

Long-term Outcomes in Laparoscopic vs Open Ventral Hernia Repair

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Abstract

Objective: To ruleout whether there was a difference in, recurrence rate, morbidity, and duration of hospital stay between patients undergoing open or laparoscopic ventral hernia surgery.

Materials and methods: Cohort study in single-institution was compared prospectively collected from patient cohorts undergoing laparoscopic or open intraperitoneal onlay mesh repair. Literature search was performed using search engine Google and our online facility of Springer Link. The following search terms were used. Laparoscopic versus ventral hernia repair, 'laparoscopic repair of ventral hernia, controversies in laparoscopic ventral hernia repair, comparison of laparoscopic and open (Ventral Hernia) repair, Laparoscopic Repair of Ventral Hernia during obesity. About 143 citations found in total. Data collected from 360 consecutive patients who had undergone laparoscopic or open intraperitoneal onlay mesh repair of a ventral hernia were prospectively collected from October 1995 and December 2005 are recorded .

Main outcome of the study: Hernia recurrence and duration of hospital stay and morbidity. Postoperative complications of Clavien grade 2 or more than grade 2 were considered as major complications.

Results: Intraperitoneal onlay mesh surgery was performed in 233 patients by open approach and in 127 patients by laparoscopic approach. Groups were similar for sex and body mass index and it is calculated by weight in kilograms divided by the height in meters squared and the mean age for the laparoscopic group was 3 years younger; and the mesh was selected larger for the laparoscopic group. Mean follow-up for both laparoscopic and open groups was 30 and 36 months; and the conversion rates are 4%. Major morbidities were 15% in the open group and 7% in the laparoscopic group. Recurrence rates were 9% in the open group and 12% in the laparoscopic group. Postoperative inpatient admission was more frequent after the open procedure than after the laparoscopic procedure (28% and 16%, respectively).

Conclusions: Outcomes of the study shows not much difference with respect to recurrence rates after long-term follow-up; however, lower rate of major morbidity and increased outpatient-based procedure rates favor laparoscopic repair in this study.

INTRODUCTION

More than 2 million abdominal surgery's take place yearly in USA; with an estimated 3 to 20% of those patients develop ventral incisional hernia. With 90 000 ventral incisional hernia repairs are performed every year, the question of whether an

open or laparoscopic repair should be performed it depends on general surgeons interest. Data are still inconclusive on morbidity and recurrence rates. The main purpose of this study is to compare the outcome of the patients undergoing open and laparoscopic intraperitoneal onlay mesh repairs in a single institution for a period of 10 years.

DATA

Data from all 651 patients who underwent ventral incisional hernia repair between October 1995 to December 2005 at a single institution were collected prospectively. Patients who had undergone an intraperitoneal onlay mesh repair, either open or laparoscopic, are only considered. The techniques of both repairs have been described here.

Open Mesh Techniques

Rives, Stoppa and Wantz popularized Open surgical technique After taking patients to operative theater and under general anesthesia, endotracheal intubation and with close monitoring operation was started. After painting and draping of abdomen the incision was made according to the site and size of the hernia subcutaneous flap was raised up to 4 to 5 cm around the hernia and the hernial sac was found, contents was reduced sac was excised. The mesh is placed in the intraperitoneally and fixation of the mesh done with interrupted sutures at minimum of two centimeters from the fascial edge. Anterior rectus sheath closed over the mesh with a loop of polypropylene without tension, and then skin closed over the drain depending upon size and extension of the wound.

Laparoscopic Repair of Ventral Hernia

Almost all types of Ventral Hernia can be operated by minimal access surgical techniques except if the size more than 10 cm and it should be explained clearly to the patient that the laparoscopic repair will not help cosmetically if the skin is very lax and hanging loosely in the large hernia. In Laparoscopic Ventral Hernia Repair evacuation of urinary bladder in lower abdominal surgery and Nasogastric tube in upper abdominal surgery is necessary, because in most of the cases the access is through the palmar's point which is about 2 to 3 cm below the

left costal margin in mid clavicle line. Day before surgery bowel should be prepared, that will give more working space during surgery in the abdominal cavity. Laparoscopic Ventral Hernia Repair can be done with various methods either intraperitoneal or extraperitoneal. But in our study repair was done intraperitoneally.

Anesthesia

General anesthesia with endotracheal intubation and close monitoring.

Patient Position

Supine position without any tilt, so that the bowel is distributed evenly.

