

Efficacy of laparoscopic IPOM for paraumbilical hernia using polypropylene mesh and comparison with open mesh repair

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Abstract: *Introduction:* Umbilical hernias are encountered at the umbilical ring and may be present at birth or develop subsequently in later part of life. Adults having asymptomatic and small defects need to be followed clinically. Surgical treatment needs to be offered if the hernia enlarges or symptoms occur or if incarceration occurs. Laparoscopic repair of ventral hernias including umbilical hernias is gaining popularity in the recent times. Further the choice of mesh for laparoscopic repair is controversial. *Material and Methods:* This was a prospective study conducted at BLDEU's Shri B. M. Patil Medical College, Vijayapur from Oct 2015 to Aug 2017 and included 68 patients with umbilical/ paraumbilical hernia. All 34 patients in the laparoscopic group underwent intraperitoneal onlay mesh repair (IPOM) and 34 in the open mesh repair underwent onlay mesh repair. Polypropylene mesh was used in both the groups. *Result:* The laparoscopic repair (LR) group had a mean operative time of 74.4 min which was significantly more than the operative time of 52.5 min in open mesh repair group. The mean length of hospital stay at 6.9 days was higher in the open mesh repair (OR) group compared to 3.9 in laparoscopic group. There was no significant difference in the rate of complications among the two groups. Further the laparoscopic group showed advantages to the patient in terms of early post-operative mobilization and less post-operative pain. *Conclusion:* Although the use of mesh fixation device contributes to the higher cost of laparoscopic IPOM repair and the operating time is also longer laparoscopic repair of umbilical and paraumbilical hernia using polypropylene mesh offers advantage to the patient in terms of reduced hospital stay, decreased postoperative pain and a comparable complication rate to the widely practiced open mesh repair. Laparoscopic IPOM with polypropylene mesh is technically safe, effective and feasible with a better clinical outcome in patients requiring treatment for umbilical and paraumbilical hernia.

Keywords: Laparoscopic Ipom, Umbilical Hernia Repair, Lap Hernia Repair, Onlay Mesh Repair.

Abbreviations: IPOM-Intraperitoneal Onlay Mesh; DM-Diabetes Mellitus; HTN-Hypertension; MPGN-Mesangioproliferative Glomerulonephritis; LR-Laparoscopic Repair; OR-Open Repair, VAS- Visual Analogue Scale

Introduction

Umbilical hernias are encountered at the umbilical ring and may be present at birth or develop subsequently in later part of life. Adults having asymptomatic and small defects need to be followed clinically. Surgical treatment needs to be offered if the hernia enlarges or symptoms occur or if incarceration occurs. Surgical treatment can be done in the form of primary sutured repair or if defect is larger than 2cm prosthetic mesh repair is preferred [1]. Prevalence of paraumbilical hernia in the adult population is estimated to be 2%. Further this condition is more commonly seen in multiparous females and

patients with ascites secondary to liver cirrhosis. Umbilical hernias in adults are mostly acquired and may be attributed to various factors that cause increased intra abdominal pressure (pregnancy, ascites, etc.) which exert a pull on the abdominal musculature and produce weakness of the connective tissue fibres [2].

Mayo repair is less commonly performed today due to its high rate of recurrence. Instead small defects are closed primarily and defects larger than 2cm are closed using prosthetic mesh. Various techniques for

placing the mesh are- using a mesh to bridge the defect, placing a preperitoneal underlay mesh and reinforcing it with suture repair, and laparoscopic mesh placement. Most appropriate method of umbilical hernia repair is a matter of debate and there is no universal consensus about it. Various synthetic mesh products are available. Polypropylene and polyester mesh have been successfully placed in extra peritoneal position. A single sheet PTFE (Polytetrafluoroethylene) or a composite type mesh have been placed in intraperitoneal position [3].

Currently judicious use of following three concepts in the repair of paraumbilical hernia has resulted in low morbidity and recurrence rates. They include firstly use of imbrication of several layers in an attempt to reinforce surgical repairs, secondly the use of synthetic prosthesis to buttress repair and thirdly laparoscopic approach [4]. Laparoscopic repair of umbilical hernia is gaining popularity in recent times as it additionally helps to visualise other small defects and any abdominal pathology and its efficacy and safety need to be evaluated and compared with the conventional repair techniques.

