Original Research Article

New Indian Journal of Surgery
Volume 11 Number 4 / October–December 2020
DOI: https://dx.doi.org/10.21088/nijs.0976.4747.11420.8

Is The Laparoscopic Approach a Better Alternative in Comparison to The Open Technique for The Management of Primary Ventral Hernias? A Comparative Analysis

Om Pramod Kumar[1], Shaurav Ghosh[2], Pranav Sharma[3]

Author's Affiliation: [1-3]Assistant Professor, Department of General Surgery, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka 560066 India.

How to cite this article:
Om Pramod Kumar, Shaurav Ghosh, Pranav Sharma. Is The Laparoscopic Approach a Better Alternative in Comparison to The Open Technique for The Management of Primary Ventral Hernias? A Comparative Analysis. New Indian J Surg. 2020;11(4):497–504.

Abstract

Introduction: Since its introduction in the early 1990s, laparoscopic ventral hernia repair has gained popularity Over 400,000 ventral hernia repairs (VHRs) are performed each year world-wide. Purpose of this study to evaluate open repair versus laparoscopic approach to offer best possible and effective hernia management.[4,11,12,15,24]

Methods: Between January 2018 and December 2020, 30 patients with primary ventral hernia were randomized to receive either open retro-rectus mesh repair (OHR, Group 1) or laparoscopic mesh repair (LVHR, Group 2). These patients were followed up at 2,4 and 6 months intervals thereafter annually for both groups.

Results: Primary ventral hernia are common in age range 41–50 years. In the group 1, majority of patient opting OHR were females (53.3%) while in group 2, males opted for LVHR (66.7%). Swelling was a common presentation in group 2, where as pain was common in group 1. Duration of complaints were similar in both groups. Precipitating factor in group 1 was multiparity (46.7%),whereas in group 2 it was obesity (46.7%). The majority of defect sizes was less than 2x4cm^2 in the open (group 1) and 3x1 to 3x3 cm^2 in laparoscopic group (group 2). In group 1, 60% infra-umbilical location,whereas in group 273.3% had supra-umbilical location of hernia. 66.7% showed reducibility in group 1, whilst 73.3% showed reducibility in group 2. Cough impulse was positive in both groups. Both groups had a diagnosis of para-umbilical hernia. Hypertension (13.3%) was mostly associated with group 1, where as Diabetes mellitus (13.3%) was mostly associated with group 2. Both groups underwent their respective surgeries as planned. Seroma collection and wound-related infectious complications were common in group 1 and post-operative respiratory distress was common in group 2. Patient compliance and follow-up was more in group 2 when compared to group 1.There were no cases of recurrence until the time frame of follow-up.

Conclusions: Laparoscopic repair of Primary ventral hernias is superior to open mesh repair in terms of fewer complications, recurrence, and patient compliance outcome.

Keywords: Incisional hernia; Laparoscopic mesh repair; Open mesh repair; Primary ventral hernia; Seroma; Wound complications.

Introduction

Ventral hernias occur along the mid-line of the anterior abdominal wall. Incidence can vary ranging from 2% to 20%. Ventral hernias, along a previous abdominal surgery site, are called incisional hernias. They are a common occurrence,incurring large costs on the healthcare system with a vast majority presenting themselves as emergency surgeries or post-surgery complications. Amongst post-operative patients, 10% face the risk of hernia following mid-line laparotomy, 5% following transverse muscle splitting incision and less than 1% following laparoscopic repair. The cost of surgeries are variable, dependingon hospital stay, surgery type (open versus Laparoscopic) and area affected. Escalation of treatment cost is dependent

Corresponding Author: Shaurav Ghosh, Assistant Professor, Department of General Surgery, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka 560066 India.

E-mail: shauravghosh@gmail.com

on length of hospital stay, number of man-hours lost during treatment and post-operative complications.[1-4,11--16,21,29,30]

Objective

To evaluate if laparoscopic approach a better alternative in comparison to the open technique for the management of primary ventral hernias. Multiple variables like age ,gender, swelling,pain,precipitating factors, size, location, reducibility, cough impulse, comorbidity, post - op complications like recurrence were studied

Material and Method

Patients and Methods: The prospective study was conducted at a single surgical unit of the Department of Surgery, Vydehi Institute of Medical Sciences And Research Centre, Bangalore, India, between January 2019 and December 2019. The diagnosis of incisional and ventral hernia was based on clinical examination.

