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Research Article

Comparative study in clinical response in open versus laparoscopic ventral hernia repair

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ABSTRACT

Background: Repair of ventral hernia is one of the most common operations performed by surgeons around the world. The treatment of this common problem has seen an evolution from the pure tissue repairs to the prosthetic repairs and in the recently to laparoscopic repair. The fact that so many hernia repairs are practiced is a testimony to the fact that probably none is distinctly superior to the other. Hence this comparative study of clinical response in open versus laparoscopic ventral hernia repair in terms of operative time, post-operative pain, hospital stay and time until resumption of daily and routine work.
Methods: In this prospective observational study, 40 patients of uncomplicated ventral hernia were scheduled to undergo elective hernia repair, 20 patients by open mesh repair (onlay method) and 20 by laparoscopic mesh repair. Complicated and recurrent hernias were excluded. Patients were followed up with regular visits at 3 months interval till 1 year.
Results: Laparoscopic hernia repair requires longer time to perform compared to open repair. Postoperative pain and analgesic requirement were significantly less in laparoscopic group after 24 hours of surgery. Overall complications were more common in open group as compared to laparoscopic group. There is significant reduction in hospital stay, return to daily and normal activities in patients underwent laparoscopic hernia repair.
Conclusions: The database of our retrospective study regarding age and sex incidence, clinicopathological features and therapeutic outcome was comparable to other studies in various literatures.

Keywords: Ventral hernia, Open vs laparoscopic, Hernioplasty

INTRODUCTION

"A surgeon can do more for the community by operating on hernia cases and seeing that his recurrence rate is low than he can by operating on cases of malignant disease" (Sir Cecil Wakely- President: Royal College of Surgeons (Eng) 1948).

Hernia is as protrusion of a viscous or part of viscous through a natural or acquired defect in the wall of its containing cavity.[1] A ventral hernia is defined by a protrusion through the anterior abdominal wall fascia. These defects can be categorized as spontaneous (primary) or acquired or by their location on the abdominal wall. Epigastric hernias occur from the xiphoid process to the umbilicus, umbilical hernias occur at the umbilicus, and hypogastric hernias are rare spontaneous hernias that occur below the umbilicus in the midline. Acquired hernias typically occur after surgical incisions and are therefore termed incisional hernias.[2]

Based on national operative statistics, incisional hernias account for 15% to 20% of all abdominal wall hernias; umbilical and epigastric hernias constitute 10% of

hernias. Incisional hernias are twice as common in women as in men. As a result of the almost 4 million laparotomies performed annually in the United States and the 2% to 30% incidence of incisional hernia, almost 150,000 ventral hernia repairs are performed each year.[3,4] Several technical and patient-related factors have been linked to the occurrence of incisional hernias. There is no conclusive evidence that demonstrates that the type of suture or technique of incisional closure at the primary operation affects hernia formation.[5,6]

Hernia is one of the common surgical problems. Repair of ventral hernia is one of the most common surgical procedures worldwide, irrespective of country, race or socio-economic status and constitutes a major health-care in every country.

"Father of Modern herniorrhaphy" was Shouldice who performed multilayered repair in 1953. It was probably the most successful of the pure tissue methods, suturing only the local tissue without the addition of any prosthetic mesh.[7]

Starting from the beginning of modern anatomic hernia surgery, recurrences have plagued and frustrated surgeons of all ages, experience, skill and nationality.[8] Soon after the introduction of synthetic plastic mesh in the 1950's surgeons began experimenting with its use in bridging tissue defect.[9] In 1950s Horwich and Usher used prosthetic materials (2.5 cm x 7 cm) for treating inguinal and Incisional hernias.[10,11] Up to mid-1980s there has been increase in the use of prosthetic mesh in surgery for hernia.

