

Research Article

Comparative analysis of open versus laparoscopic ventral hernia repair

Suresh Badiger*, Sanjay N. Koppad, Ashwin Kulkarni, Harsha Kodliwadmth

Department of General Surgery, SDM College of Medical Sciences, Sattur, Dharwad, Karnataka, India

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***Correspondence:**

Dr. Suresh Badiger,

E-mail: drsuresh97@gmail.com

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ABSTRACT

Background: An incisional hernia develops in 7% to 11% of laparotomy incisions. Laparoscopic repair was applied to the ventral hernias, with the expectation of earlier recovery, fewer postoperative complications, and decreased recurrence rates. This prospective study was performed to compare the outcomes after open and laparoscopic ventral hernia repair.

Methods: It is prospective study involved 100 patients with ventral hernia, were subjected either to repair by laparoscopy or to open repair. The open surgical operations were performed by the retro-rectus mesh repair, whereas the laparoscopic repairs were performed using the intra-peritoneal on lay dual mesh (IPOM) repair technique.

Results: The mean surgery durations were significantly lower in laparoscopic repair when compared to open repair ($p=0.000$). The mean duration of post-operative analgesics used in laparoscopic group is 2.84 ± 0.60 days as compared to open ventral hernia repair 5.47 ± 2.16 days ($p=0.000$) which is significant. The mean postoperative stay in hospital was shorter for the laparoscopic group than for the open hernia group (2.66 versus 6.88 days; $p=0.000$). Antibiotics used in laparoscopy group is for 1.33 ± 0.70 days as compared to open repair 2.52 ± 0.98 days ($p=0.000$). Return to the activity or normal daily work is significantly low in laparoscopic group as compared to open repair of hernia (4.13 versus 13.98 days; $p=0.000$). There were fewer post-operative complications in laparoscopy.

Conclusions: The findings demonstrate that laparoscopic ventral hernia repair in our experience was safe and resulted in shorter operative time, fewer complications; shorter hospital stays, and earlier returns to daily activity. Hence, it should be considered as the procedure of choice for ventral hernia repair.

Keywords: Incisional hernia, Laparoscopic ventral hernia repair, Open retro-rectus mesh repair, Laparotomy

INTRODUCTION

Ventral hernias (VH) are occurring as a result of weakness in the musculofascial layer of the anterior abdominal wall.¹ Unlike all other hernias that surgeon evaluate and repair, incisional hernias are unique in that surgeon contributes to the source and cause of the disease. Prospective studies have reported an incidence of between 7.4 and 11%.² Abdominal wall defects occur within the first 5 years after the surgical incision is made, but many develop long afterward. Estimated 65% of hernias develop in the first 5 years after surgery and one

in three hernias cause symptoms as shown in a larger prospective study.³ The ventral hernia repair is based on the principle of rives-stoppa open retrorectus tension free mesh repair.⁴

In the laparoscopic technique, the mesh is placed in an intraperitoneal location and where the rise in the intra-abdominal pressures is totally diffused along each square inch of the mesh and not along a tenuous suture line, as happens in conventional suture repairs. An increase in the intra-abdominal pressures thus helps to keep the mesh in place rather than displace it, as is the case in conventional overlay repairs. Therefore, as with the retromuscular,

sublay repair described by Stoppa et al the laparoscopic repair of ventral defects capitalizes on the physics of Pascal's principle of hydrostatics by using the forces that create the hernia defect to hold the mesh in place.⁴

The laparoscopic approach affords the surgeon the ability to clearly and definitively define the margins of the hernia defect and to identify additional defects that may not have been clinically apparent preoperatively. Complete visualization of the fascia underlying the previous incision allows for identification of smaller 'swiss-cheese' defects that could be missed in an open approach.⁵ One of the key determinants to a high recurrence rate following conventional repairs is the phenomenon of occult hernias. These are the hernias liable to be missed during an open repair. The occult hernia may either be in relation to the primary hernia or at a distance from the primary hernia but within the previous scar or it may be a hernia totally unrelated to the previous scar. The advantage of laparoscopic approach is that not only the primary hernia but the entire scar and not only the scar but the entire abdominal wall can be inspected. Such an approach ensures that occult hernias are detected and treated.