Inclusion and Exclusion Criteria: Uncomplicated primary ventral, including irreducible hernia, were considered. Patients with obstruction or strangulation, local or systemic infection, or a psychiatric problem precluding informed consent for surgery were excluded, along with patients unfit for general anaesthesia and pneumo- peritoneum.

Methodology: Each patient was counseled about details of both open and laparoscopic repair, after which informed and written consent was obtained for randomization and operative procedure. A total of 30 patients were recruited for study after evaluation based on inclusion and exclusion criteria. Option for the choice of surgery given and patient preference was considered.

Operative Techniques: Group 1 (open repair): Foley's catheter was used to decompress urinary bladder if the duration of the procedure was expected to be long (large defect) or the defect was in the lower abdomen. Skin incisions were made according to site and size of defect. Subcutaneous flaps were raised for 3 to 5 cm around the defect depending on the available healthy fascial tissue around the margins of the defect. The hernia sac was opened, and contents reduced. Dissection carried forward between the posterior rectus sheath and the rectus muscle or in lower abdomen between the rectus muscle and peritoneum. Whenever possible, the posterior sheath/peritoneum was closed primarily with 2–0 absorbable suture. Polypropylene mesh of a suitable size (with minimum of 3 cm overlap beyond the margins of defect) was placed between posterior rectus sheath/peritoneum and rectus muscle. The mesh was fixed at four corners with 2–0 polypropylene suture taken out through abdominal muscles on the anterior rectus sheath. The anterior rectus sheath was closed over the mesh with a loop of polypropylene or nylon continuous suture where possible, without excessive tissue tension. The skin was closed over the suction drains.[5–7,13,14,25]

Group 2 (laparoscopic repair): Creation of safe pneumoperitoneum: The Veress needle was inserted at the umbilicus. Carbon dioxide (CO_2) gas was used to achieve pneumoperitoneum, and an intraabdominal pressure of 14 mmHg was considered.

Port placement: A 10-mm port was used for the 30°, 10-mm telescope. Two additional 5-mm ports were placed depending on location of hernial defect. The placement of the ports was lateral or away from the margins of the defect so that all the margins of the defect were in view throughout the procedure. A 10-mm port was placed at level of umbilicus, with one 5-mm port above and one 5-mm port below. Omental and bowel adhesions taken down using monopolar diathermy. Hernia sac not dissected. The defect was identified, and survey of the whole parietal wall for additional defects done.[5–7]

Defect and mesh size: The operating surgeon gauged the size of the defect with the help of two, three, or four fingers (laparoscopic procedure) or with a scale (open procedure) intraoperatively if this was not possible preoperatively because of irreducible hernia. It was ascertained that polypropylene mesh should overlap by at least 3 to 5 cm from margins of the defect. Therefore, 15X15-cm mesh was considered adequate for defects measuring up to 8X8 cm.[11,13,25] Any deficient coverage at any margin was supplemented with extra patches. Multiple defects could be covered with a single or additional mesh. Mesh fixation done with a 5-mm tacker. The tacks were placed at each corner, then at a 2- to 2.5-cm distance along the peripheral margin, and again in a second row close to defect margin. The 10-mm port was closed with a 2–0 polyglactin 910 suture. The skin of all the ports was closed with 3–0 monofilament nylon. A ball of gauze was placed over the region of the hernia defect, with a pressure dressing applied and maintained for 2 weeks. The Foley catheter was removed at the end of the procedure.

Follow-Up Evaluation: After discharge, the patients were followed up in 2,4 and 6-month intervals.

Statistical Analysis: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean - SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data are made: assumptions that dependent variables should be normally distributed, samples drawn from the population should be random, and realizations of the samples should be independent. Student-T test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (inter group analysis) on metric parameters. Chi-square / Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. Significant figures

+ Suggestive significance (p-value: 0.05<P<0.10)

* Moderately significant (p-value:0.01<P ≤ 0.05)

