ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 11, pp.41757-41761, November, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ORIGINAL ARTICLE

LAPAROSCOPIC VERSES OPEN VENTRAL MESH HERNIA REPAIR: A PROSPECTIVE STUDY

Tansila Din, *Wani Sajad, Sheikh Imran, Kumar Pawan, and Shiv, S.

SKIMS, Souram Srinagar, India

ARTICLE INFO

Article History:
Received 24th August, 2016
Received in revised form
29th September, 2016
Accepted 17th October, 2016
Published online 30th November, 2016

Key words:

Ventral hernia,
Laparoscopy,
Open,
Mesh.

ABSTRACT

Background and Objectives: The contemporary results of open ventral hernia repair are not that satisfactory because of high rate of wound complications, recurrence rates and increased morbidity. Laparoscopic repair of ventral and incisional hernias (LIVH) can be accomplished in a simple, reproducible manner while dramatically lowering recurrence rates and morbidity. The aim of this study was to compare laparoscopic verses open ventral hernia repair.

Materials and Methods: It was arandomized prospective study conducted over 1 and 1/2 years. A total of 80 patients were randomized in two groups, laparoscopic and open (n =40 in each). Polypropylene mesh and composix mesh was used in both the groups. Post-operative pain, hospital stay, return to normal activity and post-operative complications were compared in two groups.

Results: Post-operative pain, hospital stay, return to normal activity and post-operative complications were less in laparoscopic repair as compared to open repair. Seroma formation occurred in 10 patients in laparoscopic group. Wound infection/ mesh infection was seen in2 patients in open group. There was no conversion from laparoscopic repair to open repair in our series.

Conclusions: Laparoscopy is safe and effective in the management of ventral hernia. Laparoscopy does not compromise the basic principles of surgery for ventral/incisional hernia and provides all advantages of minimal access surgery in terms of less pain, better cosmesis, low rate of complications, lesser hospital stay, low risk of recurrence rate and early return to routine activity as compared to open technique.

Citation: Tansila Din, Wani Sajad, Sheikh Imran, Kumar Pawan, and Shiv, S., 2016. "Laparoscopic verses open ventral mesh hernia repair", *International Journal of Current Research*, 8, (11), 41757-41761.

INTRODUCTION

An abdominal wall hernia is the protrusion of intraadominal organs or tissue through a defect in the abdominal wall. Abdominal wall hernias can be classified into primary ventral and incisional hernia (Kingsnorth and LeBlanc, 2003). There are four different main types of primary ventral hernias: Umbilical, paraumblical, epigastric and spigelian (Sajid *et al*., 2009). Smaller hernias can be more dangerous than larger ones. Large recurrent hernia presents a major challenge, as repair is a complex procedure with significant risk of complications and recurrence. Depending on the technique of the primary surgery (Laparoscopic or Open), up to 15% of all patients develop incisional hernia (Franchi *et al*., 2001; Sorensen *et al*., 2005). Most of these hernias enlarge over time and can become quite large. Sometimes it can give rise to serious complications such as bowel obstruction and even incarceration. Therefore, all abdominal wall hernias should ideally be corrected by surgical means (Cassar and Munro, 2002). The traditional open anatomical closure have been shown to give unacceptably high recurrence rates of up to 54% in incisional hernia repair and repair using surgical meshes has become gold standard now (Luijendijk *et al*., 2000; Paul *et al*., 1998). Various types of meshes used are net meshes (polypropylene, polyester), composite/dual meshes (ePTFE), biological mesh and tissue separating meshes. Open mesh techniques have less recurrence rates (15 to 30%). However, there are specific potential drawbacks, such as seroma, hematoma, mesh infection, chronic pain, and stiffness of the abdominal wall. The Laparoscopic technique has shown improvement in terms of less wound complications, shorter hospital stay, less pain coupled with early recovery and more patient comfort. The aim of this study was to compare the effectiveness and safety in laparoscopic and open ventral hernia repair at our institute.

Corresponding author: Sajad Wani,
SKIMS, Souram Srinagar, India.

MATERIALS AND METHODS

This study was conducted from 1st May 2012 to 15th October 2013. It was a randomized controlled prospective study comparing the two groups of patients. Group A undergoing laparoscopic ventral hernia repair and group B undergoing open ventral hernia repair. All patients irrespective of age and sex presenting with ventral hernias i.e. epigastric, umbilical, paraumblical and incisional hernias were included in the study.