Nevertheless, open hernia repair can be a major operation with considerable morbidity due to mesh-related infections. An increasing interest in laparoscopic surgery and the availability of new materials have encouraged the adoption of laparoscopic techniques in ventral hernia repair. Laparoscopic ventral hernia repair (LVHR) was introduced into surgical practice by LeBlanc and Booth in 1991. Limiting factors in most studies include technical variations, limited sample size, and restricted follow-up.⁶

METHODS

This study which is prospective, involved 100 patients with ventral hernia that presented during the period of July 2012 to January 2015 admitted to single surgical unit in our institute (SDM College Of Medical Sciences and hospital Dharwad, India) and were subjected either repair by laparoscopy or open repair and followed up for one year. Patients in both groups were comparable with respect to age and co morbid condition (diabetes, hypertension obesity). The objective of the study is to compare laparoscopic versus open ventral hernia repair with regard to postoperative pain and nausea, operative results, peri-operative and postoperative complications, hospital admission, duration of stay, and return to the work. Inclusion criteria were hernia diameter between 3 and 15 cm, location at the ventral abdominal wall, indication for elective repair, age 18 years or older, and written informed consent. Exclusion criteria included are contraindication for pneumo-peritoneum, an absolute contraindication for general anaesthesia, acute and sub-acute intestinal obstruction and a history of an open abdomen treatment. All patients underwent routine laboratory investigations (complete blood count, blood chemistries) chest X-ray, ECG for elderly and high

resolution ultrasound of anterior abdominal wall to know the defect size.

Operative procedures; in our study, 50 patients underwent open repair and 50 patients underwent laparoscopic repair of ventral hernia.

Open mesh techniques

Open surgical technique was popularized by Rives, Stoppa and Wantz under general anesthesia. Foleys catheter was put for patients with lower abdominal ventral hernia repair and nasogastric tube for upper abdominal hernia repair with peri-operative single-dose antibiotic in the form of cefozolin 1 gm and dose repeated as and when duration exceeded more than two hours. Skin incision was made according to site and size of defect, a subcutaneous flap was raised up to 3 to 5 cm around the defect and after the hernia sac was found, the contents were reduced. Then plane created between posterior rectus sheath and muscle above the arcuate line and rectus muscle and peritoneum below the arcuate line. The posterior rectus sheath and peritoneum were closed primarily with 1:0 absorbable suture, then polypropylene mesh (trulene mesh, suture India) of suitable size with a minimum of 5 cm overlap beyond the margin of the defect and were placed between posterior rectus sheath/peritoneum and rectus muscle. The anterior rectus sheath was closed with a loop of polypropylene without tension after placing suction drain of 16 F. Then the skin was closed either with 2-0 ethilon or skin staplers as shown in Figure 3.

Laparoscopic repair of ventral hernia

In laparoscopic repair of ventral hernia, evacuation of the urinary bladder in lower abdominal surgery and nasogastric tube in upper abdominal surgery was done, pneumoperitoneum created through Palmer's point, 2 to 3 cm below the left costal margin in the mid-clavicle line with veress needle. More often, a veress needle entry is possible without additional risk; however, in cases of severely scarred abdomen 'battlefield abdomen': an open entry is the method of choice. Bowel was prepared to make more room in the abdominal cavity, the surgeon stands left of the patient with the camera man on his right. The monitor was placed opposite to the surgeon and the instrument trolley was towards the leg of the patient. Generally three trocars are adequate for small to moderate size hernias. 10 mm trocars at palmer point and other two 5 mm trocars at left lumbar and iliac fossa along the anterior axillary line. Adhesions of the abdominal contents to the hernial sac and the surrounding abdominal wall are lysed and the contents of the hernia are reduced as shown Figure 1. Hernia sac is excised as much as possible to avoid seroma formation. Tran facial sutures applied with poly propylene 1-0 suture with help of cobbler needle to obliterate the defect after reducing pneumoperitoneum partially. Size of the defect measured and appropriate size of dual mesh (Lotus company, PRO-

VISC3D). Polyurethane-visceral side, polyester- parietal side) covering 4 cms to 5 cms beyond defect was selected.