Port Position

Port Placement Technique

The patient is painted and draped and after that checking light cable, insufflation tube, electrocautery, suction irrigation canula and veress needle patency with focusing and white balancing of the camera, then pneumoperitoneum is created by veress needle in the left Palmer's point (this point is contraindicated in splenomegaly) other site like right hypochondrium, flank or iliac fossa can also be used for telescope port. Once pneumoperitoneum created then 10 mm port put after desirable insufflation another one 5 mm port and 10 mm port according to Baseball diamond concept put under vision, after diagnostic laparoscopy the procedure if there is any adhesion careful Adhesiolysis is done. Content of sac returned back which is either omentum or bowel then the extent of defect assessed thoroughly then measurement of the defect drawn on the external surface of anterior abdominal wall and adequate size mesh that cover the whole defect and overlapping up to 4 to 5 cm from the edge of the defect, all the necessary precaution to be taken to avoid contamination of the mesh, then the mesh rolled and inserted in port to the abdominal cavity, then mesh unrolled and it is fixed by means of Tacker, Endoanchor or Protack, to abdominal wall with out opening the peritoneum technique. After completing the repair the ports withdrawn under vision and telescope port are removed last. Ports of 10 mm better to be repaired because cases of incisional hernia reported in some articles. Recently two port laparoscopic ventral hernia repairs were also reported in some articles.

Choice of Mesh

For the hernia repair laparoscopically meshes underwent many changes over the last few years, in general the ideal mesh is characterized by economic aspects, functionality, operative handling, sterility and even anti-infective property and optimized biocompatibility.

1. It should be rapid and permanent in growth into the prosthesis.
2. It should decrease the risk of intestinal adhesion.

There are two types of mesh commonly used synthetic and collagen based in most article ePTFE were used with polypropylene, because of a low affinity for adhesion, the PTFE mesh is probably the first choice for intraperitoneal prosthesis. In summary the use of mesh can reduce the recurrence rate from 40 to 50% to about 10% only.

The type of operation was determined by surgeon preference. Patients were referred from the same patient pool to members of a surgical group.

Exclusion Criteria

Patients, who underwent additional procedures at the time of hernia repair, such as planned bowel resection or nonmesh repairs, are excluded from this analysis.

Additional dates were collected from the review of patient records. Variables are assessed by patient demographics like age, sex, body mass index [BMI is calculated as the weight in kilograms divided by the height in meters squared], and comorbidities like obesity diabetes, IHD, pulmonary diseases, details about the operative procedure (open versus laparoscopic repair and type and size of mesh used), and outcome data such as morbidity, recurrence rates, and duration of stay. The type of mesh used depends upon the operating surgeon's preference and mesh availability. Polypropylene was used by some surgeons and it was determined by intraoperatively so that the amount of omentum present will prevent bowel contact with the mesh to prevent adhesion. The duration of hospital stay was recorded either as outpatient surgery and assigned the value of 0.5 days or as a postoperative inpatient admission with the number of days recorded. Comorbidities are specifically addressed were the corners. If a patient was identified to have pulmonary disease that was stated in the medical record for follow up. Patients who underwent a conversion to open repair remained in the laparoscopic group for an intention-to-treat analysis.

Complications

Clavien classification was used for staging postoperative complications. Complications of grade II or higher are considered as major complications. In this classification, grade I complications not require pharmacological treatment or intervention; grade II complications that include patients those requiring pharmacological treatment, total parenteral nutrition or blood transfusions, grade III complications require surgical, radiological or endoscopic intervention; grade IV complications are life threatening and require intensive care unit management; and grade V complications result in death. Postoperative occurrences of a seroma are identified by examine the patient.

In laparoscopic hernia surgery, the hernia sac are not excised. This effectively leaves behind a potential space for seroma formation. It happens to be one of the complications inherent to this procedure. A significant seroma was defined as a seroma that caused pain or discomfort, erythema, or infection. Most seromas resolve with time, some requiring eight to 12 weeks for complete resolution. Majority of the authors considered the seromas for conservative management. Some surgeons have advocated using dressing or abdominal binder to cause compression on abdominal wall to occlude the potential dead space.

In the laparoscopic group patients, significant seromas are aspirated. In the open group, drains are placed at the time of operation to prevent the formation of a seroma. No data were collected regarding fixation-related pain. A statistical analysis was done by using Fisher exact test and Wilcoxon rank sum test, and test with SAS statistical software version 9.3 (SAS Institute, Inc, Cary, NC).

Results

From the year 1995 October to December 2005, a total of 651 patients underwent ventral hernia repair at single institution. Around 514 (79%) underwent an open ventral hernia repair and 137 (21%) underwent a laparoscopic ventral hernia repair. Around two hundred eighty one patients (55%) who have underwent the open repair and 10 patients (7%) who have underwent the laparoscopic repair were excluded from the study because they underwent either additional procedure, like planned bowel resection or a nonmesh ventral hernia repair. A total of two hundred and thirty three patients who underwent an open procedure and one hundred twenty seven patients who underwent a laparoscopic procedure are used in the final statistical analysis. Five patients (4%) required conversion from the laparoscopic to the open procedure because of hemodynamic instability, or inability to obtain visualization, or technical difficulties during the mesh placement.