Patients having co-morbid conditions and those undergoing additional surgery along with hernia repair were also included. Patients with intestinal obstruction, strangulation and preexisting skin disease, ascites were excluded from the study. All patients undergoing laparoscopic ventral hernia repair were subjected to general anaesthesia and patients undergoing open ventral hernia repair were subjected to either general or spinal anaesthesia. Intra-peritoneal onlay mesh placement technique was used in laparoscopic group and extra-peritoneal onlay or underlay mesh placement in open group. In open technique, a polypropylene mesh was sutured onto the closed anterior rectus sheath (Onlay) or to fascial edges (Inlay). Number 1-0/2-0 Prolene suture was used to fix the mesh. A closed suction drain was placed in the subcutaneous space, over the mesh. Subcutaneous tissue was closed using 2-0 vicryl (polyglactin) suture. The skin was approximated using 3-0 nylon suture or 3-0 monocryl or skin staples (Fig-1). In laparoscopic technique, pneumoperitoneum was created using a Veress needle in the left subcostal region (Palmer's space) or by open (Hasson) technique in patients with previous surgical scar and a 30^0 laparoscope was used. Three trocars were placed laterally away from hernia site. Complete adhesiolysis of the anterior abdominal wall was performed. Adhesiolysis was performed with careful sharp dissection using cold scissors, harmonic scalpel and judicious use of electrocautery (Fig-2). After completion of the adhesiolysis, contents of the hernia sac were completely reduced and the fascial defect was measured. A prosthetic mesh was tailored to overlap the defect by at least 4cm-5cm. A composite mesh or polypropylene was used as an intaperitonealonlay mesh. Four to eight non-absorbable sutures (Prolene) were placed extra corporally at the cardinal points of the mesh, marked on the skin and on the prosthesis. The mesh was introduced in the abdomen and unrolled. The sutures at the cardinal points were pulled trans-abdominally and tied in transfascial position so that they were placed on the sheath (fascia) (Fig-3). Additional transfascial sutures were then placed using a suture passer instrument if required. In between sutures mesh was fixed with Tacks (Protack/Absorbatack/Permasorb). No intraabdominal/abdominal wall drain was placed in any of the laparoscopic group patients. A compressive bandage was applied over the defect externally depending on the size of the hernia, for prevention of seroma. Data was analyzed with the help of statistical package for social scientists (SPSS version 17) for windows. Continuous data with normal distribution was analyzed by student's t-test and categorical data was analyzed by Chi-square test expressed as mean and percentage. Significance was taken at less than five percent probability (p value <0.05).

RESULTS

Patients in both two groups were comparable in terms of demographic variables like age and sex. Mean size of hernia defect was approximately same in both the groups but the mean size of mesh used was larger in the laparoscopic group. Type of mesh (weather polypropylene or composite) did not affect the short term complications (6 months) after laparoscopic hernia repair. Operating time was longer in laparoscopic group (mean 109.75 min) as compared to open group (mean 93.375 min). However this was statistically insignificant (p value= 0.007) (Table-1). No significant intra-operative complication was observed in either of two groups. Minor serosal tears occurred in 2 patients in open group during intraoperative period which were immediately repaired. Postoperative pain was significantly less after laparoscopic ventral hernia repair as compared to open surgery, at 24 hours (p value=0.002) and 48 hours (p value=0.00). Mean pain scores were less in laparoscopic group as compared to open group at 6hours and 12 hours also but were not statistically significant (p values=0.99 and 0.623 respectively).