Figure 1: Showing the hernia defect after reduction of contents in laparoscopy.

Mesh folded like banana leaf and introduced intraperitoneal through 10 mm trocar and mesh is unfolded so that white side (polyester) facing abdominal wall and blue side coated with polyurethane facing viscera. Mesh is fixed trans-facially in the middle with sutures provided along with mesh with help of cobbler needle. Absorbable (ethicon secure strap) tackers used to fix the mesh all around and corners as shown Figure 2.



Figure 2: Showing the dual mesh fixed by tackers at all corners with secure strap in laparoscopic repair.

Hemostasis was achieved before the removal of the trocars. All 10-mm trocar fascial defects were closed. Skin defects were closed with skin staplers. Catheter and ryles tube removed before extrubating the patient. Compressive dressing (bolster) prepared from guaze is placed over the hernia defect to prevent seroma formation for one week. Patients were followed one and two weeks after surgery and up to one year.

Statistical analysis

Unpaired students T test and paired T test were used to find out the statistical significance. A P-value <0.005 was

taken as significant. SPSS version 20 was used for statistical analysis.

RESULTS

The study group consisted of 50 patients in laparoscopic ventral hernia repair (35 women and 15 men) with a mean age of 43.22 years and 50 patients in open retromuscular repair (20 women and 30 men) with mean age 48.33 years. The patients in the two groups were comparable at baseline in terms of age, presenting complaints, and comorbid conditions. The types of hernia in both laparoscopic and open repair were shown in Table 1. Comorbidities associated with patients are shown in Table 2. The parameters used to compare the both group showed in Table 3, which shows that patients in laparoscopic group had defect size 3.94 cms comparable with patients in open hernia repair with defect size of 3.75 cms (p=0.428 not significant). The mean follow-up time was 12 months. The mean surgery durations were 0.55 hour for the laparoscopic repair and 2.10 hours for the open repair as shown in Figure 3 (p=0.000, significant difference).

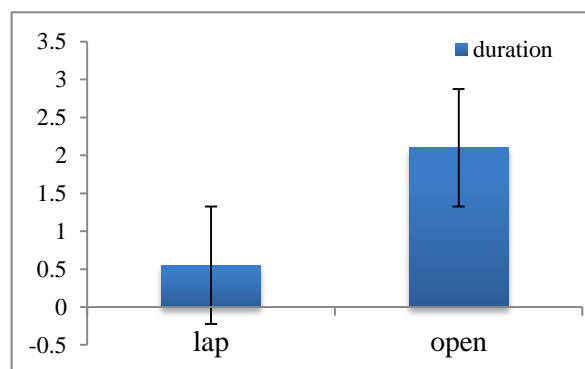


Figure 3: Showing comparison of duration of surgery in hours in lap versus open repair.

The mean duration of post-operative analgesics used in laparoscopic group is 2.84 days as compared to open ventral hernia repair 5.47 days as shown in Figure 4 (p=0.000) which is significant.