With the advent of laparoscopy entering every field of surgery, laparoscopic hernia repair was the obvious next step but unlike laparoscopic cholecystectomy, laparoscopic hernia repair took 16 years for a market penetration of 5-15% in the developed world.[12] Laparoscopic hernia repair is associated with less post-operative pain and early ambulation but it is more expensive, takes longer time to perform.[13] Studies showed that open mesh repair had more advantages, reference to cost, recurrence and vascular complications than laparoscopic repair.[14]

In the past, only recurrence rate was taken in to account as the first goal in hernia repairs. Today, laparoscopic or open routes, new challenges have to be faced to obtain not only a solid repair with low morbidity and mortality rates, but also a pain less post-operative period, short hospital stay, an inexpensive technique, a technique easy to teach and feasibility of carrying out repairs by every surgeon.[15]

So far till date, there is no ideal operative procedure for ventral hernia repair without any complications that are, postoperative pain, postoperative infections, recurrence and cost effectiveness. Each type of repair had its own advantages and disadvantages.

The laparoscopic repair of ventral hernia, a relatively newer modality in the armamentarium of the surgeon, has been around only for a little over a decade. Better patient comfort, allowing tension free repair with earlier return to daily activities are some of the claimed advantages of this technique. But very few studies are available in the literature. Laparoscopic ventral hernia repair has emerged as an alternative to open procedure.

Hence this prospective study comparing laparoscopic ventral hernia repairs with open ventral hernia repairs.

METHODS

This is a prospective observational study performed on 40 patients of uncomplicated ventral hernia after taking permission from the institutional ethical committee. Patients were selected irrespective of their age, gender, comorbid conditions and previous surgeries. All complicated and recurrent hernias were excluded. After preoperative evaluation and anaesthetic check-up, 20 patients were subjected to open hernia repair using polypropylene mesh by onlay method and 20 patients by laparoscopic ventral hernia repair using dual mesh. Type of anaesthesia for hernia surgery was anaesthetist's choice. Most of the patients received general anaesthesia.

Prophylactic antibiotic ceftriaxone (third generation cephalosporin) was given to all patients at the time of induction of anaesthesia. And the next dose of antibiotic was repeated after 12 hours. All patients were observed for postoperative wound infection and complications. If complications occurred in the immediate postoperative period antibiotic was extended to the necessity of the complication otherwise extra dose of antibiotic was not recommended.

In the present study postoperative pain was compared using visual analogue scale (VAS) and verbal rating scale (VRS).[16,17] In analgesic drug selected for analgesia is tramadol (Opioid analgesic), three doses of 50 mg intravenously on '0' post-operative day (POD) were given. From the 1st postoperative day onwards no analgesic was prescribed to patients. If the patient complains of pain and VRS score is >5, then those patients were categorized for the need of extra analgesic requirement that is 50mg oral formulation of tramadol.

All the patients were monitored post operatively for complications like seroma formation, wound infections and treated accordingly like drainage of seroma, daily dressings. Sutures were removed in between the seventh (7th) to fourteenth (14th) postoperative day in all patients and followed 1, 2, 3 weeks and 3 months for any complications including recurrence till the period of 1 year.

Following parameters were assessed

- Duration of surgery

- *Post-operative pain assessment:*
  - On '0' POD, pain was assessed with VAS at 1hr, 6 hours, 12 hours and 24 hours regularly.
  - On '1st' POD, pain was assessed with VRS at 12hours and 24 hours.
- Doses of analgesics required (in number) on '0' POD and '1st' POD
- Complications in the immediate post-operative period (during hospital stay) like operative site pain, fever, seroma, wound infection, mesh infection and recurrence.
- Total duration of hospital stay (in number)
- Return to daily activities after Surgery (in number)
- Return to normal regular work after surgery (in number)
- Follow up on 7th POD and problems like pain, seroma, wound infection and need of daily dressings
- Statistical analysis was performed with SPSS 15.0 statistical software. univariate analysis (ANOVA) was performed to identify differences between the study groups. A p-value of < 0.05 was considered as significant.

