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Original Research Article

A comparative study of laparoscopic trans abdominal pre peritoneal ventral hernia repair versus open pre peritoneal ventral hernia repair

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ABSTRACT

Background: Ventral hernias are defined as a protrusion of abdominal contents through the abdominal wall muscle. It can be categorised as spontaneous or acquired or by their location on the abdominal wall like epigastric hernia, umbilical hernia, para umbilical hernia etc. This original article reveals that laparoscopic trans abdominal pre peritoneal (TAPP) mesh placement for ventral hernia usually follows the current principle of hernia surgery and give better results from open pre peritoneal ventral hernia repair.
Methods: A prospective study conducted in Dr. D. Y. Patil Medical College and Hospital, Pune for the period of 2017-2019 comparing laparoscopic TAPP vs. open preperitoneal ventral hernia repair. Total of 25 patients for laparoscopic TAPP repair and 25 patients for open preperitoneal repair were compared.
Results: Total 50 cases were studies in which 25 for laparoscopic and 25 for open repair. Majority of patients were female than males. Incidence of para umbilical (56%) was found to be more. Intra operative, post-operative complications were found to be more in open repair than laparoscopic TAPP repair.
Conclusions: Laparoscopic TAPP ventral hernia repair is safe with fewer complications. Therefore, offers successful treatment for ventral hernia repair with added benefits of laparoscopy such as better visualization and magnification of the hernia defects which are not clinically apparent and less chances of injury which is not possible by open technique. Laparoscopic TAPP ventral hernia repair gives equal results in terms of recurrence and less complications than open ventral hernia repair.

Keywords: Ventral hernia, Laparoscopic TAPP repair, Open pre peritoneal repair

INTRODUCTION

Ventral hernias are defined as a protrusion or bulge of abdominal contents through the abdominal wall muscle/fascia. This may be present at birth or acquired from weakening or disruption of the overlying fascia, or from failed healing of a surgical incision.[1]

Ventral hernias can be categorised as spontaneous or acquired or by their location on the abdominal wall. Hernias occurring between the xiphoid process upto the umbilicus are called as epigastric hernias. Hernias occurring at the umbilicus are called as umbilical hernias. In adults, the defect in the median raphe is immediately adjacent to (most often above) the true umbilicus, although at operation this is indistinguishable, termed as para umbilical hernia.[2] Acquired hernias typically occur after surgical incisions and are therefore termed incisional hernias. Other unusual hernias present are spigelian hernia, lumbar hernia.[3]

Ventral hernias are one of the most common problems confronting general surgeons. Incisional hernia is a common long-term complication of abdominal surgery

and is estimated to occur in 3-13% of laparotomy incisions. However, its incidence is more than 23% in patients, due to development of surgical site infection in the laparotomy wound.[4]

Incisional and para-umbilical hernias which constitute about 85% of the overall ventral abdominal hernias are most commonly present.[5]

Umbilical hernias are congenital in origin and occur due to incomplete closure of the umbilical scar in the child or fails to close and stretches in later years in adult patient. In adults the cause is usually acquired and incidence is more in females. Female to male ratio 3:1.[6] Paraumbilical hernias usually occur through the linea alba either above or below the umbilicus and not through the umbilical scar.[7]

Several methods of open ventral hernia repair have been practiced from conventional suture repair to open tension-free mesh repair methods, but with suboptimal results. Recurrence rates, after primary suture repair, range from 24-54% whereas tension-free repair mechanism with prosthetic mesh has decreased the recurrence rate up to 10-24%.[8,9] The onlay technique involves primary closure of the fascia defect and placement of a mesh over the anterior fascia and pre peritoneal repair involves placement of mesh over parietal peritoneum. The major advantage of this approach is that the mesh is placed outside the abdominal cavity, avoiding direct interaction with the abdominal viscera. However, disadvantages include seroma formation, surgical site infection and the repair is usually under tension. Prospective analysis of this technique is not available, but a retrospective review has reported recurrence rates of 28%.[10]