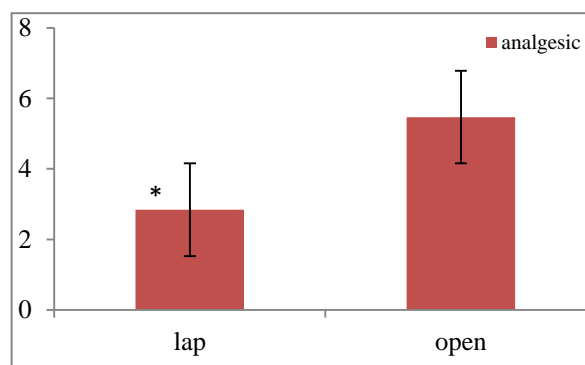


Figure 4: Differences in number of days of post-operative analgesics used in our study.

Table 1: Demographical characteristics of the patients.

	Laparoscopic technique (n=50)	Open technique (n=50)
Gender distribution		
Males	15 (22.2)	30(60.4)
Females	35 (77.8)	20(39.6)
Mean age	43.22±20.31	48.33±12.67
Types of hernia		
Umbilical hernia	22 (44.4)	16 (30.2)
Incisional hernia	15(31.1)	17 (32.1)
Epigastric hernia	4(4.4)	7 (13.2)
Recurrent incisional hernia	6 (13.3)	4 (7.5)
Paraumbilical hernia	3 (6.6)	4 (7.5)
Ventral hernia	Nil	1 (1.9)
Spigelain hernia	Nil	1 (1.9)

The mean postoperative stay in hospital was shorter for the laparoscopic group than for the open hernia group as depicted in Figure 5. (2.66 v 6.88 days; p=0.000). Antibiotics used in laparoscopy group is for 1.33 days as compared to open repair 2.52 days (p=0.000). Return to the activity or normal daily work is significantly low in laparoscopic group as compared to open repair of hernia as shown in Figure 6. (4.13 versus 13.98 days; p=0.000). There were fewer intra and post-operative complications (seroma, wound infection and enterotomy) among the patients who underwent laparoscopic repair than among those who had open repair as shown Table 4.

Table 2: Co-morbidities associated with the hernia.

Co- morbidities	Laparoscopy (n=50)	Open (n=50)
Diabetes mellitus	4	3
HTN	11	9
Asthama	Nil	1
Esophageal varices	Nil	1
Obesity	15	14

Table 3: Comparative analysis of parameters in laparoscopic and open ventral hernia surgery.

Parameter	Laparoscopy technique (n=50)	Open technique (n=50)	t-value	p-value
Defect size (cms)	3.9444±1.40	3.75±0.99	0.796	0.428
Duration of surgery (hours)	0.55±0.25	2.10±0.40	-3.630	0.000
Analgesic (days)	2.8444±0.60	5.4717±2.16	-7.889	0.000
Antibiotics (days)	1.3333±0.70	2.5283±0.98	-3.630	.000
Stay at hospital (days)	2.6667±0.953	6.8846±1.57	-15.705	.000
Return to activity (days)	4.1556±2.13	13.9811±3.27	-17.172	0.000

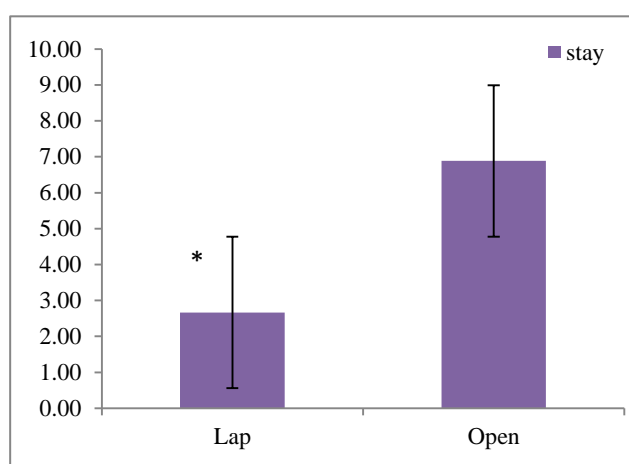


Figure 5: Showing the differences in duration of hospital stay (days) in our study.