RESULTS

Age and sex distribution

Out of 40 patients, the maximum number of cases i.e. 12 (30%) patients were found in the age group of 51-60 years. The mean age of patient was 49.87±11.99 years with range of 23-70 years. Out of 40 patients, 17 were males and 23 were females and male to female ratio was1:1.35. Out of 40 patients, 19 patients were having primary ventral hernia and 21 patients were having incisional hernia as a result of previous surgery. Out of 21 patients of incisional hernia, 7 (33.34%) patients had undergone elective surgeries and 14 (66.66%) patients had undergone emergency surgeries previously which lead to the present incision hernia.

Duration of surgery

Table 1: Comparison of duration of surgery.

Procedure	Mean (min)	Median (min)	SD	Minimum (min)	Maximum (min)
Open-mesh repair	101	95	22.78	60	140
Laparo-scopic repair	115.5	120	28.72	60	180

Laparoscopic repair (115.5min) requires longer time to perform than Open mesh repair (101min) with P value of 0.09.

Post-operative pain assessment

Laparoscopic (LAP) repair group had less pain score (8.65) than open (9.05) after 1 hour of surgery with p-value 0.007. Laproscopic group had less pain score (7.95) than open (8.4) after 6 hours of surgery with p-value of 0.007. Laparoscopic group had less pain score (7.15) than open group (7.5) after 12 hours of surgery with p-value 0.06. LAP repair group had less pain score (6.1) than open repair group (6.35) after 24 hours of surgery with p=0.17 (Figure 1).

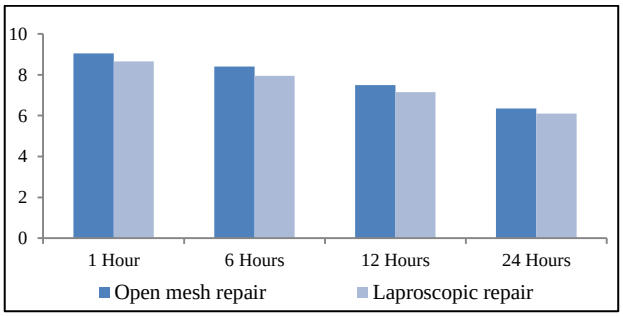

Figure 1: Pain assessment/visual analogue scale (VAS) on the day of surgery.

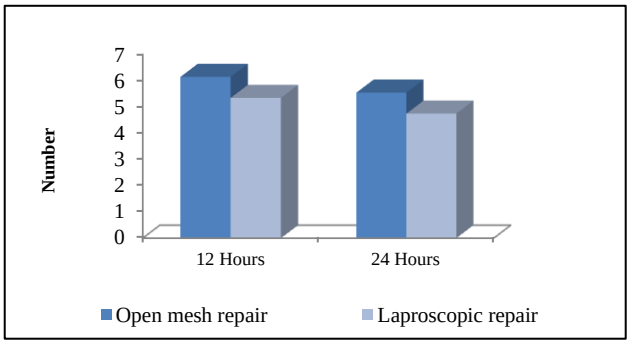

Figure 2: Verbal rating scale (VRS) on the 1st POD.

Laparoscopic repair had less pain scores (5.35) after 12 hours of 1st POD compared to open (6.15) with p-value of 0.01. Laparoscopic repair had less pain score (4.75) after 24 hours of 1st POD compared to open (5.55) with p-value of 0.0003 (Figure 2).

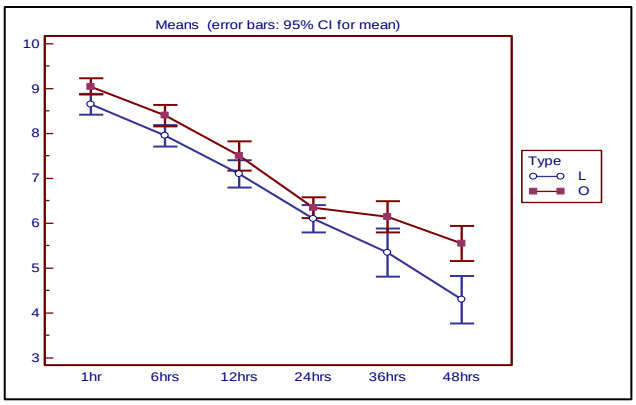

Figure 3: All categorical variables were represented as means ± SD and were compared using Student 'T' test-recording of hourly measurement such as VAS on both groups repeated measures ANOVA.