** Strongly significant (p-value: P≤0.01)

Results

Primary ventral hernia are common in age range 41–50 years (Table 1). In the group 1(Table 2), majority of patient opting OHR were females (53.3%) while in group 2 (Table 2), males opted for LVHR (66.7%). Swelling was a common presentation in group 2, (Table 3), where as pain was common in group 1. Duration of complaints (Table 4) were similar in both groups. Precipitating factor (Table 5). The majority of defect sizes (Table 6). In group 1 (Table 7), 60% infra-umbilical location, whereas. 66.7% showed reducibility in group 1 (Table 8). Cough impulse was positive in both groups (Table 9). Both groups had a diagnosis (Table 10). Hypertension (13.3%) was mostly associated with group 1, where as Diabetes mellitus (13.3%) was mostly associated with group 2 (Table 11). Both groups underwent their respective surgeries as planned (Table 12). Seroma collection and wound-related infectious complications (Table 13). Patient compliance and follow-up (Table 14). There were no cases of recurrence (Table 15) until the time frame of follow-up.

Study design: A Comparative two group surgical study.

Table 1: Age distribution of patients studied.

Age in years	Group 1 (n=15)	Group 2 (n=15)	Total (100%) (n=30)
21–30	1(6.7%)	4(26.7%)	5(16.7)
31–40	3(20%)	3(20%)	6(20)
41–50	6(40%)	4(26.7%)	10(33.3)
51–60	3(20%)	3(20%)	6(20)
61–70	2(13.3%)	1(6.7%)	3(10)
Total	15(100%)	15(100%)	30(100)
Mean ± SD	46.20±10.80	41.47±12.93	43.83±11.95

Samples are age matched with p=0.286.

Patients (n=30, p=0.286, Table 1), with primary ventral hernias undergoing mesh repair were prospectively randomized

In group 2, Table 1 majority belonged to the age range 21–30 years (26.7%;) and 41–50 years (26.7%) each with Mean ± SD, 41.47±12.93.

Table 2: Gender distribution of patients studied.

Gender	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Female	8(53.3%)	5(33.3%)	13(43.3)
Male	7(46.7%)	10(66.7%)	17(56.7)
Total	15(100%)	15(100%)	30(100)

Samples are gender matched with p=0.269.

Gender distribution (Table 2) of patients (n=15 in each group, p=0.269) showed increased number of females (n=8,53.3%) in group 1 and increased number of males (n=10,66.7%) in group 2.

Table 3: Comparison of swelling and pain in two groups of patients studied.

	Group 1 (n=15)	Group 2 (n=15)	Total (n=30,100%)	p value
Swelling	12(80%)	13(86.7%)	25(83.3)	1.000
Pain	8(53.3%)	4(26.7%)	12(40)	0.136

Comparison of swelling (p=1.000) and pain (p=0.136) in two groups of patients were studied (Table 3).

Table 4: Duration of complaints studied in the two groups.

Duration	Group 1(n=15)	Group 2 (n=15)	Total (n=30,100%)
1–6 months	2(13.3%)	5(33.3%)	7(23.3)
7–12 months	2(13.3%)	0(0%)	2(6.7)
1–2 years	5(33.3%)	10(66.7%)	15(50)
2–5 years	5(33.3%)	0(0%)	5(16.7)
>5 years	1(6.7%)	0(0%)	1(3.3)
Total	15(100%)	15(100%)	30(100)

p=0.016*, significant, Fisher Exact test

Hence, the above-mentioned leads us to the discussion of the duration of complaints, in two groups. (Table 4).

Table 5: Precipitating Factor in two groups of patients studied.

Precipitating Factor	Group 1 (n=15)	Group 2 (n=15)	Total (n=30,100%)
Nil	0(0%)	1(6.7%)	1(3.3)
Yes	15(100%)	14(93.3%)	29(96.7)
• Obesity	4(26.7%)	7(46.7%)	11(36.7)
• Multiparity	7(46.7%)	2(13.3%)	9(30)
• Lifting heavy weights	4(26.7%)	4(26.7%)	8(26.7)
• Smoking	0(0%)	1(6.7%)	1(3.3)

p=1.000, Not significant, Fisher Exact test

Precipitating Factor in two groups (Table 5) of patients studied showed multiparity (n=7,46.7%) as a cause in group 1.

Table 6: Size distribution in two groups of patients studied.

Size	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
<2x4	6(40%)	3(20%)	9(30)
3x1 to 3x3	4(26.7%)	6(40%)	10(33.3)
4.1x4.5	2(13.3%)	4(26.7%)	6(20)
>4x5	3(20%)	2(13.3%)	5(16.7)
Total	15(100%)	15(100%)	30(100)

p=0.600, not significant, Fisher Exact test

Size distribution (Table 6) in two groups of patients was studied. Majority of patients in group.

