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A comparative study of laparoscopic versus open ventral hernia repair

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ABSTRACT

Background: The use of laparoscope in the treatment of abdominal wall hernia repair was first reported in 1993 by LeBlanc and William. But with the passage of time and gaining of expertise, LVHR is now being perform more often but it is still not the gold standard of management. Today the proven advantage laparoscopic ventral hernia repair, open ventral hernia repair is less intraoperative blood loss, shorter hospital stays and early return to normal activity. We tried to compare laparoscopic ventral hernia repair versus open ventral hernia repair in primary ventral hernia. **Aims and Objectives:** The aim of this study was to compare laparoscopic ventral hernia repair (LVHR) and open ventral hernia repair with respect to the operating time, intraoperative blood loss, intraoperative enterotomy, post-operative complications, hospital stay, and return to normal activity. Retrospective cum prospective study. **Materials and Methods:** This retrospective cum prospective study was conducted in a tertiary care center teaching hospital, M.L.B. Medical College, Jhansi between January 2020 and June 2021. All consented patients after matching for age, sex, and type of ventral hernia, were allocated to either two groups: Groups A open ventral hernia repair (OVHR) 25 case versus Group B (Laparoscopic ventral hernia) repair 25 case. **Results:** In our study intraoperative blood loss, post-operative complication, hospital stay, return to normal activity was less in LVHR as compared to OVHR. Operating time was found to be non-significant between two groups and occurrence of inadvertent enterotomy although more in LVHR, was still insignificantly different. **Conclusion:** The findings of present study demonstrate that LVHR was safe and better when compared with OVHR.

Key words: Laparoscopic ventral hernia; Mesh; Open ventral hernia repair; Transfacial suture

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INTRODUCTION

Ventral hernia is defined as any protrusion through abdominal wall, with the exception of hernia through the inguinal and femoral regions.[1]

Ventral hernia can be classified as spontaneous (primary) or acquired (secondary) or by their site on the abdominal wall. Spontaneous hernias are classified as epigastric hernia, umbilical hernia, and hypogastric hernia. Acquired hernias commonly occur after surgical incisions, so they are termed incisional hernias.[2]

The main challenges in hernia management lie in deciding the surgical approach and type of repair procedure to perform, that is, laparoscopic or open surgery, anatomical or mesh repair and type of mesh to use, and where to place the mesh to guarantee the strongest possible repair with the least probability of recurrence.[3]

The use of laparoscope in the treatment of abdominal wall hernia repair was first reported in 2000 by LeBlanc Ka et al[4].

But with the passage of time and gaining of expertize laparoscopic ventral hernia repair (LVHR) is now being perform more often but it is still not the gold standard of management. Today the proven advantage LVHR, open ventral hernia repair (OVHR) is less intraoperative blood loss, shorter hospital stay, and early return to normal activity. We tried to compare LVHR versus OVHR in primary ventral hernia.

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Aims and objectives

The aim of this study was to compare laparoscopic and open hernioplasty in all ventral hernias (including incisional hernia, epigastric hernia, spigelian hernia, hernia after cesarean section, hernia after appendectomy, and hernia after any laparotomy).

Data for comparison would include:

1. Operating time
2. Intraoperative blood loss
3. Intraoperative enterotomy
4. Post-operative complications
   - Vascular complications
   - Pain
   - Recurrence
   - Surgical site infection
   - Seroma
5. Return to normal activity.
6. Hospital stay.

MATERIALS AND METHODS

Study design

This retrospective cum prospective study was conducted in a tertiary care center teaching hospital, M.L.B. Medical College, Jhansi between January 2020 and June 2021.

Source and methods of collection of data

This study population included patients with all types of ventral hernia both (spontaneous hernia and incisional hernia) admitted to the department of surgery a proper relevant clinical history or clinical examination and investigation were carried out.

The present study was conducted after obtaining the ethical committee approval and written informed consent form 50 patients who are randomly divided into two groups after matching age, sex, and type of hernia.