Analgesic requirement

Laparoscopic repair group required less analgesic on the day of surgery compared to open repair group with p-value of 0.4. Laparoscopic repair group require less analgesic on the 1st POD compared to open repair group with p value of 0.29 (Figure 4).

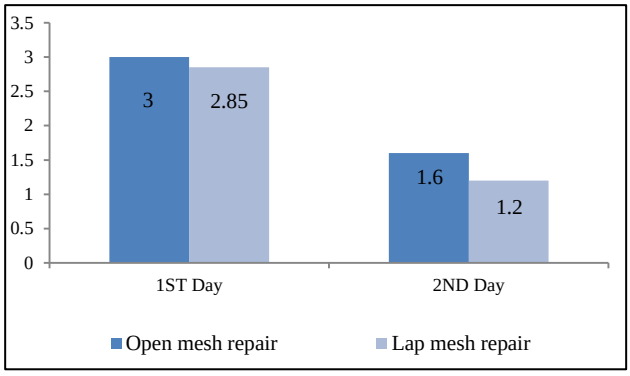

Figure 4: Requirement of analgesic drug.

Immediate Post-operative complications

Operative site pain was the most common immediate post-operative complication in both the groups. Overall all complications were more common in open group as compared to laparoscopic group (Table 2).

Table 2: Comparison of complications on the immediate post-operative period during hospital stay.

Complication	Open mesh (20)	Lap repair (20)
Seroma	6/20 - 30%	2/20-10%
Wound infection	4/20-20%	2/20-10%
Fever	5/20- 25%	4/20-20%
Operation site pain	20/20-100%	16/20-80%

Hospital stay

Laparoscopic group patients had less no of hospital stay (3.65 +/- 1.06 days) than open mesh repair group (4.25+/- 0.94 days) with p-value 0.07 (Table 3).

Table 3: Total duration hospital stay (days).

Procedure	Mean	Median	SD	Minimum	Maximum
Open mesh repair	4.25	4	0.94	3	7
Laparoscopic repair	3.65	4	1.06	2	6

Return to routine activities and work

Return to daily activities was earlier in laparoscopic group (1.95 +/- 0.66 days) than open repair group (2.5 +/- 0.5 days) with p value 0.00627. Return to regular work was earlier in laparoscopic mesh repair group (10.6 +/- 2.92) than open repair with mesh (14.75+/-3.35) with p-value 0.0002.

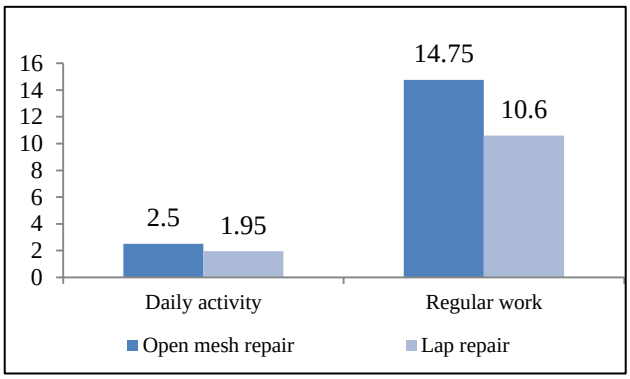

Figure 5: Return to activities after surgery.

Post-operative complications

Overall all complications were more common in open group as compared to laparoscopic group. Wound infection on 7th POD was seen in 10% patients of from open group while none from the laparoscopic group shows wound infection.

Table 4: Complications on 7th POD.

Parameters	Open mesh repair (20)	Laparoscopic repair (20)
Seroma	4/20-20 %	2/20-10 %
Pain	8/20-40 %	4/20-20 %
Wound infection	2/20-10 %	0/20-0 %
Daily dressings	6/20-30%	2/20-10 %

During subsequent follow up seroma was seen in 2 patients (10%), chronic pain in 2 patients (10%) and need of extra antibiotics in 2 patients (10%) of open group. Mesh infection and recurrence were observed in none. In laparoscopic group, no complications were seen during subsequent follow up.

