A COMPARATIVE STUDY OF LAPAROSCOPIC VENTRAL HERNIA REPAIR WITH AND WITHOUT CLOSURE OF HERNIAL DEFECT

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ABSTRACT

BACKGROUND

Despite the developments in laparoscopic repair of ventral hernia, some problems in this repair still persist. In addition to recurrence and postoperative pain, the problem of seroma with persistent postoperative bulge and loss of body image render the procedure unacceptable to patients. This was the basis on which our study was conducted. We studied and compared the safety, efficacy and postoperative morbidity of laparoscopic ventral hernia repair with and without closure of hernial defect.

MATERIALS AND METHODS

We compared 30 patients in Group A (where the defect was closed before mesh was placed) and 30 patients in Group B (where the defect was not closed and mesh was placed directly over the defect).

RESULTS

In this study, the average defect size was 43.66 cm² in Group A and 44.53 cm² in Group B. In our study the incidence of postoperative seroma in the closure group was 6.6%, whereas it was 53% in the non-closure group. There was one recurrence in our mean follow-up of 10 months, in closure group and 3 in non-closure. 80% of patients in the closure group were very satisfied with their body image, whereas only 20% of patients in the non-closure group were very satisfied with their body image.

CONCLUSION

The advantage of closure of the hernial defect before mesh reinforcement in laparoscopic ventral hernia repair has been established. A drastic decrease in the incidence of seroma has occurred. Quality of life in the postoperative period is better, because there is no bulge and patients are satisfied. The correlation with reduction in the incidence of recurrence needs further follow-up.

KEYWORDS

Laparoscopic Ventral Hernia Repair, Defect Closure, Body Image.

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BACKGROUND

Series of studies have shown the superiority of laparoscopic approach over the open approach for repair of incisional and ventral hernia.^[1,2] Problems in laparoscopic ventral hernia repair still persist. In addition to recurrence and post-operative pain and seroma, there is the problem of persistent bulge and loss of body image when the defect is not closed before mesh placement, which requires appraisal for further improvement.^[3] The technique of laparoscopic ventral hernia repair remains controversial, and it has never been adequately investigated whether to bridge or not to bridge the defect on top of the mesh. There are different approaches from different centres regarding whether to close or not close the defect, but the results have never been compared. Therefore, this study was taken up to compare the safety and efficacy of laparoscopic ventral hernia repair with and without closure of the hernial defect.

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Aims and Objectives

To study and compare safety, efficacy and post-operative morbidity of laparoscopic ventral hernia repair with and without closure of hernial defect.

MATERIALS AND METHODS

We carried out this non-randomised controlled trial, in which 60 patients suffering from ventral hernia were enrolled over a period of 2 years. We selected 30 patients in Group A (where the defect was closed before mesh was placed) and 30 patients in Group B (where the defect was not closed, and mesh was placed directly over the defect) after matching parameters of age group, range of defect size and body mass index (BMI).

Exclusion criteria included patients with obstructed hernia, recurrent hernias, very large hernias, associated large apron of fat (requiring abdominoplasty), paediatric age group, patients not fit for general anaesthesia and patients with significant co-morbidities, e.g. uncontrolled hypertension. All patients were examined and investigated preoperatively. The procedure was explained to the patients and an informed written consent taken.

Operative Technique

Pneumoperitoneum was created by using closed technique. A Veress needle was inserted at Palmer's point. Adhesiolysis was carried out to visualise the hernial defect. The margins of the defect were then measured and in Group A we closed the hernial defect using Polydioxanone (PDS) by continuous

sutures at an interval of 1 - 2 cm with additional 3 - 4 sutures in the retrograde manner. In Group B, the defect was not closed, and further steps were carried out in similar manner in both groups.

Composite mesh was used in all the patients. Mesh was introduced and centrally oriented to overlap the defect, 5 - 7 cm circumferentially followed by its fixation using combination of transabdominal sutures and tackers. Tackers were placed every 1 - 2 cm at the margin of the defect in two rows. We used our own innovative technique for transabdominal fixation of the mesh, which was done every 3-5 cm on the defect margins. Two Epidural needles were used. One Epidural needle was used for making an Endoloop of number one Polypropylene and was passed at the proposed site of fixation through 1 - 2 mm incision over the abdominal wall piercing through the mesh. Another Epidural needle carrying number one Polydioxanone was passed through the same incision into the abdomen keeping a distance of 1 - 2 cm between the two needles and then passed through the loop made by the first Epidural needle keeping a sufficient length of 7 - 10 cm with the help of needle holder and then both needles were withdrawn outside and both ends of Polydioxanone suture were tied in 5 - 6 knots and buried in the subcutaneous tissue.