Diagnosis of cancer in sixteen patients (7%) in the open hernia group and 7 patients (6%) in the laparoscopic hernia group had diagnosed prior to surgery. There are no data on preoperative prealbumin levels are collected. The mean BMI as a proxy for obesity-related malnutrition are similar for both the groups. Describes the different types of mesh used for the repairs, with the polypropylene mesh used in the earlier phase of the study in patients with sufficient omentum present. No mesh-related bowel fistula was recorded.

Around, 43 patients (12%) experienced Clavien grade II complication or much higher. in the open hernia repair group major complications were significantly seen when compared to laparoscopic hernia group. One patient (0.4%) had a postoperative DVT after open ventral hernia repair which was complicated by *Candida* septicemia and he was died. In the laparoscopic group one patient manifested sepsis by an

unrecognized enterotomy on the first postoperative day and it required reoperation for mesh removal. The patient was recovered and underwent open ileostomy takedown and hernia repair done one year later. Six patients experienced mesh infection in the open group which required removal of the mesh. None of the patients from the laparoscopic group had mesh infection. Major complications seen in patients with preexisting pulmonary comorbidities; Around 27% of patients with pulmonary comorbidities versus 10% of patients without pulmonary disease suffered postoperative complications. The recurrence rate and complication rate were not correlated with the type of operation performed (laparoscopic vs. open) in patients with pulmonary comorbidities. By using a logistic regression model, and the occurrence of the complication was associated with the operative method without the adjustment for pulmonary disease and the remained associated after adjustment for pulmonary disease. BMI did not alter these conclusions, and BMI did not contribute significantly to the model. In 16 patients (13%) in the laparoscopic group and 21 patients (9%) in the open group had recurrence at a mean follow-up between 30 and 36 months respectively. Median follow-up was done 25 months for patients with open hernia repair and 36 months for the patients with laparoscopic hernia repair. 75 patients (32%) in the open hernia group and 45 patients (36%) in the laparoscopic group had more than 36 months duration for follow-up. Determination of recurrence was done by physical examination and documentation in the record. In addition to the records, all the available imaging studies that include computed tomography scans obtained in asymptomatic patients for unrelated diagnoses like cancer follow-up or injury are reviewed. Any information of recurrence in the record or on the imaging studies, whether they are symptomatic or not, are taken as recurrence. Statistical analysis did not reveal about the effect related to the type of mesh used on the recurrence rate. Studies revealed that patients who developed a postoperative abscess had increased recurrence rate that is 4.4-fold recurrence when compared with those who did not develop an abscess. Patients with higher BMI rates more than 30 had a 5-fold risk of recurrence when compared with patients with normal weight (BMI<25) Postoperative inpatient admission was more frequent in the open procedure than after the laparoscopic procedure respectively; The higher rate of outpatient surgery in the laparoscopic group than in the open group was associated with a shorter mean duration of stay (mean \pm SD length of stay, 0.9 ± 1.4 days vs. 1.4 ± 2.0 days, respectively).

DISCUSSION

Ventral hernias are more common, and controversy are still exists as to the best method for surgery. There are no large randomized or multicenter trial has been completed till today, although one systematic review was published in the year 2004. Data from smaller trials and cohort studies represent the available evidence.

Some of these studies are summarized in our study has provided an additional experience in a large patient population and a long follow-up.

Systematic review performed by the auspices of the Royal Australasian College of Surgeons Australian Safety and Efficacy Register of New Interventional Procedures–Surgical and other recent studies show clear differences in the duration of the hospital stay, operating room supply cost, and the total hospital cost between open and laparoscopic ventral incisional hernia repair. Studies show patient underwent laparoscopic hernia repair had significantly shorter the hospital stay, the instrument cost was significantly higher, and the overall cost was significantly lower. Large variations without a clear difference between the open and laparoscopic hernia repair methods in comparison with complication rates and recurrence rates. Our study used the Clavien classification of complications to account not only for the occurrence of a complication but also for the severity. By using this classification, data suggest that more severe complications occurred in patients undergoing open ventral hernia repair, whereas seromas were more frequently noted in patients undergoing laparoscopic repair. The most significant patients for complications are patients with preexisting pulmonary disease. This study did not have enough statistical power to examine any correlation between the complication rates and mesh type.