- Group A: Laparoscopic ventral hernia repair (LVHR) [IPOM plus]
- Group B: Open ventral hernia repair (OVHR).

Exclusion criteria

- Patients presenting with strangulated hernia and a hernia size more than 6 cm transvers diameter were excluded from the study.

Methodology

The hernia defect was documented and USG CT scan with regards to number and size of defects. All patients received antibiotic prophylaxis injection cefuroxime (1.5 gm IV) half and hour before surgery.

Procedure for open surgery

All patients were operated under spinal anesthesia. Foleys catheterization and nasogastric tube were occasionally used. Skin flap undermining was limited only to edge of sac. The sac was opened contents inspected and reposited back. The preperitoneal space dissection was started by striping the peritoneum 1–2 inches from the age of defect. Adequate prepertioneal space was created to accommodate a 15 cm transverse length mesh Figure 1. Mesh was not fixed as the dissection preperitoneal space trap the mesh Figure 2. Anterior rectus sheath and rectus muscle was closed over the mesh by nonabsorbable sutures. Suction drain

Figure 1: Preperitoneal space created around the defect (approximately 5 cm all around)

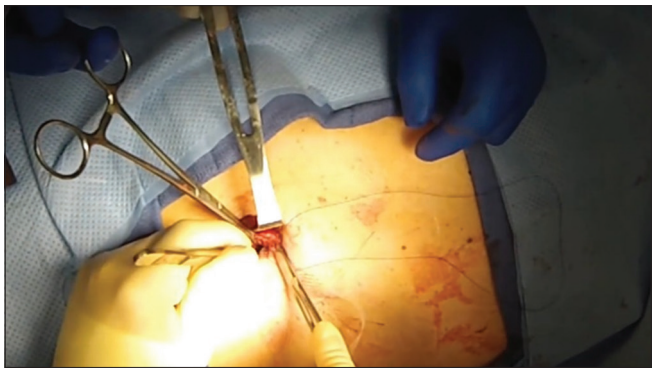

Figure 2: Mesh fixation in preperitoneal space done

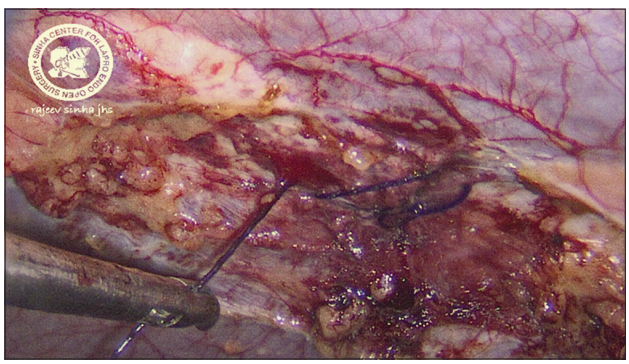

Figure 3: Adjacent tissue from the defect was removed after achieving hemostasis with closure of fascial defect by braided absorbable suture

Figure 4: Mesh fixation done with transfascial suture

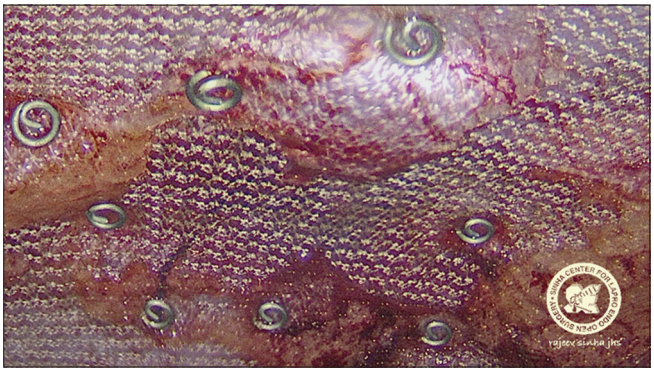

Figure 5: Mesh was anchored with the use of trackers

was placed in few cases based on the need depending on skin flap dissection.