Table 5: Complications in follow-up (2, 3 weeks and 3 months).

Parameters	Open mesh repair (20)	Laparoscopic repair (20)
Seroma	2/20-10%	0
Chronic pain	2/20-10%	0
Extradose of Antibiotic	2/20-10%	0
Mesh infection	0	0
Recurrence	0	0

DISCUSSION

The maximum age incidence of incisional hernia in the present study was in the age group of 31-60 years (75%) which is similar as reported by Goel et al (1981) as 62.33% patients in this range and Shah et al (1977) reported maximum incidence in age group 21-40 years.[18,35] The mean age of the patient in the present study was 49.87±11.99 (23-70) years. Shukla et al (1998) reported mean age 39 (18-68) years. Bose et al (1999) in their study reported mean age of 44.96 (18-76) years and reported youngest patient of 20 years and oldest 71 years and stated that children are supposed to be relatively immune to the development of incisional hernia.[20,21]

In our study, male to female ratio was 1:1.35 which is comparable to studies by Goel et al (1981) reported male to female ratio as 1:1.25, Parekh et al (1988) reported ratio of 1:3.75 and Shukla et al (1998) reported ratio 1:9.[19,20] Higher incidence in female population is explained as the gynecologic surgeries are the leading cause of incisional hernia. In our study, out of 21 patients of incisional hernia 14 (66.66%) patients had undergone emergency surgery previously and remaining 7 (33.34%) patients had elective surgery as an indication of previous operation leading to hernia comparable to studies reported by Bose et al (1999) who reported 50.91% incisional hernia rate as a result of emergency procedures, Parekh et al (1988) reported 27.83% cases of incisional hernia to be the result of emergency surgeries and 72.37% as result of elective surgeries.[19,21]

The duration of operation did not differ significantly in all the groups (p=0.09). Laparoscopic repair took at an average of 115.5minute, while open mesh repair took 101 minute. Rosen MJ et al (2009) also showed no significant statistical time difference between laparoscopic and open technique in their study.[22] While McGreevy et al (laparoscopic repair 132 min/open repair 102 min, P 0.0001), and Eker HH et al (laparoscopic repair 100 min/open mesh repair 76 min), significant increased duration with laparoscopic repair as compared to open mesh repair.[23,24] In Lomanto D et al (laparoscopic repair 90min/open mesh repair 93.3 min), open repair is longer as compared with lap repair.[25]

Laparoscopic repair VAS was less in the 1st hour, 6 hours and 12 hours of operation as compared to that of open mesh repair and this was statistically significant (p=0.007, p=0.007, p=0.006 respectively). Post-operative pain at 24 hours (p=0.17) on the very first POD was less in laparoscopic in the present study although it was not statistically significant. Lomanto D et al, Rosen MJ et al and Eker HH et al using VAS and other scores showed that pain score was not statistically significant in the immediate postoperative period.[22,24,25]

Analgesic requirement (number) on the day of surgery was not significantly (p=0.4) different in either of these techniques and this was in tandem with the experience of Rosen MJ et al and Eker HH et al[22,24]. First POD analgesic requirement (number) also did not show significant difference (p=0.2) and this was in tandem with the experience of Rosen MJ et al and Eker HH et al.[22,24]

Hospital stay also did not differ significantly (p=0.11) with lap 2.75 days and open group 3.25 days, although the mean duration of stay was less in laparoscopic group as compared to Open mesh repair group. McGreevy et al showed similar results with lap 1.1 days and in open group 1.5 days with p=0.1 Lomanto D et al, in their studies showed shorter hospital stay in laparoscopic group (2.7 days) compared to open (4.7 days) with p=0.044.[23,25]