Table 7: Location distribution in two groups of patients studied.

Location	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Infra-umbilical	9(60%)	4(26.7%)	13(43.3)
Supra-umbilical	6(40%)	11(73.3%)	17(56.7)
Total	15(100%)	15(100%)	30(100)

p=0.065+, significant, Chi-Square test.

Location distribution (Table 7) in two groups of patients were studied.

Table 8: Reducible/ Irreducible in two groups of patients studied.

Reducible/ Irreducible	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Irreducible	5(33.3%)	4(26.7%)	9(30)
Reducible	10(66.7%)	11(73.3%)	21(70)
Total	15(100%)	15(100%)	30(100)

p=1.000, Not significant, Chi-Square test.

Symptoms of ventral hernia; reducibility was studied (Table 8).

Table 9: Cough Impulse in two groups of patients studied.

Cough Impulse	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Negative	0(0%)	1(6.7%)	1(3.3)
Positive	15(100%)	14(93.3%)	29(96.7)
Total	15(100%)	15(100%)	30(100)

p=1.000, Not significant, Fisher Exact test.

Cough Impulse in two groups of patients were studied (Table 9).

Table 10: Diagnosis in two groups of patients studied.

Diagnosis	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Para-umbilical Hernia	14(93.3%)	15(100%)	29(96.7)
Recti divarication with Para-umbilical Hernia	1(6.7%)	0(0%)	1(3.3)
Total	15(100%)	15(100%)	30(100)

p=1.000, Not significant, Fisher Exact test.

Having mentioned, the above, diagnosis in two groups of patients were studied (Table 10).

Table 11: Associated Disease in two groups of patients studied.

Associated Disease	Group 1 (n=15)	Group 2 (n=15)	Total (n=30,100%)
No	10(66.7%)	12(80%)	22(73.3)
Yes	5(33.3%)	3(20%)	8(26.7)
• Hypertension	2(13.3%)	1(6.7%)	3(10)
• Diabetes Mellitus	0(0%)	2(13.3%)	2(6.7)
• Arterial septal defect	1(6.7%)	0(0%)	1(3.3)
• Hypothyroidism	1(6.7%)	0(0%)	1(3.3)
• Pulmonary Koch's	1(6.7%)	0(0%)	1(3.3)

p=0.682, Not significant, Chi-square test.

Associated morbidity in two groups of patients studied (Table 11), showed

Table 12: Procedure done in two groups of patients studied

Procedure	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
Laparoscopic Mesh Repair	0(0%)	15(100%)	15(50)
Open Mesh Repair	14(93.3%)	0(0%)	14(46.7)
Mayo's repair with Hernioplasty	1(6.7%)	0(0%)	1(3.3)
Total	15(100%)	15(100%)	30(100)

p<0.001**, significant, Fisher Exact test.

Procedure done in two groups of patients studied (Table 12) showed.

Table 13: Post-operative Complications.

Post op Complications	Group 1 (n=15)	Group 2 (n=15)	Total (n=30,100%)
No	7(46.7%)	12(80%)	19(63.3)
Yes	8(53.3%)	3(20%)	11(36.7)
• Seroma collection	5(33.3%)	0(0%)	5(16.7)
• SSI	2(13.3%)	0(0%)	2(6.7)
• Drain Site Infection	0(0%)	1(6.7%)	1(3.3)
• Hematoma	1(6.7%)	0(0%)	1(3.3)
• Plaster allergy	0(0%)	1(6.7%)	1(3.3)
• Respiratory Distress	0(0%)	1(6.7%)	1(3.3)

p=0.058+, significant, Chi-Square test.

53.3%(n=8) patients in group 1 and 20%(n=3) in group 2 had post-operative complications (Table 13).

Table 14: Follow up.

Follow Up	Group 1(n=15)	Group 2(n=15)	Total (n=30,100%)
2–3 months	8(53.3%)	12(80%)	20(66.7)
4–5 months	3(20%)	2(13.3%)	5(16.7)
>5 months	3(20%)	1(6.7%)	4(13.3)
Lost to Follow Up	1(6.7%)	0(0%)	1(3.3)
Total	15(100%)	15(100%)	30(100)

p=0.459, Not significant, Fisher Exact test.