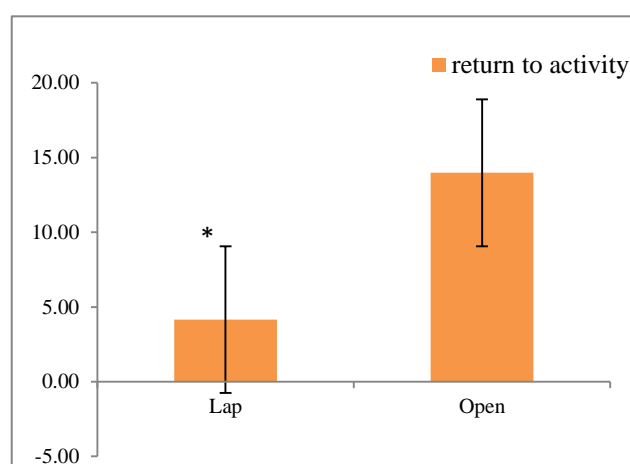


Figure 6: Showing the number of days taken to return to the normal activities after surgery in both groups.

Table 4: Intra and post-operative complications between laparoscopic and open hernia repair.

Complications	Laparoscopic (n=50)	Open (n=50)
Enterotomy	Nil	Nil
Seroma	2 (4 %)	8 (16%)
Wound infection	1(2%)	10 (20%)
Mesh infection	Nil	2 (4%)

DISCUSSION

Laparoscopic ventral hernia repair was started by LE Blanc in 1993. After that, evaluations were done to make laparoscopic surgery easier and safer for ventral hernia repair. With the use of the laparoscopic approach, large incisions and drain placement can be avoided (Figure 7), which leads to a reduction in postoperative wound-related problems which are comparable to our study.^{7,8}

The results of our prospective study revealed that, as compared to open repair, laparoscopic repair is associated with shorter duration of surgery, reduced post-operative analgesic requirement and antibiotic requirement.

Duration of hospital stay and return to the normal activity are significantly shorter for laparoscopic repair than for open hernia repair. The reasons for this is because of extensive dissection of retromuscular space to have 3 to 5 cms mesh cover beyond the hernia defect which causes more pain, longer duration of surgery, requirement of suction drain for longer period of time and late return to the normal daily activity. The complication rate for laparoscopic repair was low. The laparoscopic procedure

was associated with potentially less wound infection and seroma formation as compared with open repair. Recent reports on this topic have supported minimal postoperative morbidity, a shorter convalescence period, and an acceptable recurrence rate.^{9,10}



Figure 7: Post-operative day 4 of retrorectus mesh repair umbilical hernia.

The results of our study are quite comparable with studies done by Park, Carbaja and Rameshaw as shown in Table 5, which supports our strong recommendation that laparoscopic ventral hernia repair should be the procedure of choice in an experienced laparoscopic surgeon's hand.¹¹⁻¹³

Table 5: Comparison with other studies.

Observation	Park ¹¹		Carbaja ¹²		Rameshaw ¹³		Our study	
	Lap	Open	Lap	Open	Lap	Open	Lap	Open
Operating time (min)	95	78	87	112	56	82	55	130
Length of stay (day)	3,4	6.5	2.2	9.1	1.7	2.8	2.6	6.8
Infection rate (%)	00	02	00	18	00	03	00	02
Seroma rate (%)	04	02	13	67	00	00	03	08
Patients	56	49	30	30	79	174	50	50

CONCLUSION

Nowadays, laparoscopic repair of ventral hernia is being accepted by most of the surgeons and patients. Almost all ventral hernias can be repaired by laparoscopy, regardless of morbid obesity and age group. It is believed that laparoscopic repair is beneficial in terms of less post-operative pain, shorter hospital stay, less wound infection. It is even possible to reduce operative time because of standardized techniques, surgeons getting more skill, use of mesh fixation devices and new mesh

implantation. So, laparoscopic repair is considered as first choice for ventral hernia repair.

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