Port closure was done followed by antiseptic dressing. A compression bandage was applied in those patients where the defect was not closed (Group B). The patients were monitored post-operatively and subsequently followed up. The various quantitative parameters between the two groups were compared using unpaired t-test and qualitative using chi square test and 'p' value was calculated to determine any significance in the parameters by using SPSS-21.

RESULTS

In our study, the age of the patients ranged from 22 to 60 years. The mean age in Group A was 37.89 ± 7.71 years and in Group B was 39.93 ± 8.59 years, (p value > 0.05). There were equal number of patients in each age group range in both groups. Out of 60, 56 (93.33%) patients were females and 4 patients (6.66%) were males.

44 patients had incisional hernia, 12 patients had paraumbilical hernia and 4 patients had epigastric hernia. In cases of incisional hernia, the most common cause was gynaecological procedures- caesarean section (45.5%) followed by hysterectomy (31.8%).

Surgical Procedure	No. of Patients	% Age
Caesarean section	20	45.5
Hysterectomy	14	31.8
Exp. Laparotomy	4	9.1
Cholecystectomy	4	9.1
Appendectomy	2	4.5
Total	44	100

Table 1. Incisional Hernia in Relation to Surgical Procedure

12 patients in the study had normal weight (BMI= 18-25). 40 patients in the study were overweight (BMI > 25). 4 patients were obese (BMI > 30) and 4 patients were morbidly obese (BMI > 35). These patients were equally distributed in both the groups.

The range of defect was 30 to 60 sq. cm in both the groups. We divided the defect size into three sections i.e. 30-

40 sq. cm, 40-50 sq. cm and 50-60 sq. cm for proper matching of both groups. There were equal number of patients in each defect size range in both groups. There were 12 patients suffering from hypertension, 4 from diabetes mellitus and 2 patients were suffering from chronic airway disease.

An abdominal bulge was the most common complaint of the patients (100% patients) followed by pain (66%).

Operative Findings- In all cases, there were adhesions between the omentum and abdominal wall. Small intestines were adherent with the defect in five cases (8.3%). The colon and urinary bladder were the contents in two cases each (3.3%).

Composite mesh was used in all cases and mesh fixation was done by combination of transabdominal sutures and tackers. Intraoperative complications were seen in 8 patients. There were 6 cases of intraoperative haemorrhage, during adhesiolysis managed using electrocautery. There were 2 cases of visceral injuries in the study. In Group A there was one case of visceral injury during adhesiolysis where the urinary bladder was injured and was repaired laparoscopically with Polyglactin 910 in a continuous manner and no conversion was required. An indwelling catheter was placed and the patient was discharged on 5th postoperative day on catheter which was removed after 2 weeks.

In Group B there was a case of injury to small intestines without contamination, which was repaired with a limited conversion and the rest of the procedure was carried out as usual. In Group A the mean operating time was 109.76 ± 6.62 minutes, whereas in Group B it was 90.4 ± 7.4 minutes. This difference was highly statistically significant (p value < 0.0000001).

Immediate post-operative pain was measured using a visual analog scale (VAS). In Group A majority (28) patients had mild post-operative pain, only two patients had severe post-operative pain. In Group B, all patients had mild post-operative pain. Statistically, there was no difference in post-operative pain in the two groups, (p value > 0.05). In Group A the mean hospital stay was $3.8 \pm .76$ days, whereas in Group B it was $3.56 \pm .81$ days. Therefore, the difference was statistically insignificant.

Post-operatively, 18 patients developed seroma within first week, 2 cases (6.6%) of seroma in the closure group (Group A) and 16 cases (53%) of seroma in the non-closure group. Statistically, this difference was highly significant (p value < 0.00008012 , chi sq= 15.56 and df= 1). All were managed conservatively. There were 4 cases (2 in each group) of port site infection within the first week, post-operatively treated with oral broad-spectrum antibiotics and local wound care. The infection resolved within a week in all four cases. In further follow-up 5 patients complained of mild pain 3 weeks post-operatively, whereas one patient complained of severe pain. These were managed by NSAIDs.

There was one case of seroma in Group B after 3 weeks, which resolved within 6 weeks with conservative management. The patient was suffering from morbid obesity. There was no case of mesh infection or trocar site herniation in our study.