6.7%(n=1) patients were lost to follow- up (Table 14).

Table 15: Incidence of Recurrence in two groups of patients studied.

Recurrence	Group 1(n=15)	Group 2(n=15)	Total (n=30,a100%)
Negative	15(100%)	15(100%)	30(100)
Positive	0(0%)	0(0%)	0(0)
Total	15(100%)	15(100%)	30(100)

p=1.000, Not significant, Fisher Exact test

Incidence of recurrence (Table 15) as short-term outcomes in both groups of patients were same with p=1.000, not significant.

Disccussion

Patients (n=30, p=0.286) with primary ventral hernias undergoing mesh repair were prospectively randomized to open mesh repair (OHR, group 1) or laparoscopic ventral hernia mesh repair (LVHR, group 2) repair, with 15 patients in each group. In the group 1, majority (40%) belonged to the age group 41–50 years with Mean ± SD, 46.20±10.80.

In group 2, majority belonged to the age range 21–30 years (26.7%;) and 41–50 years (26.7%) each with Mean ± SD, 41.47±12.93. Results suggest increased incidence of ventral hernia in the productive age range 41–50 years causing burden on the economy by increasing the morbidity in its working population.[4,15]

Gender distribution of patients (n=15 in each group, p=0.269) showed increased number of females (n=8,53.3%) in group 1 and increased number of males (n=10,66.7%) in group 2. This perhaps reflects the education level, awareness, cost of treatment and spending preferences of patient. Most individuals economically and socially well-off preferred LVH repair. Owing to the small sample size, further studies were needed to ascertain facts.[4,12]

Comparison of swelling (p=1.000) and pain (p=0.136) in two groups of patients were studied. Group 2 had greater number of patients presenting swelling (n=13,86.7%) and group 1 had greater number of patients presenting pain (n=8,53.3%). This reflects the fact that in group 1, though swelling was an obvious cause, patient did not present to hospital until symptomatic with pain. However, in group 2, patients did not wait for symptoms to get aggravated.[17,18]

Hence, the above-mentioned leads us to the discussion of the duration of complaints, in two groups. In group 1, majority of patients belonged to the range 1–2 years (n=5,33.3%) and 2–5 years (n=5,33.3%). In group 2, majority of patients belonged to the range 1–2 years (n=10,66.7%). It is to be mentioned here that here are substantial number of patients in group 2 of age range 1–6 months (n=5,33.3%) opting for LVH repair. Thus, in the duration of complains studied, p=0.016, Significant.

Precipitating Factor in two groups of patients studied showed multiparity (n=7,46.7%) as a cause in group 1. This was followed by obesity (n=4,26.7%) and lifting heavy weight (n=4,26.7%) with equal distribution. In group 2 however, obesity (n=7,46.7%) was the main cause. Here p=1.000, not Significant.[17,18,26]

Size distribution in two groups of patients was studied. Majority of patients in group 1(n=6,40%), had a hernia size of <2x4cm^2. However, a few (n=3,20%) had a maximum size of >4x5cm^2. In group 2, majority (n=6,40%) had a hernia size of 3x1 to 3x3cm^2. A few (n=2,13.3%) had a maximum size of >4x5cm^2. When considering all the patients (n=10,33.3%), majority had the size 3x1 to 3x3cm^2. Here P=0.600, not Significant.[17,18]

Location distribution in two groups of patients were studied. In group 1,9(60%) patients had hernia in infra-umbilical region. In group 2, 11(73.3%) patients had hernia in supra-umbilical region. In our studies, supra-umbilical distribution of hernia was more common than infra-umbilical region. Here, P=0.065+, Significant.[17,18]

Symptoms of ventral hernia; reducibility was studied. In majority of patients in group, 66.7% (N=10) had reducible hernia. In group 2, 73.3%(n=11) had reducible hernia. In total 70%(n=21) patients showed reducibility. p=1.000, Not Significant and unrelated to age, gender and the method opted for closure of hernia.[8,17–20]

Cough Impulse in two groups of patients were studied. All patients, 100%(n=15), in group 1 had cough impulse. Likewise, in group 2, 93.3%(n=14) patients had positive cough impulse. Total of 96.7%(n=29) patients had cough impulse in our study. However, p=1.000, insignificant. Cough Impulse is a factor unrelated to age and gender distribution. Whether it has co-relation to post -operative status of patients in both groups remains to be studied.[8,17–20]