Procedure for laparoscopic surgery

All the patients were operated under general anesthesia. Nasogastric tube was optional but a Foleys catheter was placed for upper abdominal hernias. Surgeon position was on the side opposite to the side of hernia or in medline defect on the left side of the patient. Pneumoperitoneum was established by veress needle through Palmers point. Adhesiolysis was done using sharp dissection. Defect delineated and size was measured intracorporeally and extracorporeally. The size of the mesh required was selected for minimum 5 cm normal overlap. The area to be covered by the mesh was marked after pneumoperitoneum was released and the sites for transfascial sutures were marked with the defect at its center. The defected was closed with transfascial interrupted extracorporeal number 1 prolene suture or number 1 PDS suture Figure 3 The mesh was fixed with eight transfascial sutures Figure 4. The sutures were drown out with the help of suture passer needle. Non-absorble Tackers (Coviden Protack) where applied around the defect in a Double crown technique Figure 5. Compression dressing applied on the hernia site to prevent seroma formation.

Post-operative assessment of pain

The pain in the post-operative period was graded according to the visual analog scale ranging from no pain to the worst possible pain on a scale of 0–10.

Cosmesis was assessed by a patient satisfaction score on a scale of 1–10, where 1 is the best possible result and 10 is the worst possible result.

Statistical analysis

Data were analyzed by the Statistical Package for the Social Sciences (SPSS for windows, version 25.0). Descriptive statistics included mean and standard deviation for numerical variables, and the percentage of different categories for categorical variables.

RESULTS

In this study most common age group of ventral hernia is 40-50 years and most common in female. Incisional hernia in more common than spontaneous ventral hernia (Tables 1-3).

In this study intraoperative enterotomy more chance in laparoscopic ventral hernia repair and intraoperative blood

Table 1: Age distribution in study group

Age	Group A (*n*=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
21–30 years	1	4.00	3	12.00
31–40 years	6	24.00	3	12.00
41–50 years	10	40.00	8	32.00
51–60 years	4	16.00	4	16.00
>60 years	4	16.00	7	28.00
Total	25	100	25	100.00

Table 2: Mean age distribution in study group

Age (in years)	Group A (n=25) [LVHR]	Group B (n=25) [OVHR]	P value
Mean±SD	47.48±11.0571	49.92±14.0384	0.50 (NS)

Table 3: Sex distribution in study group

Sex	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
Male	8	32.00	10	40.00
Female	17	68.00	15	60.00
Total	25	100.00	25	100.00

Table 4: Type of hernia in study group

Type of hernia	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
Incisional Hernia	16	64.00	13	52.00
Spontaneous ventral hernia	9	36.00	12	48.00
Total	25	100.00	25	100.00

Table 5: Mean duration of surgery in study group

Duration of Surgery	Group A (n=25) [LVHR]	Group B (n=25) [OVHR]	P value
Mean±SD	46.44±14.148	51.76±21.639	0.31 (NS)

Table 6: Intraoperative blood loss (ml)

Blood loss (in ml)	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
<50	19	76.00	5	20.00
50–100	5	20.00	5	20.00
101–150	0	0.00	11	44.00
151–200	0	0.00	0	0.00
>200 mL	1	4.00	4	16.00

Table 7: Mean post-operative pain (VAS) in study group

Post-operative pain (VAS)	Group A (n=25) [LVHR]	Group B (n=25) [OVHR]	P value
Day 1	4.88±1.166	6.4±1.414	0.0001 (S)
Day 2–5	1.2±1.155	3.44±1.227	0.0003 (S)
Day 6–10	0.4±0.816	1.84±1.281	0.0003 (S)
Day 11–15	0.08±0.4	1.36±0.952	0.0001 (S)

Table 8: Intraoperative events in study group

Intraoperative events	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
Enterotomy	1	4.00	0	0.00

Table 9: Post-operative events in study group

Post-operative event	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
Seroma	1	4.00	3	12.00
Surgical site infection	1	4.00	2	8.00
Pain	2	8.00	10	40.00
Vascular complication	0	0.00	0	0.00
Recurrence	0	0.00	1	4.00
Return to normal activity	25	100	25	100