Laparoscopic ventral hernia repair was reported for the first time early in the ninety's. It uses intra peritoneal onlay mesh placement (IPOM) was used to achieve a tension-free repair of the hernia. In the recent years, there has been a rising concern regarding certain long-term complications involving intra peritoneal mesh placement like mesh adhesion, fistula formation, and mesh migration into hollow organs resulting in various acute abdominal events. Due to such significant, though uncommon adverse events, some surgeons have favoured sublay repair for ventral and incisional hernias.[11]

Laparoscopic trans abdominal pre-peritoneal (TAPP) repair in this technique pre peritoneal retromuscular positioning of polypropylene mesh is done and the peritoneum which acts as a natural barrier between the bowel and the mesh results in low postoperative complications and negligible adhesion formation. It is also far less expensive than the barrier mesh.[12] Laparoscopic Trans abdominal pre peritoneal mesh placement usually follows the current principle of hernia surgery, and is based on the sound physiological principle of diffusing the total intra-abdominal pressure on each square inch of the implanted mesh and usually follows the current principle of hernia surgery.[13] The tissue in growth is expected to be more extensive than the intra-abdominal position of the mesh. These advantages have an effect on the major surgical outcomes in laparoscopic pre peritoneal ventral hernia repair and by minimal invasive approach which causes minimum trauma to the abdominal wall and lowers the recurrence rate to 2-5%.[14]

METHODS

This is a prospective study. The study was conducted on randomly selected newly diagnosed ventral hernia cases coming to the Dept. of Surgery, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune. Duration of study was 2 years from July 2017 to July 2019.

Sampling method and sample size

Patients admitted to our institute in surgery wards fulfilling the following inclusion-exclusion criteria were included in this study and categorized randomly in two groups, group A consisted of 25 patients for laparoscopic TAPP ventral hernia repair and group B was 25 patients for open ventral hernia repair. Patients were informed and the consent was taken. Institutional ethical committee clearance was taken.

Inclusion criteria

Patients of age group 15-65 years and all patients of ventral hernia attending the OPD were included in the study.

Exclusion criteria

Immuno-compromised patients, patients not fit for the surgery, all the emergencies like complicated hernia and patients with recurrent ventral hernias were excluded from the study.

Patients of group A underwent laparoscopic TAPP ventral hernia repair under general anaesthesia while patients of group B underwent open pre peritoneal repair under spinal anesthesia. Intra and post-operative complications were noted and tabulated. Postoperative patients of both groups were given I.V. Inj. cefotaxime 1 gm B.I.D. on day of operation and continued for 3 days. Patients in the postoperative period were closely followed up for complications, recovery, and recurrence under the parameters including postoperative pain (visual analogue scale was used to assess the pain. The patient was instructed to indicate the point in the image to indicate how much pain they were experiencing), seroma formation, surgical site infection and early recurrence.

Statistical analysis

The categorical variables were assessed using Pearson Chi-square or Fischer exact test. The quantitative

variables were assessed using T-test. The test was considered significant only if the p value comes out to be less than 0.05. Comparison of operative time, complications, recurrence and safety between both the groups were done.

RESULTS

Majority of the cases i.e. 18 cases (36%) were in 56-65 years age group followed by 15 cases in 46-55 years and 13 cases in 36-45 years and 4 cases in 26-35 years (Table 1). Out of total 50 cases 31 (62%) were females and 19 males (38%) (Table 2). Majority of cases were para umbilical hernia (n=28), 20 cases were incisional hernia and only 2 cases were epigastric hernia.

In para umbilical hernia the mean operative time in group A was 75 mins and in group B was 74 mins while in Incisional hernia it was 100 mins in group A and 95 mins in group B and in epigastric hernia case it was 85 mins in group A and 80 mins in group B. Overall, the mean operative time in group A was 89.80 minus and in group B was 79.40 mins. The operative time is significantly more in group A than group B ($p<0.05$) (Table 4).

The maximum cases i.e. 41 had no complication of which 24 were in group A and 17 were in group B. The intra op hemorrhage was seen in 9 cases, out of which 8 cases in group B and 1 case in group A. The intra operative hemorrhage was significantly less in group A than in group B ($p<0.05$) (Table 5).