Having mentioned, the above, diagnosis in two groups of patients were studied. In group 1, majority of patients, 93.3%(n=14) had para-umbilical Hernia. In group 2, majority of patients,100%(n=15) had para-umbilical hernia. In total, there were 96.7%(n=29) patients with para-umbilical hernia. p=1.000, insignificant.[21,24]

Associated morbidity in two groups of patients studied, showed that group 1, had majority of cases of Hypertension (13.3%, n=2) and group 2 had more of diabetes mellitus (13.3%, n=2). p=0.682, not Significant. Both groups reiterated the fact that there is delay in treatment of patients until they become symptomatic. Further, studies could suggest causes.[8,17–21,24]

Procedure done in two groups of patients studied showed that in group 1, 93.3%(n=14) patients underwent OHR as planned. 6.7%(n=1) underwent Mayo's repair with Hernioplasty. In group 2, all patients,100%(n=15) underwent LVHR as planned without any conversions. p<0.001, significant. The reason for choice of surgery in group 1 can be attributed to the anticipation of peri-operative complications.[8,17–21,24]

53.3%(n=8) patients in group 1 and 20%(n=3) in group 2 had post-operative complications. In group 1, 33.3%(n=5) patients had seroma collection and 13.3%(n=2) patients had SSI. In group 2, none of the 15 patients had neither seroma collection nor wound infection. However, in group 2, 6.7%(n=1) had drain site Infection, 6.7%(n=1) had plaster allergy and 6.7%(n=1) had respiratory distress. p=0.058+, significant suggests that Laparoscopic approach caused less complications of seroma formation and SSI.[8,17–21,24]

Further studies showed that in group 1 53.3%(n=8) patients came for follow-up within 2–3 months post-surgery. 6.7%(n=1) patients were lost to follow- up.

In group 2, 80%(n=12) patients came for follow-up within 2–3 months post-surgery. None were lost to follow-up. Patient compliance was more in

Outcomes of other studies in LVHR

Authors	Publication year	Sample size(n)	Follow-up period (year)	Conclusion
Ecker BL, et al[15]	2016	13567	5	OVHR had higher incidence of perioperative complications, postoperative readmissions, higher cost and revisional hernia repair
Colavita PD, et al[12]	2013	18223	1	LVHR had fewer complications, shorter LOS, lower hospital charges, more routine discharge, and decreased mortality.
Colavita PD,et al.[11]	2012	710	12	Prospective QOL study LVHR associated with decrease in QOL in short term. LOS, infection rates and overall complication are decreased in LVHR. and recurrence rates are equal.
Sharma A, et al[30]	2011	1242	13	LVIHR leads to low recurrence rates and low rates of wound and mesh infection. Occult hernias are diagnosed and optimally treated laparoscopically.
Sajid MS, et al[29]	2009	366	14	Laparoscopic repair of IVH is safe, with fewer complications and shorter hospital stays, and shorter surgical time. Postoperative pain and recurrence rates are similar for both techniques.
Pierce RA, etal.[21]	2007	5340	14	Fewer wound-related and overall complications and lower rate of hernia recurrence for LVHR.
Palanivelu C,et al[23]	2007	721	10	Laparoscopic repair is well-tolerated and can be accomplished with minimum morbidity in ventral hernias.
Franklin ME Jr, et al[16]	2004	384	11	Mean operating time, average blood loss, postoperative complication less in LVHR. Hence safe, feasible, and effective alternative to open techniques.
Heniford BT, et al[19]	2003	850	9	LVHR had low rate of conversion to open surgery, short LOS, moderate complication rate, and low risk of recurrence

group 2.This translated into reduced over-all cost of intervention in group 2. However, both long term follow-up and associated complications need to be studied. Here p=0.459, Not significant. Incidence of recurrence as short-term outcomes in both groups of patients were same with p=1.000, not significant.