After 3 weeks in Group A, 24 patients (80%) were very satisfied with their body image and 6 patients (20%) were moderately satisfied. In Group B 12 patients (40%) were not satisfied, 12 patients (40%) were moderately satisfied and 6 patients (20%) were very satisfied. This difference is

statistically highly significant, (p value= 0.000003359, chi sq.= 21.6 and df= 1).

Figure 1. Body Image Satisfaction

In Group A, 28 patients were satisfied with their quality of life and 2 patients were not satisfied. These were the case that had developed seroma. In Group B only 6 patients were satisfied with their quality of life and 24 patients were not satisfied. 16 of these had post-operative seroma and 8 patients complained of persistent bulge. This difference is also highly statistically significant (p value < 0.0000001, chi sq.- 32.85 and df-1).

	Group A (Closure)	Group B (Non-Closure)
Mean age (years)	37.89 ± 7.71	39.93 ± 8.59
Mean BMI (kg/m ²)	27.83 ± 3.71	28.33 ± 4.07
Mean size of defect (sq. cm)	43.66 ± 8.77	44.53 ± 7.86
Mean no. of ports	3.16 ± 0.37	3.23 ± 0.43
Mean operative time (minutes)	109.76 ± 6.62	90.40 ± 7.4
Trocar injury	nil	nil
Injury during adhesiolysis	1(3.3%)	1(3.3%)
Complete conversion	nil	nil
Limited conversion	0	1
Seroma	2(6.6%)	16(53%)
Satisfied with quality of life	28(93%)	6(20%)

Table 2. Comparison of Findings in the Two Groups

There was a single case (3.3%) of recurrence in Group A and 3 recurrences (10%) in Group B. In our study, we noticed a mean follow-up of 10.53 ± 3.4 months in Group A and 10.93 ± 3.43 in Group B.

DISCUSSION

Laparoscopic repair of ventral hernia has proven its superiority over the open approach in various surgical studies in terms of various parameters such as post-operative pain, hospital stay etc. But certain issues still need to be tackled such as seroma and post-operative body image

satisfaction, which are encountered in usual laparoscopic ventral hernia repair. Certain authors have found benefit in closure of defect before placement of mesh in terms of the body image by eliminating post-operative bulge and also have observed reduction in incidence of seroma.^[4,5] In this study our aim was to compare safety, efficacy and post-operative morbidity of Laparoscopic ventral hernia repair with and without closure of hernial defect.

The age of the patients in this study ranged from 22 to 60 years. In a similar study conducted by Le Blanc et al,^[6] the range was 24 - 81 years. In this study, the majority of patients were females and 80% patients had BMI > 25. This was similar to study conducted by Heniford et al,^[7] where 78% patients had BMI > 25. 30% patients in our study were suffering from co-morbid conditions, hypertension being the commonest, similar to the study conducted by Sanders et al^[8] where 67% were suffering from co-morbid conditions with hypertension again being the commonest.

In 80% cases we used 3 lateral ports in a triangular position. In 12 cases (20%) we used 4 ports. LeBlanc et al^[6] used 3 ports in 46% cases, 4 ports in 32% cases and 5 ports in 11% cases. We needed additional ports to facilitate difficult adhesiolysis.

Omentum and preperitoneal fat was the most common content of the hernial sac in this study and was adhered to the defect in 100% cases. The mean size of defect in our study was 43.66 ± 8.77 sq. cm in Group A and 44.53 ± 7.86 sq. cm in Group B. We had excluded defects > 60 sq. cm in our study. In a study conducted by LeBlanc et al,^[6] the average size of defect was 155 sq. cm and in the study by Heniford et al^[7] the mean defect size was 100 sq. cm. After measuring the defect size, the mesh was then tailored to overlap the defect by 5 cm. This overlap was done keeping in view the displacement of mesh in the initial stages and mesh shrinkage at a later stage similar to the technique used by Sanders et al^[8] in their study.

We used the Composite mesh in all the 60 cases. LeBlanc et al^[6] in their study used ePTFE mesh in 29% cases and Gore-Tex dual mesh in 67% cases. Orientation of mesh was done by using central suture technique. Corner suture technique using suture passer was used by Sanders et al.^[8] As far as fixing the mesh is concerned various fixation devices like tacks, sutures and surgical glue have been used. We used combination of tackers and transabdominal sutures for fixation of mesh by our own innovative technique as described before. Heniford et al^[7] used transabdominal suture fixation using a suture passer in all cases.

The mean operating time in Group A was 109.76 ± 6.62 minutes, which was significantly more than Group B in which it was 90.4 ± 7.4 minutes similar to studies conducted by Palanivelu et al.^[9] Hence, one limitation of closing the defect was increased operating time.