Table 1: Age wise distribution of cases in study group.

Age (in years)	No. of cases	Percentage (%)
16-25	0	0
26-35	4	8.0
36-45	13	26.0
46-55	15	30.0
56-65	18	36.0
Total	50	100.0

Table 2: Gender wise distribution of cases in study group.

Gender	No of cases	Percentage (%)
Male	19	38
Female	31	62
Total	50	100

Table 3: Type of hernia wise distribution of cases in study group

Type of hernia	No of cases	Percentage (%)
Para umbilical hernia	28	56.0
Incisional hernia	20	40.0
Epigastric hernia	2	4.0
Total	50	100.0

Table 4: Comparison of operative time (minutes) in group A and group B.

	Group A (n=25)		Group B (n=25)		Z value	P value
	Mean	SD	Mean	SD		
Operative time (minutes)	89.80	14.396	79.40	15.229	2.48	0.017

Table 5: Comparison of cases with Intra operative hemorrhage in group A and group B.

Intra op hemorrhage	Group A	Group B	Total
Yes	1	8	9
No	24	17	41
Total	25	25	50

Fisher exact test: p=0.023.

The maximum cases i.e. 36 had no complication of which 21 were in group A and 15 were in group B (Table 6). The intra op injury to surrounding structures was seen in 14 cases, out of which 10 cases in group B and 4 case in group A. The intra operative injury to surrounding structures was less in group A than in group B but not statistically significant ($p>0.05$).

Only 2 patients (8%) in Group A required open conversion to onlay repair. No patients from Group B converted to open onlay repair. Laparoscopic TAPP repair Group A was technically difficult than open pre peritoneal repair Group B but not statistically significant ($p>0.05$) (Table 7).

Table 6: Comparison of Intra operative injury to surrounding structures in group A and group B.

Injury to Surrounding structures	Group A	Group B	Total
Yes	4	10	14
No	21	15	36
Total	25	25	50

Chi-square=3.57, p=0.059.

Table 7: Conversion to open onlay repair in group A and group B cases.

Failure/ conversion to open onlay repair	Group A	Group B	Total
	N (%)	N (%)	
Yes	2 (8)	0	2
No	23 (92)	25 (100)	48
Total	25	25	50

P=0.15.

Table 8: Post-operative pain comparison in group A and group B.

Parameter	Group A (n=25)		Group B (n=25)		MW test Z value	P value
	Mean	SD	Mean	SD		
Pain score	1.76	0.779	4.64	1.630	5.65	<0.0001

It was calculated on the basis of VAS score. The mean pain score of all patients in Group A was 1.76 and mean pain score in Group B was 4.63. Post-operative pain was found to be significantly more in Group B than Group A ($p<0.05$).

Table 9: Comparison of seroma formation in group A and group B.

Seroma	Group A	Group B	Total
Yes	1	8	9
No	24	17	41
Total	25	25	50

Fisher exact test: P=0.023

The maximum cases i.e., 41 had no complication of which 24 were in group A and 17 were in Group B. The seroma formation was seen in 9 cases (18%), out of which 8 cases (32%) in Group B and 1 case (4%) in Group A. The seroma formation was significantly less in Group A than in Group B ($p<0.05$).

Table 10: Comparison of cases having surgical site infection in group A and group B.

SSI	Group A	Group B	Total
Yes	1	9	10
No	24	16	40
Total	25	25	50

Chi-square=8, p=0.005.

The maximum cases i.e., 40 had no complication of which 24 were in group A and 16 were in group B. The surgical site infection was seen in 10 cases (20%), out of which 9 cases (36%) in group B and 1 case (4%) in group A. The surgical site infection was significantly less in group A than in group B ($p<0.05$).

The maximum cases i.e. 45 had no complication of which 25 were in group A and 20 were in group B. The early recurrence was seen in 3 cases (6%), out of which 2 cases (8%) in group B and 1 case (4%) in group A. The early recurrence was more in group B than group A but not statistically significant ($p>0.05$).

Table 11: Comparison of cases having early recurrence in group A and group B.