Table 10: Mean hospital stay in study group

Hospital stay (in min)	Group A (n=25) [LVHR]	Group B (n=25) [OVHR]	P value
Mean±SD	2.84±0.80	6.56±3.863	0.0001 (S)

Table 11: Resume to work in study group

Resume to work (in days)	Group A (n=25) [LVHR]		Group B (n=25) [OVHR]	
	Number	Percentage	Number	Percentage
0–5 days	23	92.00	0	0.00
6–10 days	02	8.00	0	0.00
11–15 days	0	0.00	20	80.00
16–20 days	0	0.00	5	20.00
Total	25	100	25	100

Table 12: Mean Resume to work in study group

Mean resume work (in days)	Group A (n=25) [LVHR]	Group B (n=25) [OVHR]	P value
Mean±SD	11.72±4.335	17.00±5.392	0.0002 (S)

loss and post operative complication (Seroma, Surgical site infection, Pain, Vascular complication, Recurrence, Return to normal activity) and hospital stay is more in open ventral hernia repair (Group B) so laparoscopic ventral hernia repair is more favourable than open ventral hernia repair (Tables 4-12).

DISCUSSION

Demographically age and gender both the groups were comparable with P=0.5 (NS) mean age in Group A was 49.84±8.72 and mean age in Group B was 49.12±19.03 years Tables 1 and 2. Similar result was reported by Ketan et al., which found the most common age group to be 41–50 years in both the groups Table 3.

Types of hernia

In both the study groups, majority of patients had incisional hernia followed by spontaneous ventral hernia rate was comparable and it was found insignificant Table 4.

Duration of surgery

Mean duration of surgery was 46±14.14 min in Group A where as in Group B duration was found to be 51.76±21.63 min, the difference was seen to be non-significant with P=0.31 (NS) Table 5.

Similar result was also observed in the study of Rogmark et al[5], where was no statistically difference between operative

time for open or laparoscopic repair was documented. The operating time among other factor depend on the expertize of the surgeon.

But Carbajo et al[6], in the year 1999, conducted a study of major incisional and abdominal wall hernia repair with mesh in which total 60 patients were assigned at random, over a 3 years period, to two homogenous group. Half of them were operated upon laparoscopically and rest with open surgery. The group that was operated on laparoscopically had a significantly lower surgery time Table 6.

Intraoperative blood loss

Intraoperative blood loss, in Group A, the majority of 76% patients had <50 mL blood loss whereas, in Group B, 44% patients had blood loss between 100 and 150 ml. The difference was found to be highly statistically highly significant (P<0.0001). This result is in concordance with many previously published studies.

A study by Ahonen-Siirtola et al[7], in the year 2015 entitled "Complications in Laparoscopic Versus Open Incisional Ventral Hernia Repair. A Retrospective Comparative Study" found that laparoscopic operations had a lower mean blood loss (13 vs. 31.5 mL, P=0.028), compared to open operations.

Intraoperative enterotomy

In our study, Group A 1 patient had enterotomy (4%) whereas there was no enterotomy in Group B. This patients operation was converted to open laparotomy and primary repair of bowel perforation was done Table 8.

Zhang et al[8], in the year 2014, conducted a study of laparoscopic versus open incisional and ventral hernia repair, A systemic review and meta-analysis they found that incidence of bowel injury was significantly higher in laparoscopic group as compared to open group (laparoscopic (4.3% vs. open group 0.4%).

In another study by Karl Andrew Le Blancet al[9] in 2007 "Enterotomy and mortality rate of laparoscopic incisional and ventral hernia repair. Review of literature "The review had identified this to occur in 1.78% of patient who undergo review of LVHR".

Post-operative complication

In our study, we found that the majority of the patient in both the study group had postoperative pain followed by surgical site infection as most frequent complications.

Seroma

Seroma formation in Group A (LVHR) was seen in 4% was less as compared to Group B (OVHR) (12%).

