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Original Research Paper

COMPARATIVE ASSESSMENT OF OPEN VENTRAL HERNIA REPAIR EFFICACY TO LAPAROSCOPIC HERNIA REPAIR

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ABSTRACT

Background: Ventral hernia repair recently, is preferred to be managed using a laparoscopic approach recently which has the advantage of reducing the morbidity associated with the conventional open surgical approach for repair of the ventral hernias.

Aim: The present study aimed to comparatively assess the outcomes of open ventral hernia repair efficacy to laparoscopic hernia repair.

Methods: The study included 92 subjects with ventral hernia, either incisional or primary, and were evaluated. Included 92 subjects were randomly divided into two groups of 46 subjects each. In all the subjects from both groups, postoperative major and minor complications, degree and presence of postoperative pain, hospital stay duration, hernia location, fascial defect sizes, body mass index, surgical time, and demographic data were collected and compared.

Results: Reduced incidence of mesh infection and shorter hospital stay duration were seen in laparoscopic hernia repair with $p<0.05$ for both. Mean surgical time was significantly higher in the laparoscopic hernia repair group ($p<0.005$). The most common complication was seroma which was more frequently seen in the laparoscopy group ($p<0.05$). Postoperative pain was comparable in the two study groups ($p>0.05$).

Conclusions: The present study concludes that laparoscopic ventral hernia repair has comparable efficacy to open ventral hernia repair. For successful ventral hernia repair, high technology with advancements, high laparoscopic experience, and advanced surgical skills are vital factors.

Keywords: Hernia, mesh, laparoscopy, ventral hernia, repair of hernia

INTRODUCTION

Ventral hernias present a protrusion of a portion of tissues or organs through a defect in the abdominal wall. The incidence of hernia following abdominal wall surgery ranges to nearly 13% on a global scale. Various risk factors have been associated with the development of hernia such as occasionally poor surgical closure, underlying disease process, abdominal distension, obesity, male gender, and wound infection. Significant morbidity has been associated with hernia including hernia content ischemia, strangulation, intestinal obstruction, and/or pain. Despite an advancement in the repair method of the hernias, significant mortality and morbidity are associated with hernia repair. Hernias are repaired with

surgical methods only that utilize two techniques namely laparoscopic mesh repair and open repair with or without the use of the mesh.[1]

Considering the mortality, morbidity, and incidence associated with the method and condition of the hernia repair, it is vital to select the accurate and ideal method of the hernia repair. Early and existing literature data depict that various disadvantages are associated with laparoscopic hernia repair including the mesh use, need for specific instruments, equipment cost, and larger surgery duration. However, recent literature data report similar surgical time with laparoscopic techniques as with open repair with experienced surgeons. Also, laparoscopic hernia repair is considered as cost-effective as open repair with early return of work and lesser hospital stay duration.[2]

Laparoscopic hernia repair was first introduced in 1993 by Le Blanc and Booth.[3] They described the advantages of laparoscopic hernia repair surgeries depicting lower complication rates and better results with laparoscopic hernia repair compared to open hernia repair surgeries. Presently, only defects with complete loss of abdominal muscle structures and massive tissue loss are considered unsuitable for laparoscopic repair.[4]

Laparoscopic hernia repair utilizes a minimally access approach, has gained popularity, and has been widely used since its introduction in 1993. Laparoscopy utilizes few and small incisions to introduce laparoscopic instruments. Laparoscopy does not repair the fascial defects and covers the defect after reducing the hernia sac with or without the use of the mesh. A meticulous dissection is done resulting in fewer complications such as intestinal injury, bleeding, infection, and seroma.[5]

Repair of ventral hernia with laparoscopy has been reported to have excellent results in the existing literature. However, existing literature data is scarce and shows conflicting results concerning ventral hernia repair with laparoscopy or open surgery and needs further comprehensive exploration.[6] Hence, the present study aimed to comparatively assess the outcomes of open ventral hernia repair efficacy to laparoscopic hernia repair.

MATERIALS AND METHODS

The present prospective clinical study was aimed to comparatively assess the outcomes of open ventral hernia repair efficacy to laparoscopic hernia repair. The study subjects were from the Department of General Surgery of the institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study included 92 subjects having confirmed diagnosis of ventral hernia, either incisional or primary. The included subjects were assessed and examined thoroughly. The 92 subjects were randomly divided into two groups having 46 subjects each where Group I subjects were managed with a laparoscopic approach and Group II subjects were managed with an open surgical approach. The inclusion criteria were subjects willing to participate and the exclusion criteria were subjects who did not give consent for study participation, emergency surgical cases, and subjects with a hernia defect of >3cm.