Older studies described obesity as a risk factor for the development of ventral incisional hernias and also risk factor for recurrence and complications. studies show that patients with a BMI more than 30 had a risk of recurrence 5 times higher when compared to patients with a BMI less than 25. The high BMI combined with a relatively long follow-up may have contributed to our recurrence rates, which were at the upper end of the reported spectrum. Laparoscopic patient group required significantly fewer inpatient admissions, a finding that may be explained by better pain control or faster recovery from operative trauma, as suggested by others.

CONCLUSION

This study confirms that laparoscopic ventral incisional intraperitoneal onlay mesh hernia repair is associated with less severe complications, equivalent recurrence rates, and shorter hospital stays when compared with open repair. It further validates the use of the laparoscopic approach.

REFERENCES

1. Text book of laparoscopic surgery part 2 procedures by Prof. Dr. R. K. Mishra M.MAS, MRCS (UK).
2. Perrone JM, Soper NJ, Eagon JC et al. Perioperative outcomes and complications of laparoscopic ventral hernia repair. *Surgery*. 2005;138:708-16.
3. Ramshaw BJ, Esartia P, Schwab J et al. Comparison of laparoscopic and open ventral herniorrhaphy. *Am Surg* 1999; 65:827-32.
4. Carbajo MA, Martin del Olmo JC, Blanco JI et al. Laparoscopic treatment vs open surgery in the solution of major incisional and abdominal wall hernias with mesh. *Surg Endosc*, 1999; 13:250-52.
5. LeBlanc KA. Incisional hernia repair: laparoscopic techniques. *World J Surg* 2005; 29:1073-79.
6. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004; 240:205-13.
7. Itani KM, Neumayer L, Reda D, Kim L, Anthony T. Repair of ventral incisional hernia: the design of a randomized trial to compare open and laparoscopic surgical techniques. *Am J Surg*. 2004; 188(suppl):22S-29S.
8. LeBlanc KA, Booth WV, Whitaker JM, Bellanger DE. Laparoscopic incisional and ventral herniorrhaphy in 100 patients. *Am J Surg* 2000; 180:193-97.
9. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic ventral and incisional hernia repair in 407 patients. *J Am Coll Surg* 2000; 190:645-50. Robbins SB, Pofahl WE, Gonzalez RP. Laparoscopic ventral hernia repair reduces wound complications. *Am Surg*. 2001; 67:896-900.
10. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic repair of ventral hernias: nine years' experience with 820 consecutive hernias. *Ann Surg* 2003; 238:391-400.
11. McGreevy JM, Goodney PP, Birkmeyer CM, Finlayson SR, Laycock WS, Birkmeyer JD. A prospective study comparing the complication rates between laparoscopic and open ventral hernia repairs. *Surg Endosc*. 2003;17:1778-80.
12. Lomanto D, Iyer SG, Shabbir A, Cheah WK. Laparoscopic vs open ventral hernia mesh repair: a prospective study. *Surg Endosc* 2006;20:1030-35.
13. Birgisson G, Park AE, Mastrangelo MJ Jr, Witzke DB, Chu UB. Obesity and laparoscopic repair of ventral hernias. *Surg Endosc*. 2001;15:1419-22.
14. Mendoza-Sagaon M, Hanly EJ, Talamini MA et al. Comparison of the stress response after laparoscopic and open cholecystectomy. *Surg Endosc* 2000;14:1136-41.
15. Laparoscopic repair of ventral /incisional hernias, by chowbey pradeep k, sharma anil, mehrota magan, khuller rajesh, soni vandana, bajjal manish, minimal access surgery & bariatric surgery center, Sir Ganga Ram Hospital, New Delhi 110060, India.
16. 17 Pham C, Watkin S, Middleton P, Maddern G. Laparoscopic Ventral Hernia Repair: An Accelerated Systematic Review. Adelaide, South Australia: Australian Safety and Efficacy Register of New Interventional Procedures–Surgical; 2004. ASERNIP-S report 41.
17. Heartsill L, Richards ML, Arfai N et al. Open Rives-Stoppa ventral hernia repair made simple successful but not for everyone. *Hernia*. 2005;9:162-66.
18. Obesity and laparoscopic repair of ventral hernia. G.Birgison '1', A.E.Part, '1' M.J.Mastrangelo '1'. D.B.Witzke '2'.U.B.Chu '1'. Department of surgery, university of Kentucky chandler medical center, Lexington, KY, USA. Department of pathology, university of Kentucky chandler medical center, Lexington, KY, USA.
19. Earle D, Seymour N, Fellingner E, Perez A. Laparoscopic vs open incisional hernia repair: a single-institution analysis of hospital resource utilization for 884 consecutive cases. *Surg Endosc*. 2006;20:71-75.