Similar results has been observed in 2008 study by Tsimoyiannis et al[10], entitled "Seroma and Recurrence in Laparoscopic Ventral Hernioplasty:" Cauterization of the hernia sac and a central full-thickness suture to reduce dead space significantly to prevent seroma Table 9.

Surgical site infection

In our study found that surgical site of infection formation in Group A (4%) was less as compared to Group B (4%).

Similar result were also observed in study by Castro PM et al[11], in the year 2014 who conducted a study entitled "Laparoscopy versus Laparotomy in the repair of Ventral Hernias: systematic review and meta-analysis." Their objective was to compare the laparotomy and laparoscopic techniques for correction of ventral hernia when related to perioperative complications, length of hospitalization, surgical time, and recurrence of hernia. And concluded that in the correction of ventral hernias, the use of laparoscopic technique is effective to reduce infections of the surgical wound.

Pain

In our study, we found that majority of the patient in Group A had less post-operative pain as compared to Group B. Incidence post-operative of pain was very high Group B (40%) than group A (8%). This data were statistically significant Table 7. Similar results had been observed in other studies also.

Pierce et al[12], in the year 2007, conducted a study titled "Pooled data analysis of laparoscopic versus. OVHR: 14 years of patient data accrual" found that open approach had higher incidence of prolonged procedure site pain (1.96% vs. 0.92%, P=0.0469) as compared to LVHR

Vascular complications

In our study, there was no vascular complication like DVT or pulmonary embolism. All patients had normal BMI. Rogmark P et al[5], reported no case of vascular complication, however in other studies like Colavita et al[13], the reported incidence of DVT was 0.5% for laparoscopic group versus 0.7% for open group; In Ecker et al[14], it was 0.2% for laparoscopic group versus 0.3% for open group and in the study by Ahonen-Siirtola et al[7], the reported rate was 0.4% of laparoscopic group versus 0.62% of open group for pulmonary embolism.

Recurrence

In our study, we found that only one patient in Group-B had recurrence was statistically insignificant.

Similar result was also observed by Gonzalez R et al[15], in the year 2003 who conducted a study entitled

"Laparoscopic Versus Open Umbilical Hernia Repair." They reviewed all umbilical hernia repairs performed over last 5 years at their hospital. The length of stay (LOS) was longer in the open repair with mesh than in the (primary suture repair) group. When compared with open repair with mesh, LR resulted in the lower recurrence rates. LR resulted in fewer recurrences in patients with the previous repairs and hernia larger than 3 cm than in open techniques.

Duration of hospital stay

In our study, we found that all patients in Group A have hospital stay of (1–3 days) and Group B had stay of 5–7 days, respectively. This difference was found to be statistically significant with P=0.0001. This result is accordance with previously published studies.

In study by Fernández Lobato et al[16], in the year 2014 who conducted a study titled "Cost-benefit analysis comparing laparoscopic and OVHR." in which they did a prospective study of 140 patients with primary and incisional hernia, and analyzed clinical data, morbidity, costs of surgery, and hospital stay costs found that LVHR is associated with a lower average LOS Table 10.

Return to work

In our study in Group A patient returned to work within 11.72±4.335 days of post-operative day but in Group B return to work 17±5.392 days. The deference was found to be statistically significant. Lifting heavy weight and exercise were not permitted till 6 weeks Tables 11 and 12.

Limitations of the study

Sample size was a small and single-center study.

CONCLUSION

The findings of the present study demonstrate that LVHR was safe and when compared with OVHR had comparatively-

1. Shorter operative time.
2. Less intraoperative blood loss.
3. Less post-operative pain.
4. Less hospital stay.
5. Early return to normal activity.
6. Less recurrence.
7. But the incidence of enterotomy was slightly more in laparoscopic which was insignificant difference.
8. Hence, it is concluded than LVHR should be procedure of choice.

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SKP, ASY, RS- Concept and design of the study, prepared first draft of manuscript; Interpreted the results; reviewed the literature and manuscript preparation; Concept, coordination, preparation of manuscript and revision of the manuscript.

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