In the study, Group I subjects were managed with a laparoscopic approach and Group II subjects were managed with an open surgical approach with both groups having 46 subjects each. No subjects from the laparoscopic group were converted to open surgery. Before surgery, all subjects having incisional hernia were given 1gram sulbactam-ampicillin intravenously and underwent mechanical bowel

preparation. In all the subjects, low molecular weight heparin was given subcutaneously preoperatively. All the surgical procedures were done under general anesthesia with nasogastric tubes being used for decompression and Foley urinary catheter was placed in all the subjects.

On the first and 2nd day postoperatively, all subjects were given the same narcotic analgesic, 50 gm pethidine thrice daily via intramuscular route and 8mg Ioronoxicam as an anti-inflammatory drug twice daily via intravenous route. After 2nd postoperative day, oral analgesics such as 1gm metamisol thrice daily were used for analgesia. During the hospital stay and at 1 week postoperatively, pain scores were assessed in all the subjects using VAS (visual analog scale).[7]

In Group I, the hernia was approached laparoscopically via lateral approach and from the farther abdominal side from the hernia defect for the port placement. Veres needle was inserted through the left upper abdominal quadrant to establish the pneumoperitoneum. Three trocars were utilized during the surgery. Complete exploration of the abdominal cavity was done to identify the hernia defect. Following adhesiolysis, hernia defect margins were defined clearly and the peritoneal sac was left in situ. The mesh used was either polyester and polyurethane or expanded polytetrafluoroethylene mesh.

Hernia defect edges were palpated under direct vision and were marked on the skin using skin markers that were sterilized before use. Meshes were placed to overlap all the margins of the hernia for a minimum of 3 cm. The meshes were fixed to the abdominal wall using titanium trackers and non-absorbable transfascial sutures. In 8 subjects, anchor sutures were used as replacements for titanium trackers. In four subjects, on-trackers were used for mesh fixation. Non-absorbable sutures were used to close the port site. No drains were placed.

In Group II subjects, an open surgical approach was used and abdominal fascia was covered using the polypropylene mesh. The dissection of the fascia was done at a minimum of 5cm from the edges of the defect. Non-absorbable sutures were used to attach the polypropylene mesh. In all the subjects, aspirative suction drains were given. In cases with daily drainage of <50 ml, suction drains were removed.

In all the subjects from both groups, postoperative major and minor complications, degree and presence of postoperative pain, hospital stay duration, hernia location, fascial defect size, body mass indices, surgical duration, and demographic data were collected and compared.

The data gathered were analyzed statistically using the SPSS software version 21.0 (IBM Corp., Armonk, NY, USA) and the chi-square test. The data were expressed as mean and standard deviation and frequency and percentage. Statistical significance was kept at a p-value of <0.05.

RESULTS

The present prospective clinical study was aimed to comparatively assess the outcomes of open ventral hernia repair efficacy to laparoscopic hernia repair. The 92 subjects were randomly divided into two groups having 46 subjects each where Group I subjects were managed with a laparoscopic approach and Group II subjects were managed with an open surgical approach. The mean age of the study subjects in Group I and II was 50.5±8.8 years and 54.3±9.2 years respectively which was non-significant with p>0.05. There was a significantly higher number of females in the laparoscopy group compared to the open surgical group with a p-value of <0.05. Primary and incisional hernia were seen

in comparable subjects of two groups with $p>0.05$. Mean BMI was significantly higher in the laparoscopy group compared to the open surgical group with $p>0.05$ as shown in Table 1.

In two subjects, missed intestinal injury was seen as a major complication where subjects were surgically managed again on 4th day postoperatively. The small site of intestinal injury was exteriorized as a stoma. The mesh was removed secondary to intra-abdominal infection, and the abdomen was left open for 2 weeks. Missed enterotomy can be attributed to intraoperative burn from the electrocautery. After 3 months, the stoma and abdominal wall were closed. Ileus was developed in another subject postoperatively where abdominal adhesions were seen on laparotomy which can lead to ileus. In the open surgery group, a high incidence of wound infection was seen which needed mesh removal in 8 subjects.

In two subjects having a parastomal hernia, recurrence was seen in hernia managed with open repair using the Proleene graft, and in these two subjects, recurrent hernia was managed with the laparoscopic approach. Another subject with recurrent left inguinal hernia was reported along with a large epigastric hernia. Both of these hernias were managed with laparoscopy and successful repair was seen in all these cases.