Omentum was the most frequent content in hernial sac. There were no Intra-operative complications such as bowel or vascular injury requiring conversion to open technique. There was no significant difference in the average defect size, mesh size, or operative time between the two groups. Blood loss was more in OHR. However, no patient required blood transfusion.[8,17–21,24,27,28]

LVHR was less painful and cosmetically superior, with better outcome in terms of reduced hospital stay and total avoidance of recurrence and wound complications.[1–4,9–12]

The main cause of primary ventral hernias in our study was multiparity followed by obesity and lifting heavy weights. The major disadvantage of conventional incisional and primary ventral hernia repair has been wound-related complications. The wound-related complications include wound hematoma, infection, seroma, and long- term chronic pain.[17,18,26]

The incidence of wound-related complications from open mesh repair reportedly ranges from 3.5% to 18% (average, 8.1%) whereas for laparoscopic repair, incidence is 2%.In our study, group 1 reported the majority of wound complications. Seroma formation has been one of the most common postoperative complication in group 1. The incidence of seroma is variable as reported in different series. However, seroma did not contribute much to the morbidity and resolved without intervention for most patients.

From the results, it can be inferred that laparoscopic incisional and primary ventral hernia repair has better acceptance by both surgeons and patients.

Conclusion

The repair of primary ventral hernias remains a challenge because of unacceptably high recurrence rates after anatomic suture techniques. Recurrence rates vary from 31% to 54%. Use of prosthetic material has significantly reduced recurrence rates to less than 10%. However, extensive tissue dissection required for mesh placement leads to increased wound infections and other wound-related complications (to an incidence of 12% or more).[22,29,30]

The feasibility of laparoscopic repair has been established (even in the absence of level 1 evidence) with large number of published case series. From our studies we concluded, Laparoscopic approach of Primary ventral hernias is superior to open mesh repair in terms of fewer complications, recurrence, and patient compliance outcome.[29–32]

References

1. Balen EM, Diez-Cabellaro A, Hernandez-Lizoain JL, Pardo F, Torramade JR, Regueira FM, Cienfuegos JA (1998) Repair of ventral hernia by expanded polytetrafluoroethylene patch. Br J Surg; 85: 1415–1418.
2. Ballem N, Parikh R, Berber E, Siperstein A. Laparoscopic versus open ventral hernia repairs: 5 year recurrence rates. Surg Endosc. 2008;22(9):1935–1940.
3. Barbaros U, Asoglu O, Seven R, et al. The comparison of laparoscopic and open ventral hernia repairs: a prospective randomized study. Hernia. 2007;11(1):51–56.
4. Beldi G, Ipaktchi R, Wagner M, Gloor B, Candinas D. Laparoscopic ventral hernia repair is safe and cost effective. Surg Endosc. 2006;20(1):92–95.
5. Bittner R, Bingener-Casey J, Dietz U, et al. Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society [IEHS])-Part III. Surg Endosc. 2014;28(2):380–404.
6. Bittner R, Bingener-Casey J, Dietz U, et al. Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society [IEHS])—Part 2. Surg Endosc. 2014;28(2):353–379.
7. Bittner R, Bingener-Casey J, Dietz U, et al. Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society (IEHS)-part 1. Surg Endosc. 2014;28(1):2–29.
8. Bower CE, Reade CC, Kirby LW, Roth JS. Complications of laparoscopic incisional-ventral hernia repair: the experience of a single institution. Surg Endosc. 2004;18(4):672–675.
9. Carbajo MA, Martp del Olmo JC, Blanco JI, Toledano M, de la Cuesta C, Ferreras C, Vaquero C (2003) Laparoscopic approach to incisional hernia. Surg Endosc 17(1): 118–122.
10. Chrysos E, Athanasakis E, Saridaki Z, Kafetzakis A, Dimitriadou D, Koutsoumpas V, Chalkiadakis G, Xynos E, Zoras O (2000) Surgical repair of incisional ventral hernias: tension-free technique

using prosthetic materials (ePTFE). Am Surg 66(7): 679–682.