Return to daily activities (days) was earlier in laparoscopic repair (1.95) than in open mesh repair group (2.5), which is statistically significant (p=0.006). In Lomanto D et al study, results are similar, open group (4.7 days) and lap group (2.7 days) with p=0.044.[25] McGreevy et al shows non-significant difference with p=0.10 (open group-1.5 days and lap group-1.1 days).[23] Rosen MJ et al also shows that, there is no significant difference between open and lap group in terms of return to daily activities.[22]

Return to normal work (in days) was also earlier in laparoscopic repair (10.6) as compared to open mesh repair (14.75) and the difference was statistically significant (p=0.0002). Itani KM et al showed laparoscopic group had shorter postoperative duration for return to normal work (28.5 days) as compared to those who had open mesh repair (23.0 days).[26] But Rosen MJ et al showed that there is no significant difference in return to regular work.[22]

Out of the 20 patients treated with open mesh repair 4 patients (20%) had post-operative wound infection which is compared and correlated with the studies of Mohammed Zarin et al as 14%, Martin- Duce et al as 16%, Ladurner et al as 11%.[26,28,29] In lap group, out of 20 patients, 2 patients (10%) had developed wound infection. Post-operative seroma occurred in 6 patients (30%) treated with open mesh repair. Chrysos et al reported seroma rate 15%, Martin- Duce et al reported as 9%, Cassar K, Munro A reported seroma formation rate of 1-15% in his series.[28,30,31]

Out of 20 patients treated with laparoscopic mesh repair in our study, 2 patients (10%) had seroma, this comparatively high incidence of seroma after laparoscopic mesh repair was also reported by various studies Costanza MJ as 12%, Toy FK as 17%.[32,33] Heniford BT et al concluded from his study that wound infection is lower in laparoscopic hernia repair compared to open, as there is decreased extent of tissue dissection in the former.[34]

Fever (25%), operation site pain (100%) were common in open mesh repair than to laparoscopic group 20% and

80% respectively in immediate post-operative period. Over all complications in immediate post-operative period in open mesh repair were more as compared to laparoscopic repair. Similar results were seen in to Lomanto D et al, Itani KM et al, McGreevy JM et al that Laparoscopic repair had fewer postoperative complications than those receiving open mesh repair.

All patients were followed on 7th POD and regular 2, 3 weeks and 3 months intervals. On 7th POD persistence of seroma was common in open mesh repair (20%), compared to laparoscopic repair (10%). Operation site pain was more common in open mesh repair (40%), compared to laparoscopic repair (20%) and wound infection of 10% compared to laparoscopic repair (none) and need for daily dressing in 30% patients observed in open mesh repair compared to Laparoscopic repair (10%). Over all complications on subsequent post-operative follow up were more in open mesh repair as compared to laparoscopic repair. Similar results were seen in to Lomanto D et al, Itani KM et al, McGreevy JM et al that Laparoscopic repair had fewer postoperative complications than those receiving open mesh repair.[23,25,26]

Fortunately, recurrences of hernia and mesh infection were observed in none of our patients. In other studies, Lomanto D et al rate of recurrence after laparoscopic repair was 2% as compared to open group (10%). In Itani KM et al, over all recurrence at 2 years was 12.5% in lap group and 8.2% in open group.[25,26] In Eker HH et al, at a mean follow up period of 35 months, a recurrence rate of 14% in open group and 18% in lap group.[24] This can be explained by less number of patients in our study as compared with those studies.

CONCLUSION

From the present study we conclude that, between laparoscopic and open ventral hernia repairs, there is no significant difference with regards to duration of operation but laparoscopic hernioplasty takes a little longer operation time. Post-operative pain, analgesic requirements on the day of surgery and first post-operative day was less in laparoscopic group as compared to open group. Postoperative morbidity in terms of complications like seroma formation, wound infection is comparatively less in laparoscopic group as seen with open group. There is significant reduction in hospital stay, return to daily and normal activities in patients underwent lap hernia repair. Recurrence of hernia and mesh infection was observed in none of our patients. This can be explained by less number of patients in our study as compared with those studies. Laparoscopic mesh hernia repair still remains to be validated with larger number of patients and longer duration of follow up.

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