5)
	30-39	Not collected	Not collected	18 (42.9)
	40-49	Not collected	Not collected	25
	50-59	Not collected	Not collected	19
	60+	Not collected	Not collected	14
BMI (Kg/m ²)	<18	Not collected	Not collected	0
	18.5-24.9	Not collected	Not collected	30 (35.7)
	25-29.9	Not collected	Not collected	44 (52.4)
	≥ 30	Not collected	Not collected	10 (11.9)

Site of hernia	Epigastric	14 (33.3)	8 (9.52)	22 (26)
	Incisional	9	17	26 (31)
	Umbilical	18 (42.9)	13	31 (37)
	Periumbilical	1	4	5 (6)

Table 2: Rates of intraoperative complications

	LVHR	OVHR	Fischer exact test (P -value)
Bleeding	0	3	0.241
Bowel injury	0	0	-
Subcutaneous emphysema	1	0	0.312
Others	0	0	-

Postoperative data complications also showed higher rates in the OVHR compared to the LVHR group, but again the absolute numbers were too small for statistical significance ($p > 0.05$). In the OVHR group two patients had formation of a seroma, four developed a wound infection and five postoperative ileus during postoperative period. This was compared to zero, two and two respectively in the LVHR group. Hernia recurrence was seen in 2 cases in the OVHR group compared to no recurrences were seen in the LVHR group. It should be noted that follow up was only for 1 year, and recurrence is more likely after this period.

The final postoperative data collected was pain using a 0=10 visual analogue scores. Table 3 and Figure 1 illustrate that patients in the LVHR group described significantly less pain than the open group and this was statistically significant (p value < 0.05) at 24 hours, 48 hours and 7 days postoperatively. The pain scores at future time points were similar.

Table 3: Pain Visual Analogue Scores

Time Interval	LVHR	OVHR	P-Value
	Mean \pm SD	Mean \pm SD	
Pre-operative	0.43 \pm 0.67	0.24 \pm 0.43	0.054
24 hours after surgery	4.00 \pm 0.31	6.12 \pm 0.45	0.006
48 hours after surgery	3.14 \pm 0.47	4.69 \pm 0.87	0.001
7 days after surgery	2.14 \pm 0.42	3.62 \pm 0.99	0.001
1 month after surgery	0.19 \pm 0.39	0.43 \pm 0.70	0.061
6 months after surgery	0.02 \pm 0.15	0.07 \pm 0.34	0.413

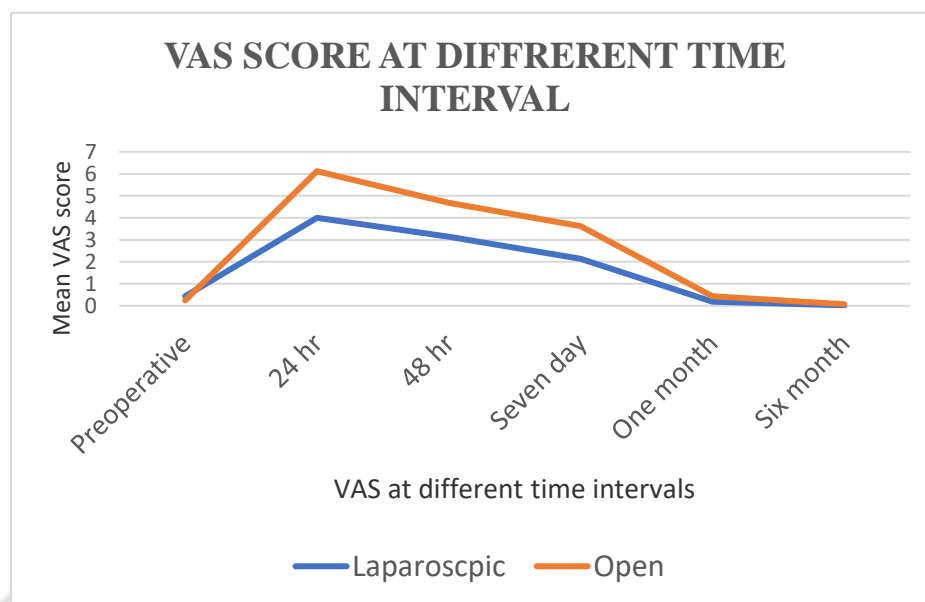


Figure 1: VAS score

DISCUSSION:

The present study is a prospective non randomized study comparing the results of open versus laparoscopic ventral hernia repair in a short term. In the present day, prosthetic mesh repair has become the gold standard for hernia surgery. This has played a pivotal role in reducing the recurrence rates. The worldwide acceptance of laparoscopic surgery, has paved the way for an alternative to open hernia surgery. Ever since the first laparoscopic ventral hernia surgery by Le Blanc in 1993(9), the procedure has faced many challenges and underwent many modifications till date. Studies have shown that major advantages of laparoscopic ventral hernia repair are avoidance of large incisions and extensive dissections, lower incidence of wound infections and hospital stay.

In a study done by Stephen (10), of the total 268 patients, 110 (41%) underwent open ventral hernia repair and 158 (59%) underwent laparoscopic ventral hernia repair. Recent study done by Anuroop et al (11) in 2017 included total 82 patients with 51 patients in open group and 31 patients undergoing laparoscopic intraperitoneal mesh repair. In one of the largest studies conducted by Chalabi et al (12) in 2015 there were a total of 611 patients, 305 patients in open group and 306 in laparoscopy group.

In our study of 84 participants, 33.3% of patient who underwent Laparoscopic ventral hernia repair were male and 66.7% of patients were female in this group; whereas in open hernia repair group 57.1% of patients were male and 42.9 % of patients were female. In general, 45.2% of patients with ventral hernia were male and rest 54.8% were female. This shows that there were almost equal distribution of ventral hernia in both sexes with slightly higher incidence in female. This finding was consistent with several other studies. In a study done by Stephen (10) 42.53% of patients were male and 57.46% of patients were female. In another study done by T.A Solomon (13), 65% of patients were female and 35% were men. Similar results were seen in recent study done by Magdy (14) where 60% patients in laparoscopic group were female and in open group 50% patient were female.

In this study, the mean age of patients undergoing laparoscopic ventral hernia repair and open ventral hernia repair in our study was 48.52 ± 12.793 years and 43.50 ± 14.920 years respectively which was consistent with study conducted by Misra et al (15) in which the mean age of the patients in open group was 45.2 years and laparoscopy group was 45.96 years but in contrast study conducted by Itani et al (16), the mean age in laparoscopy group was 61.2 years and in open group was 59.6 years.

Several studies relate obesity with the appearance of primary ventral hernias. There is increased risk of incarceration and recurrence after repair in obese patients (17). In these patients, the laparoscopic approach minimizes the risk and comorbidity generated by obesity in abdominal wall surgery obtaining better results. In a sample of 26,268 patients from 14 hospitals, Lau et al (18) stratified patients with obesity and ventral hernia according to the body mass index (BMI) and confirmed that the higher the BMI, the greater the risk of abdominal wall hernia. In this present study, it was found that 52.38% of patients with ventral hernia were overweight with BMI more than 25Kg/m² but

less than 30kg/m² and 11.90% were obese with BMI more than 30 kg/m². However, 35.71 % of patients who developed ventral hernia had normal BMI between 18.5 to 24.9 kg/m². In the study done by Stephen, 92% of patients had BMI over 25 kg/m². In a study done by Fekkes (19) including 12000 patients, surgical site infection (SSI) was significantly lower with laparoscopy than with the open approach in patients with a BMI over 30. These findings support the notion that the laparoscopic approach minimizes the risk and comorbidity generated by obesity in abdominal wall surgery.

In the present study of ventral hernia consisting of epigastric, umbilical, para umbilical and incisional hernias, umbilical hernia was the most common presentation. About 43% of the patients in open group had umbilical hernia while in laparoscopy group majority had incisional hernia which account for 40.47%. In study done by Anuroop et al (11), majority of the patients in open group had incisional hernia (47.1%) while in laparoscopy group majority were umbilical hernia (41.9%). This also shows that umbilical hernia and incisional hernia are usually the presentation in ventral hernia with other types being less common as compared to these two varieties. In another study done by Stephen et al(10), 121 out of 268 had incisional hernia followed by umbilical hernia (33/268) with other types being much less common.