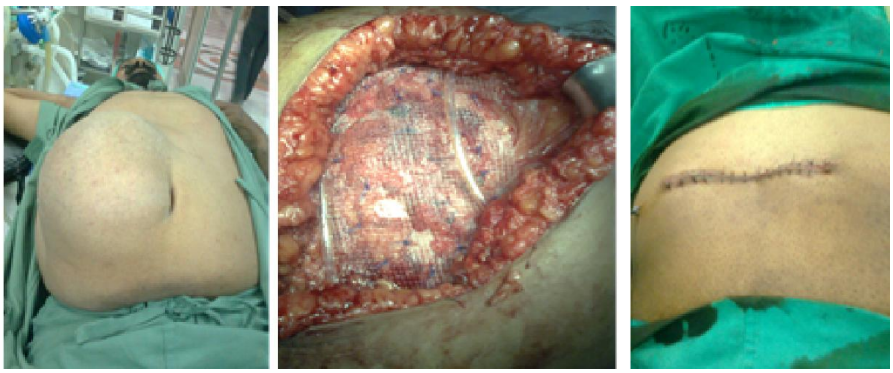

Figure 1. Polypropylene mesh sutured to the rectus sheath

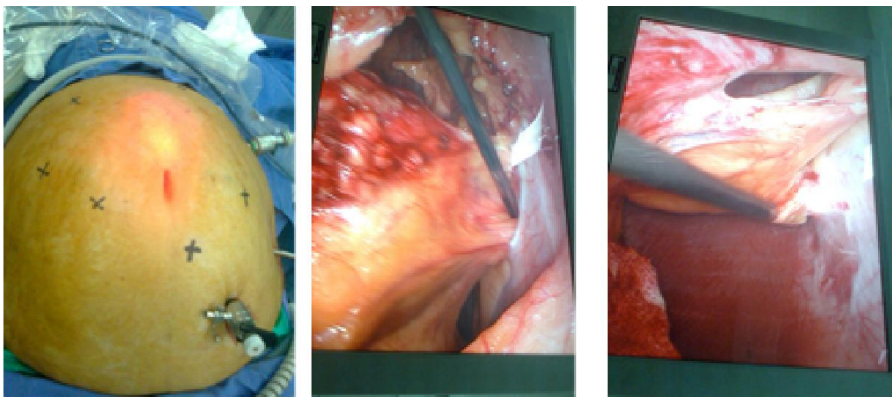

Figure 2. Complete adhesiolysis of the anterior abdominal wall

Figure 3. Mesh placed on the sheath

Table 1. Duration of surgery

Duration of surgery	No. of patients	Mean time (Minutes)	Minimum Time (Minutes)	Maximum Time (Minutes)	P value
Laparoscopic group	40	109.75 ± 33.08	60	180	
Open group	40	93.3 ± 46.86	45	210	0.007

Table 2. Post-operative pain score

Pain score at		N	Mean pain score (NPS)	Minimum	Maximum	*p* value
6 hrs.	Laparoscopic	40	0.5± 1.21	0	5	
	Open	40	0.9 ± 0.73	0	2	
	Total	80	0.7 ± 1.01	0	5	0.99
12hrs.	Laparoscopic	40	1.3 ±1.13	0	5	
	Open	40	1.4 ± 0.59	0	3	
	Total	80	1.3 ± 0.90	0	5	0.623
24hrs.	Laparoscopic	40	0.5 ± 0.81	0	3	
	Open	40	1.0 ± 0.66	0	3	
	Total	80	0.7 ± 0.78	0	3	0.002
48hrs	Laparoscopic	40	0.1 ±0.59	0	3	
	Open	40	0.6 ± 0.52	0	2	
	Total	80	0.43 ± 0.612	0	3	0.00

Table 3. Postoperative hospital stay

	N	Mean stay (days)	Minimum stay (days)	Maximum stay (days)	*p* value
Laparoscopic	40	1.5 ± 0.59	1	3	0.00
Open	40	2.3 ± 1.06	1	5	

Table 4. Time of return to normal activity

Time of return to normal activity (Weeks)	Laparoscopic		Open		Total	%age	
	No. of patients	% age	No. of patients	%age			
1	3	7.5%	0	0%	3	3.7%	*p* value
2	9	22.5%	0	0%	9	11.2%	
3	9	22.5%	0	0%	9	11.2%	
4	14	35%	5	12.5%	19	23.7%	
5	1	2.5%	2	5%	3	3.7%	
6	3	7.5%	19	47.5%	22	27.5%	
7	1	2.5%	0	0%	1	1.2%	
8	0	0%	11	27.5%	11	13.7%	0.00
>8	0	0%	2	5%	2	2.5	
Lost to follow up	0	0%	1	2.5%	1	1.2%	
Total	40	100%	40	100%	80	100%	