11. Colavita PD, Tsirline VB, Belyansky I, et al. Prospective, long-term comparison of quality of life in laparoscopic versus open ventral hernia repair. Ann Surg. 2012;256(5):714–723.
12. Colavita PD, Tsirline VB, Walters AL, Lincourt AE, Belyansky I, Heniford BT. Laparoscopic versus open hernia repair: outcomes and sociodemographic utilization results from the nationwide inpatient sample. Surg Endosc. 2013;27(1):109–117.
13. DeMaria EJ, Moss JM, Sugerman HJ (2000) Laparoscopic intraperitoneal polytetrafluoroethylene (PTFE) prosthetic patch repair of ventral hernia: prospective comparison to open prefascial polypropylene mesh repair. Surg Endosc 14: 326–329.
14. Earle D, Roth JS, Saber A, et al. SAGES guidelines for laparoscopic ventral hernia repair. Surg Endosc. 2016;30(8):3163–3183.
15. Ecker BL, Kuo LE, Simmons KD, Fischer JP, Morris JB, Kelz RR. Laparoscopic versus open ventral hernia repair: longitudinal outcomes and cost analysis using statewide claims data. Surg Endosc. 2016;30(3):906–915.
16. Franklin ME Jr, Gonzalez JJ Jr, Glass JL, Manjarrez A (2004) Laparoscopic ventral and incisional hernia repair: an 11-year experience. Hernia 8: 23–27.
17. Helgstrand F, Rosenberg J, Bay-Nielsen M, et al. Establishment and initial experiences from the Danish Ventral Hernia Database. Hernia. 2010;14(2):131–135.
18. Helgstrand F. National results after ventral hernia repair. Dan Med J. 2016;63(7):B5258.
19. Heniford BT, Park A, Ramshaw BJ, Voeller G (2003) Laparoscopic repair of ventral hernias: nine years' experience with 850 consecutive hernias. Ann Surg 238: 391–399; discussion 399–400.
20. LeBlanc, K.A. Laparoscopic incisional and ventral hernia repair: Complications—how to avoid and handle. Hernia 8, 323–331 (2004).
21. Pierce R.A.,Matthews B.D.,Frisella M.M., Brunt L.M.Pooled Data Analysis of Laparoscopic vs. Open Ventral Hernia Repair: 14 Years of Patient Data Accrual. In: Schumpelick V., Fitzgibbons R.J. (eds) Hernia Repair Sequelae. Springer, Berlin, Heidelberg.
22. Misiakos EP, Machairas A, Patapis P, Liakakos T. Laparoscopic ventral hernia repair: pros and cons compared with open hernia repair. JSLS. 2008;12(2):117–125.
23. Palanivelu C, Jani KV, Senthilnathan P, Parthasarathi R, Madhankumar MV, Malladi VK. Laparoscopic sutured closure with mesh reinforcement of incisional hernias. Hernia. 2007;11(3):223–228.
24. Perrone JM, Soper NJ, Eagon JC, et al. Perioperative outcomes and complications of laparoscopic ventral hernia repair. Surgery. 2005;138(4):708–716.
25. Raftopoulos I, Vanuno D, Khorsand J, Kouraklis G, Lasky P (2003) Comparison of open and laparoscopic prosthetic repair of large ventral hernias. JSLS 7: 227–232.
26. Raftopoulos I, Vanuno D, Khorsand J, Ninos J, Kouraklis G, Lasky P (2002) Outcome of laparoscopic ventral hernia repair in correlation with obesity, type of hernia, and hernia size. J Laparoendosc Adv Surg Tech A 12: 425–429.
27. Rogmark P, Petersson U, Bringman S, et al. Short-term outcomes for open and laparoscopic midline incisional hernia repair: a randomized multicenter controlled trial: the ProLOVE (prospective randomized trial on open versus laparoscopic operation of ventral eventrations) trial. Ann Surg. 2013;258(1):37–45.
28. Rosen M, Brody F, Ponsky J, et al. Recurrence after laparoscopic ventral hernia repair. Surg Endosc. 2003;17(1):123–128.
29. Sajid MS, Bokhari SA, Mallick AS, Cheek E, Baig MK. Laparoscopic versus open repair of incisional/ventral hernia: a meta-analysis. Am J Surg. 2009;197(1):64–72.
30. Sharma A, Mehrotra M, Khullar R, Soni V, Baijal M, Chowbey PK. Laparoscopic ventral/incisional hernia repair: a single centre experience of 1,242 patients over a period of 13 years. Hernia. 2011;15(2):131–139.
31. Silecchia, G., Campanile, F.C., Sanchez, L. et al. Laparoscopic ventral/incisional hernia repair: updated guidelines from the EAES and EHS endorsed Consensus Development Conference. Surg Endosc 29, 2463–2484 (2015).
32. Tsirline VB, Colavita PD, Belyansky I, Zemlyak AY, Lincourt AE, Heniford BT. Preoperative pain is the strongest predictor of postoperative pain and diminished quality of life after ventral hernia repair. Am Surg. 2013;79(8):829-836.