Early recurrence	Group A	Group B	Total
Yes	1	2	3
No	24	23	47
Total	25	25	50

Fisher exact test: P=1

DISCUSSION

The present study is a hospital based comparative study to compare the outcome of both laparoscopic TAPP and open ventral hernia repair on the basis of operative time, intra operative complications and post-operative complications. Total 50 cases were selected and 2 groups of 25 patients each were included. Group A underwent laparoscopic TAPP repair and group B open pre peritoneal ventral hernia repair in the study.

Age distribution

The study was conducted in total 50 cases. Majority of the cases i.e. 18 cases (36%) were in 56-65 years age group followed by 15 cases in 46-55 years and 13 cases in 36-45 years and 4 cases in 26-35 years (Table 1).

Similar finding was observed in a study conducted by Ruby et al in a prospective study comparing laparoscopic and open ventral hernia repair found majority (50%) of the patients were in the 4th to 6th decade.[15] Predominance of older age group might be attributed to weakening of abdominal muscles, delayed healing and additional age related co morbidities.

Gender wise distribution

Gender wise distribution of cases in the study. Out of total 50 cases 31 (62%) were females and 19 males (38%) (Table 2). Similar finding was also observed in a study by

Jayakar et al in the study of ventral hernia in that incidence of ventral hernia was found higher in females than males with a ratio of 1.9:1.[16] Reproductive life might has led to more strain on abdominal wall musculature weakening, leading to more occurrence of ventral hernia in female.

Additionally anaemia, hypoproteinemia which is endemic in Indian population may contribute to increased occurrence of ventral hernia. Incisional hernia in post caesarean section has contributed major part of incisional hernia in females.

Type of hernia wise distribution

Majority of cases were para umbilical hernia i.e. 28, 20 cases were incisional hernia and only 2 cases were epigastric hernia (Table 3). Similar finding was also observed in a retrospective study of 2389 patients by Dabbas et al who found that umbilical and paraumbilical hernias were the most common anterior abdominal wall hernia.[17] Prospective study by Jayakar et al found that 44% patient had Incisional hernia which was the most common variety followed by 32% had umbilical hernia and 10% had epigastric hernia.[16]

Operative time

Comparison of operative time between group A and group B in our study states that, in para umbilical hernia the mean operative time in group A was 75 mins and in group B was 74 mins while in Incisional hernia it was 100 mins in group A and 95 mins in group B, in this 2 cases of laparoscopic TAPP repair required conversion into open repair due to technical difficulties and in Epigastric hernia case it was 85 mins in group A and 80 mins in group B. Overall, the mean operative time in group A was 89.80 mins and in group B was 79.40 mins. The operative time is significantly more in group A than group B ($p<0.05$).

Additional difficulties noted were, tearing of peritoneum and leading to risk of exposure of bowel directly to mesh in two cases which required conversion to open onlay repair. Similarly, Ruby et al, found mean operating time for laparoscopic repair was 170 minutes and for open surgery 111 minutes. Hence laparoscopically done cases take longer duration than open cases.[15]

Intra operative complications wise distribution

Intra operative complications in our study found to be more in group B than group A. Total 14 number of cases (28%) had Intra operative complications in form of injury to surrounding structures. In that bowel injury occurred in 5 cases (10%); of which 3 were in group A and 2 were in group B, all patients bowel was primarily repaired without any complications, patients were kept NBM for 3 days followed by liquid and soft diet.

Rest 9 cases had intra operative haemorrhage/bleeding (18%) which got controlled by applying pressure and by the use of energy sources. 1 case (4%) in group A and 8 cases (32%) in group B, haemorrhage occurred due to injury to inferior epigastric vessels in 2 patients one from each group and 1 case had omental injury from group B and injury to abdominal muscles occurred in 6 cases of group B during dissection while creating pre peritoneal plane.The difference of injury to surrounding structures between 2 groups is not statistically significant ($p=0.059$). But intra operative haemorrhage/ bleeding was found to be significantly more in group B than group A in our study ($p=0.023$).

Umbilical injury is not included as in most of the open hernia repair omphalectomy was done. So, comparison is not rational.