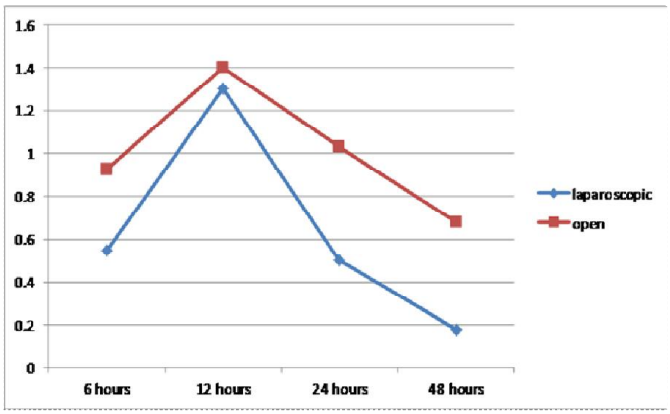

Figure 4. Post-operative pain score

Mean pain score in laparoscopic group at 24 hours was 0.5 (range 0.0-3.0) and at 48 hours mean pain score was 0.18 (range 0.0-3.0). In open group, at 24 hours mean pain score was 1.03(range 0.0-3.0) and at 48 hours mean pain score was 0.68 (range 0.0-2.0) (Table-2 and Figure-4). Mean postoperative hospital stay was shorter in laparoscopic surgery as compared to the open surgery (1.5 days as verses to 2.3 days) and was statistically significant (p=0.00) (Table-3). Time taken to return to normal activity was shorter in laparoscopic group (3.3 weeks) as compared to open group (6.5 weeks) and it was statistically significant (p value=0.01) (Table-4). Seroma formation occurred in 25% patients in laparoscopic group on follow up at 1-3 months. No patient in the open group developed seroma up to 6 months follow-up. None of our patients developed hernia recurrence or signs and symptoms of adhesions between bowel and mesh in the 6 months follow-up. Wound infection/ mesh infection was seen in two patients in open group. Both these patients were patients of recurrent hernia along with multiple comorbidities like obesity, diabetes mellitis and hypertension.

DISCUSSION

The Laparoscopic approach for treating ventral hernia has become increasingly popular during the last decade. The technique is based on the same surgical principles as the open underlay proposed by Stoppa, Rives and Wantz, which entails the placement of a large piece of mesh above the posterior rectus sheath. Only few prospective randomized clinical trials comparing laparoscopic and open incisional/ventral hernia repairs have been conducted, main data has come from non-randomized studies and have clearly shown that the laparoscopic procedure presents many advantages over open hernia repair. In particular, the minimally invasive approach eliminates the need for extensive tissue dissection necessary to achieve adequate mesh overlap, reducing the wound related complications. Another advantage of the laparoscopic approach is the identification of small fascial defects known as "Swiss cheese defects", that could be missed in an open approach and predispose to an incisional hernia recurrence. Finally the Laparoscopic approach is associated with a lower mean hospital stay, quick recovery of the patients and reduced recurrence rates. In our study, there was a statistically significant difference in the pain scores between the two groups at 24 hours and 48 hours with lesser pain scores in favour of laparoscopic group. Mean pain scores were less in laparoscopic group as compared to open group at 6hours and 12 hours also but were not statistically significant (p values=0.99 and 0.623 respectively). This is an established fact that the post-operative pain is significantly less in laparoscopic surgeries as compared to open surgeries because of decreased incision size and lesser tissue dissection and handling in laparoscopic surgery. Lomanto *et al*. (2006) and Muhammad Ali *et al*. (2014) reported the similar observations. In this modern era, post-operative hospital stay is very important for the patient as well as family so for as earning is concerned. In our patients, mean postoperative hospital stay was shorter in laparoscopic surgery as compared to the open surgery and was statistically significant (p=0.00). Our observations were similar to the observations reported by Misra *et al*. (2006), Moreno *et al*. (2002) and Olmi *et al*. (2007). Return to normal activity and work depends up on the early recovery after the surgery and has significant impact on the income of the patient. In our study, mean time to return to normal activity was shorter in laparoscopic group than open group and was statistically significant between the two groups (p value=0.01). Pring *et al*. (2008) reported in their study that in laparoscopic group, mean time to return to normal activity is 3.9 weeks (total of 30 cases) in comparison to open with mean of 4.6 weeks (total of 24 cases). Mean operative time was more in laparoscopic group open group which means laparoscopic technique took longer time for the completion of surgery as compared to open surgery. However this observation was statistically insignificant. As laparoscopic hernia repair is an advanced laparoscopic procedure which has a learning curve, it is an expected observation of laparoscopic hernia repair taking longer duration as compared to open surgery. Asencio *et al*. (1998) Barbaros *et al*. (2006) reported the similar observation. There was no major intraoperative complication in our study in terms of vascular injury, visceral injury (enterotomy), urinary bladder injury, hematoma, bleeding at Veress needle puncture site or any anesthesia related complication. Only two patients in open group (recurrent hernia) had minor serosal tears due to adhesions of bowel with previous mesh, which were immediately repaired. Moreno *et al*. (2002) in their study reported no intraoperative complication in laparoscopic group (11 cases) as compared to 4 intraoperative complications including serosal tears in open group (11 cases). Misra *et al* (2006), Navarra *et al*. (2007), Olmi *et al*. (2007) and Pring *et al*. (2008) did not report anyenterotomy in their studies in either of two groups. We did not encounter any complication like port site infection, urinary retention, bowel obstruction, fistula formation or infection of thee mesh, although mentioned in the literature.Chowbey *et al*. (2000) in their study reported of urinary retention (1%) and haematoma (1.5%). Ben-Haim *et al*. (2002) in their study reported of ileus (4%), bowel obstruction (3%) and haematoma (1%).