The operating time was one of the detrimental factors in the assessment of the effectiveness of the procedure. In the present study, the mean operating time was 76.1 mins in open group and 128 mins in laparoscopy group which was statistically significant. (p value <0.001). In the study done by Chalabi et al (13), laparoscopic repair was associated with longer operating room times (2.2 vs 1.7 h; p < 0.001), but there was a trend toward shorter average hospital stays (1.1 vs 1.5 days; p = 0.10). In our study also although laparoscopic ventral hernia repair surgery was associated with longer operative time, patients had less number of hospital stay. Furthermore, long operative time was also explained by the application of trans-fascial sutures in almost all cases in our patients treated with laparoscopic ventral hernia repair. In a RCT conducted by Hasan et al(20), the mean operative time in the laparoscopic group was significantly longer than in open group (100 vs 76 minutes, P=0.001).

In terms of postoperative pain, at 24 and 48 hours and 7 days, the LVHR group experienced significantly less pain than the open group (P <0.05). Most of the studies did not experience any pain during assessment at 1 month and 6 months in both group which is consistent in our study as well. Increased pain in open group during 24 hours to 7 days of surgery was reported which can be probably explained by extensive dissection involved in the tissue repairs as well as the size of the incision. In study conducted by Anuroop et al(11), mean duration of pain was higher in open group (6.9 days vs 2.35 days) as compared to laparoscopic group with p value <0.001. In another study done by Magdy et al (14) in LVHR group number of patients requiring additional analgesia were 30 % while in OVHR group patients requiring additional analgesia were 65 % (P = 0.027).

The significantly shorter mean hospital stay after surgery for the LVHR group were reported in several other studies. In two RCTs conducted by Holzman et. al (21), Anuroop et al (11) and Magdy et al (14) showed significant difference between the two groups and favored laparoscopy.

Both intraoperative and postoperative complications were higher in open group as compared to laparoscopy group. A prospective study done by J. M. McGreevy et al (22) comparing the complication rates between laparoscopic and open ventral hernia repairs showed that there were fewer complications among patients undergoing laparoscopic repair (8% vs 21%; p = 0.03). In study done by Froylich (23), overall, perioperative complications following LVHR and OVHR were 17.1 versus 20.5% (p = 0.53). However, in a RCT conducted by Hasan et al (24) perioperative complications were significantly higher with laparoscopy (9% vs. 2%).

All the recent studies showed decreased recurrence rates with laparoscopic repair. Numerous similar studies had been conducted at international level that favored laparoscopic repair for ventral hernia. In our study there were two recurrences seen in open group and no recurrences were reported in laparoscopic group. However, it was not statistically significant (p value >0.05). In case of laparoscopic group, trans-fascial sutures were also applied for prevention of recurrences. In study done by Froylich (23), recurrence rates in the laparoscopic and open approaches were 20.0 versus 27.1% (p = 0.28), respectively Blanc et al (9) stated —We feel the use of transfascial sutures is a must for proper fixation of the prosthetic material and also most of the earlier studies emphasized the need for transfascial sutures. In the recent times, studies are emerging with double crown technique using tacking devices which resulted in similar if not less recurrence rates.

CONCLUSION:

Laparoscopic ventral hernia repair in this study has shown promising results similar to other published literature, with a clear advantage over open repair in regard to reduced post-operative pain, decreased post-operative complications, reduced length of hospital stay, and less time for return to normal activity and better cosmesis rates.

Hence, laparoscopic ventral hernia repair is a safe and superior alternative to open repair unless there is specific contraindication for laparoscopy surgery.

Open hernia repair which is associated with higher incidence of complications is reiterated once again in our study too. Thus, management of ventral hernia with open method can be narrowed down to only cases which are complicated with multiple adhesions or irreducible, incarcerated, strangulated hernia

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Conflict of interest: None

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