There was no case of general anaesthesia related complication in either group. There was one case of visceral injury in each group (3.3%). In a similar study by Chowbey et al,^[3] the incidence was 4.3%. There were 6 cases (10%) of haemorrhage intraoperatively in our study during adhesiolysis, which were managed using electrocautery. This is similar to study by Park et al,^[10] where the incidence was 11%. There was one case (1.66%) of limited conversion in our study. In this case while doing adhesiolysis the small intestine was injured, but there was no spillage of intestinal contents. The injured portion was brought out through a

1.5cm incision and repaired using polyglactin suture in an interrupted manner. In a study conducted by LeBlanc et al^[6] the conversion rate was 5%, all of which were limited conversions.

Most patients (96%) in our study experienced mild post-operative pain, which was based on visual analog scale (VAS). In a similar study conducted by Park et al,^[10] 83% patients experienced mild post-operative pain. There was no statistically significant difference in pain perception between the two groups.

We had only 4 cases (6.6%) of port site infection, 2 in each group which is a significant improvement over another study conducted by Carbajo et al,^[1] where the incidence of infection was 18%. In our mean follow-up of 10.53 ± 3.4 months in Group A and 10.93 ± 3.43 months in Group B, there was a single case (3.3%) of recurrence in Group A and 3 recurrences (10%) in Group B, which is similar to incidence of recurrence in studies conducted by Park et al^[10] and Ramshaw et al.^[2] However, more follow-up time is needed to confirm these findings. In our study, the incidence of post-operative seroma in the closure group was 6.6%, whereas it was 53% in the non-closure group. Not only is this statistically significant, this is much less than the incidence of seromas in other studies by Carbajo et al,^[1] Park et al^[10] and Birch et al^[11] where the incidence ranged from 10% - 70%. In a study conducted by LeBlanc et al,^[6] it was seen that incidence of post-operative seroma could be reduced by applying a compression bandage over the abdominal wall up to a week post-operatively. In our study we applied compression bandage in patients of Group B, because of which these patients were unable to take a bath for a week markedly reducing their quality of life. In this study, patients were questioned about their post-operative body image from 3 weeks to 3 months post-operatively. 80% patients in the closure group were very satisfied with their body image, whereas only 20% patients in the non-closure group were very satisfied with their body image mainly due to bulge in the abdominal wall. There are currently very few studies in the literature, which have taken body image as criteria in their study.^[4,12]

In spite of all the advantages with laparoscopic ventral hernia repair, problems like seroma, persistent bulge and recurrence still exist which require management to further improve its results.

We carried out an additional step of closing the defect in patients of Group A before placing the mesh. The rationale for closure of sac is that it re-establishes viable tissue which provides a lattice upon which mesh can be placed. It reduces subcutaneous dead tissue space and it provides tissue patches for mesh placement and promotes tissue ingrowth into entire surface of mesh improving overall outcome. Certain authors have found benefit in closure of defect before placement of mesh. Palanivelu et al^[9] did suture closure of hernial defect followed by placement of mesh in 721 patients and observed that there was negligible incidence of seroma and recurrence rate was 0.55%. Agarwal et al^[13] in their study observed that laparoscopic incisional and ventral mesh hernioplasty with defect closure lead to zero incidence of seroma and no incidence of post-operative bulge in their series of patients when followed up to a period of six months.

In our study, we have been able to establish the advantage of closure of defect in laparoscopic repair of

ventral hernia. The logic behind closure of defect is restoration of abdominal wall anatomy enables the 5 cm overlap needed in placement of mesh, prevents mesh extrusion, post-operative bulge and finally it prevents seroma formation giving a satisfactory body image to the patient.

CONCLUSION

We observed that patients in Group A were much more satisfied about their body image than in Group B. This was predominantly due to post-operative seroma formation and post-operative bulge seen in patients of Group B. The only disadvantage of closure of defect as seen in our study was a longer mean operating time, but with repetition this can be overcome. The benefits outweigh the shortcomings. Hence, we conclude that laparoscopic repair of ventral hernias with closure of defect followed by mesh reinforcement is an acceptable technique and superior to non-closure of defect in terms of post-operative morbidity and body image satisfaction. It also provides an overall better quality of life to the patients. It is thus recommended to close the sac defect in laparoscopic repair of ventral hernia before mesh reinforcement, given the surgeon is experienced in this field. It is suggested that more studies in this regard should be carried out to further establish the role of closure of defect in laparoscopic repair of ventral hernia.

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