In our study, seroma formation was seen in 25% patients in laparoscopic group during first month of follow up. This is quite common in laparoscopic hernia repair because the hernia sac is not excised and fluid accumulates in empty space. Another reason may be that no suction drain was used in laparoscopic group. This resolved in all cases spontaneously and none of the patient required drainage of seroma fluid. None of open cases develop seroma possibly because of placement of vacuum drain over the mesh. Our findings are comparable toBarbaros *et al*. (2006), Navarrata *et al*. (2007). Wound and mesh infections were seen in two cases of the open group and both patients had recurrent large hernia. Wound infection started in first week in both the cases; later mesh was exposed and needed daily dressings. Healing occurred in one patient by 3½ months. Second patient had severe infection not

responding to dressings up to 3 months and this patient was lost to follow up later on. Cause for non-healing of wound and mesh infection in first patient could be malignancy (sarcoma of the thigh) which was diagnosed 4 months after surgery, when patient developed a non-healing large ulcer on the thigh. Cause for infection in another patient could be previous mesh adherent to bowel, which could not be separated and had been covered with new mesh. Carbajo *et al*. (1999) reported wound and mesh infections in none 0 (30 cases) in laparoscopic group as compared to 2 (total of 30 cases) in open group. Navarra *et al*. (2007) reported wound and mesh infections in none (12 cases) in laparoscopic group as compared to 1 (total of 12 cases) in open group. Olmi *et al*. (2007) reported wound and mesh infections in none (85 cases) in laparoscopic group as compared to 7 (total of 85 cases) in open group. None of the patient in our study had post-operative adhesional obstruction or recurrence of hernia in 6 months of follow up. Moreno *et al* (2002) and Navarra *et al*. (2007) reported hernia recurrence in none of the patient in their studies over 25 month's follow up. In our study we used polypropylene mesh in majority (37 cases) of open group (n=40) and in 18 cases of laparoscopic group. In the remaining 3 open cases and 22 laparoscopic cases we used composite mesh.As one side of the mesh faces the abdominal wall and other side is in contact with the intestine, it has been advised by some surgeons that using a composite mesh decreases the risk of adhesions as compared to the polypropylene mesh, although many surgeons continue to use polypropylene meshes routinely. In our study we used polypropylene mesh in 18 patients due to low cost of this mesh as per patient's choice. However, none of these 18 patients developed any signs and symptoms of bowel adhesions with the mesh during the 6 month follow up period. Thus, it can be safely stated that type of mesh (whether polypropylene or composite) does not affect type and severity of post-operative complications in the short term follow up following laparoscopic hernia repair although long term results are yet to be decided in our study.

Conclusion

The results of present study conclude that the laparoscopy is safe and effective in the management of ventral hernia. Laparoscopy does not compromise the basic principles of surgery for ventral/incisional hernia and provides all advantages of minimal access surgery in terms of less pain, better cosmesis, low rate of complications, lesser hospital stay, low risk of recurrence rate and early return to routine activity as compared to open technique. But we have to emphasize that laparoscopic surgery has a learning curve. Our study recommends routine use of laparoscopic technique for the management of ventral hernia.

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