In the open hernia repair group, seroma formation was not seen owing to the use of postoperative aspiration drain in study subjects. However, in 8 study subjects from the laparoscopic repair group, seromas were seen despite of using the abdominal binders. Surgical intervention was not needed in any of these seromas, and they resorbed on their own at 6 weeks follow-up. In the laparoscopic ventral hernia repair group, 2 subjects postoperatively developed remnant hernial sac hematoma and both of these subjects were on anticoagulants and had a history of prosthetic valve replacement. In these subjects, enlarging and painful mass was percutaneously drained.

The mean surgical time was significantly higher in the laparoscopic ventral hernia repair group with $p<0.05$. This can be attributed to the combined mesh fixation method in the laparoscopy group. Also, transracial tissue placement is a time-consuming procedure. The hospital stay duration was significantly shorter in the laparoscopic group compared to the open surgical repair group.

In the laparoscopic ventral hernia repair group, in 2 subjects a persistent leakage on the transfascial suture site was seen till 6 months follow-up. The fluid was collected and subjected to microbiological assessment and the results were negative. Also, no evidence of infection was seen on laboratory examination including c-reactive protein measurement, ESR (erythrocyte sedimentation rate), and whole blood counts. Graft intact in the abdominal wall was seen on abdominal tomography with no presence of an enterocutaneous fistula. In these subjects, the fistula tract and e-PTFE graft were removed. Graft rejection was the cause of leakage as all test results were negative.

On assessing the surgical outcomes following open and laparoscopic hernia repair in two groups of study subjects, ileus, hematoma, mesh removal secondary to rejection and enterotomy was seen in 4.34% (n=2) subjects from the laparoscopy group and no subject with open hernia repair with $p<0.05$. Seroma was reported in 17.39% (n=8) of subjects from the laparoscopy group and no subjects with open hernia repair. The difference was statistically significant with $p<0.05$. Mesh removal secondary to infection was done in 4.34% (n=2) subjects from the laparoscopy group and 17.39% (n=8) subjects from the open hernia repair group ($p<0.05$). Recurrence was reported in 4.34% (n=2) of subjects from

the open surgery group ($p<0.05$). Mean follow-up time, mean mesh size used, and postoperative pain were comparable in Group I and II with $p>0.05$. The mean hospital stay duration was 2.3±1.7 and 6.1±4.4 days respectively in Groups I and II which was significantly higher in an open group with $p<0.05$. The mean operative time was 99.2±32.0 minutes in the laparoscopy group which was significantly higher compared to the open group where it was 72.4±18.02 minutes with $p<0.05$.

DISCUSSION

The present study included 92 subjects that were randomly divided into two groups having 46 subjects each where Group I subjects were managed with a laparoscopic approach and Group II subjects were managed with an open surgical approach. The mean age of the study subjects in Group I and II was 50.5±8.8 years and 54.3±9.2 years respectively which was non-significant with $p>0.05$. There was a significantly higher number of females in the laparoscopy group compared to the open surgical group with a p-value of <0.05. Primary and incisional hernia were seen in comparable subjects of two groups with $p>0.05$. Mean BMI was significantly higher in the laparoscopy group compared to the open surgical group with $p>0.05$. These data were similar to the studies of Carbajo MA et al[8] in 2003 and Anthony T et al[9] in 2000 where authors assessed subjects with demographic data comparable to the present study.

The study results showed that in two subjects, missed intestinal injury was seen as a major complication where subjects were surgically managed again on 4th day postoperatively. The small site of intestinal injury was exteriorized as a stoma. The mesh was removed secondary to intra-abdominal infection, and the abdomen was left open for 2 weeks. Missed enterotomy can be attributed to intraoperative burn from the electrocautery. After 3 months, the stoma and abdominal wall were closed. Ileus was developed in another subject postoperatively where abdominal adhesions were seen on laparotomy which can lead to ileus. In the open surgery group, a high incidence of wound infection was seen which needed mesh removal in 8 subjects. These findings were consistent with the results reported by Park A[10] in 2004 and Berger D et al[11] in 2002 where the authors reported missed intestinal injury and mesh infection as major complications after hernia repair as seen in the present study.

It was seen that in two subjects having a parastomal hernia, recurrence was seen in hernia managed with open repair using the Proleene graft, and in these two subjects, recurrent hernia was managed with the laparoscopic approach. Another subject with recurrent left inguinal hernia was reported along with a large epigastric hernia. Both of these hernias were managed with laparoscopy and successful repair was seen in all these cases. These results were in agreement with McKinley RD[12] in 2004 and McGreevy JM et al[13] in 2003 where recurrent hernia following open surgery were reported to be successfully managed with laparoscopic hernia repair by the authors.