Similar finding was also observed in a study by Porecha et al who did a comparative study in 50 patients and found that laparoscopic procedure had bleeding in 2 patients and no bowel injury whereas in open repair 5 patients had bleeding and 2 had bowel injury.[19]

Malik et al found that the overall incidence of complications was considerably higher in group B with open repair compared to group A with laparoscopic repair in the form of (prolonged ileus, haematoma, intestinal injury, bleeding during adhesiolysis).[18]

Conversion to open onlay repair

Two patients (8%) in group A was required open conversion to onlay repair and no patient from group B required conversion. But difference between group A and group B for conversion rate was not statistically significant ($p=0.15$).

Conversion to open onlay repair occurred, as a result of multiple tears in peritoneum and inability to adequately mobilizing the peritoneal flaps. This decision was taken to avoid direct contact of polypropylene mesh to bowel and internal viscera. This explains added technical difficulty in mobilizing flaps and leads to increase operative time also.

Similar finding was found in the comparative study of Eker et al between laparoscopic and open hernia repair.[20] In that study 8 out of 94 cases (8.5%) required conversion to open repair due to technical difficulties.

Postoperative pain

Visual analogue scale was used to assess post-operative pain in our study. The mean pain score of all patients in group A was 1.76 and mean pain score in Group B was 4.63. Post-operative pain was found to be significantly more in group B than group A ($p<0.05$). Study by Ruby et al found that post-operative pain was less in laparoscopic repair (2.35) as compared to open repair

(3.80).[15] Study by Al Shamy et al found regarding post-operative pain it was higher in open group than laparoscopic group with highly significant distinction between two groups (p=0.001).[21]

Early complications wise distribution

Only one case (4%) from group A who was operated for umbilical hernia had seroma formation with SSI. In group B seroma was present in 8 cases (32%) because of more dissection in open repair, of which 3 cases had intra operative haemorrhage also; SSI was present in 9 cases (36%) of which seroma was present in 6 cases. Early complications (seroma formation, SSI) were significantly more in group B than group A (p=0.023, 0.005).

Similar finding was also observed in a study by Porecha et al who did a comparative study of laparoscopic versus open ventral hernia repair and found that laparoscopic procedure was associated with potentially less wound infection compared with open repair with SSI in 4 patients of Open repair and 1 patient of laparoscopic repair.[19]

Similarly, study by Ruby et al found out laparoscopic repair had less seroma and wound infection than open group in a comparative study of 40 patients.[15] Shamy et al found in his comparative study of 100 patients that laparoscopic repair had less seroma formation (8% vs 14%) and surgical site infection (4% vs 12%) than open repair.[21]

Late complications wise distribution

Only 1case (4%) had early recurrence in group A and 1 case (4%) which was operated for para umbilical hernia, who had seroma formation and SSI leads to formation of sinus tract, for which we had to remove the mesh. In group B, early recurrence was present in 2 cases (8%) and sinus formation in 3 cases (12%). Late complications was observed more in group B than in group A. But the difference between both the groups is not statistically significant (p>0.05). Zhang et al agreed with us that there was no considerable difference between both groups in the incidences of hernia recurrence.[22]

CONCLUSION

Laparoscopic TAPP ventral hernia repair is safe results in few complications and effective due to early ambulation, and less recurrence. The definite advantages over open hernia repair are significant that are, less postoperative pain, lesser incidence of wound infection and early recovery. Therefore, offers successful treatment for ventral hernia repair with added benefits of laparoscopy such as better visualization and magnification of the hernia defects which are not clinically apparent and there is a possibility to treat multiple hernias located in various quadrants of the abdomen through the same incision and less chances of injury which is not possible by open technique. It is though equal in terms of cost of open preperitoneal repair, significantly cheaper than other laparoscopic alternative. Long learning curve of laparoscopic surgery and dissection in difficult plane are though considered limiting factors. In view of early favourable results, laparoscopic ventral hernia repair is a viable option although a longer follow-up with prospective randomized controlled studies are required to establish the definitive role of laparoscopic TAPP ventral hernia repair.

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