Concerning the open hernia repair group, seroma formation was not seen owing to the use of postoperative aspiration drain in study subjects. However, in 8 study subjects from the laparoscopic repair group, seromas were seen despite of using the abdominal binders. Surgical intervention was not needed in any of these seromas, and they resorbed on their own at 6 weeks follow-up. In the laparoscopic ventral hernia repair group, 2 subjects postoperatively developed remnant hernial sac hematoma and both of these subjects were on anticoagulants and had a history of prosthetic valve replacement. In these subjects, enlarging and painful mass was percutaneously drained. These results

were comparable to the studies of Heniford BT et al[14] in 2000 and Topart P et al[15] in 2005 where similar to the present study, authors reported seroma formation after laparoscopic hernia repair which were resorbed spontaneously.

For the laparoscopic ventral hernia repair group, in 2 subjects a persistent leakage on the transfascial suture site was seen till 6 months follow-up. The fluid was collected and subjected to microbiological assessment and the results were negative. Also, no evidence of infection was seen on laboratory examination including c-reactive protein measurement, ESR (erythrocyte sedimentation rate), and whole blood counts. Graft intact in the abdominal wall was seen on abdominal tomography with no presence of an enterocutaneous fistula. In these subjects, the fistula tract and e-PTFE graft were removed. Graft rejection was the cause of leakage as all test results were negative. These findings were similar to the previous studies of Pring CM et al[16] in 2008 and Asencio F et al[17] in 2009 where leakage at transracial tissue was reported by authors secondary to graft rejection as in the present study.

The study results showed that on assessing the surgical outcomes following open and laparoscopic hernia repair in two groups of study subjects, ileus, hematoma, mesh removal secondary to rejection and enterotomy was seen in 4.34% (n=2) subjects from the laparoscopy group and no subject with open hernia repair with $p<0.05$. Seroma was reported in 17.39% (n=8) of subjects from the laparoscopy group and no subjects with open hernia repair. The difference was statistically significant with $p<0.05$. Mesh removal secondary to infection was done in 4.34% (n=2) subjects from the laparoscopy group and 17.39% (n=8) subjects from the open hernia repair group ($p<0.05$). Recurrence was reported in 4.34% (n=2) of subjects from the open surgery group ($p<0.05$). Mean follow-up time, mean mesh size used, and postoperative pain were comparable in Group I and II with $p>0.05$. The mean hospital stay duration was 2.3±1.7 and 6.1±4.4 days respectively in Groups I and II which was significantly higher in an open group with $p<0.05$. The mean operative time was 99.2±32.0 minutes in the laparoscopy group which was significantly higher compared to the open group where it was 72.4±18.02 minutes with $p<0.05$. This can be attributed to the combined mesh fixation method in the laparoscopy group. Also, transracial tissue placement is a time-consuming procedure. These results were in line with the Itani KM et al[18] in 2010 and Eker HH et al[19] in 2013 where comparable surgical outcomes of hernia repair following open and laparoscopic surgery were reported by the authors in their respective studies.

CONCLUSION

Considering its limitations, the present study concludes that laparoscopic ventral hernia repair has comparable efficacy to open ventral hernia repair. For successful ventral hernia repair, high technology with advancements, high laparoscopic experience, and advanced surgical skills are vital factors.

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TABLES

Characteristics	Group I- Laparoscopy (n=46)	Group II- Open surgery (n=46)	p-value
Mean age (years)	50.5±8.8	54.3±9.2	>0.05
Gender n (%)			
Males	8 (17.39)	18 (39.13)	<0.05
Females	38 (82.60)	28 (60.86)	
Hernia			
Primary	28 (60.86)	20 (43.47)	>0.05
Incisional	18 (39.13)	26 (56.52)	
Mean BMI	31.8±2.3	31.4±2.4	<0.05

Table 1: Demographic and disease data in study subjects before surgery

Parameters	Group I (n=46)	Group II (n=46)	p-value
Mean follow-up (months	18.2±2.2 (2-41)	20.1±1.6 (6-29)	>0.05
Recurrence	0	2 (4.34)	<0.05
Hospital stay duration (days)	2.3±1.7	6.1±4.4	<0.05
Postoperative pain	1.51±1.1	1.63±0.34	>0.05
Operative time (min)	99.2±32.0	72.4±18.02	<0.05
Mesh removal secondary to rejection	2 (4.34)	0	<0.05
Mesh removal secondary to infection	2 (4.34)	8 (17.39)	<0.05
Seroma	8 (17.39)	0	<0.05
Hematoma	2 (4.34)	0	<0.05
Mean mesh size (cm^2)	210±201	225±193	>0.05
Enterotomy	2 (4.34)	0	<0.05
Ileus	2 (4.34)	0	<0.05

Table 2: Surgical outcomes following open and laparoscopic hernia repair in two groups of study subjects