Intraperitoneal mesh placement comes with its own set of complications and the ideal choice of the mesh for intraperitoneal placement is debatable. Use of PTFE or composite mesh for intraperitoneal placement is not totally devoid of complications and at the same time increases the financial burden on the patient. According to Mathes et al [5], for hernias which have a stable skin cover, prolene mesh can be placed intraperitoneally without a significant risk of visceral complications or failure of hernia repair.

Alkhoury et al. [6] reported results of laparoscopic ventral hernia repair with intraperitoneal prolene mesh placement and newer mesh are comparable. Further, use of prolene mesh significantly lowers the cost of the procedure. Complications associated with intraperitoneal prolene mesh placement (adhesions, infection, intestinal fistulization, sinus formation, seroma and recurrence) can occur with the newer mesh types also.

There is no statistically significant difference in the incidence of these complications between these meshes. There is not even the first level of

evidence in the literature to reject intraperitoneal prolene mesh in ventral hernia repair [7]. This study aims to compare the outcome and effectiveness of laparoscopic repair and open mesh repair of umbilical and paraumbilical hernia using prolene mesh in the view of operating time, post-operative pain, complications, length of hospital stay along with a minimum follow up of 3 months.

Material and Methods

This was a prospective comparative study conducted at BLDEU's Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapur from Oct 2015 to Aug 2017 and included 68 patients with umbilical/paraumbilical hernia who presented to the hospital and gave consent for participation in the study. Patients were allotted to either of the two groups i.e laparoscopic repair group (34) or the open mesh repair group (34).

Care was taken to match the two groups with respect to age and BMI. Patients above 18 years of age, with uncomplicated paraumbilical hernia and defect size ranging between 3 cm to 5 cm were included in the study after taking due consent and fitness for surgery. Irreducible umbilical hernias were included in the study. Patients with severe comorbid conditions (severe cardiopulmonary disease, uncontrolled ascites) and patients undergoing emergency surgery were excluded.

All 34 patients in the laparoscopic repair group underwent intraperitoneal onlay mesh placement (IPOM) using 3 ports (one 10mm camera port and two 5mm working ports) with prolene mesh of appropriate size to ensure a minimum of 3-5 cm overlap beyond the defect and the mesh being fixed with a combination of 5mm spiral titanium fixation device (tacks) and transfascial sutures.

Strapping with elastic adhesive tape was done over the umbilicus immediately following laparoscopic repair and retained for 3 weeks. 34 patients in the open mesh repair group underwent onlay mesh repair with prolene mesh of appropriate size and placement of suction drain wherever deemed necessary. Details regarding duration of procedure, post operative pain, length of hospital stay

following surgery, postoperative complications and recurrence within the study period were recorded and these findings compared between two surgical procedures.

Results

The data collected was compiled and statistical analysis was done. The results have been tabulated and represented in Table no.1.

Table-1: Results of the study				
Variables		Laparoscopic repair	Open Mesh Repair	P value
Age (Mean ± SD)		46.6 ± 7.9	47.9 ± 11.8	0.613
Sex N (%)	Male	17 (50)	26 (76.5)	0.024*
	Female	17 (50)	8 (23.5)	
Duration of Symptoms (Swelling) (Mean ± SD)		6.3 ± 10.8	5.7 ± 9.9	0.794
BMI N (%)	Normal (18.5-24.9)	12 (35.3)	10 (29.4)	0.484
	Overweight (25.0-30.0)	17 (50)	15 (44.1)	
	Obese (>30.0)	5 (14.7)	9 (26.5)	
BMI (MEAN±SD)		26.9 ± 3.4	27.6 ± 3.5	0.385
Type of Hernia N (%)	Paraumbilical	9 (26.5)	12 (35.3)	0.431
	Umbilical	25 (73.5)	22 (64.7)	
Content of SAC N (%)	Enterocoele	6 (17.6)	9 (26.5)	0.449
	Omentocoele	22 (64.7)	22 (64.7)	
	Omentocoele + Enterocoele	6 (17.6)	3 (8.8)	
Comorbidities N (%)	DM	3 (8.8)	3 (8.8)	0.62
	DM + HTN	1 (2.9)	2 (5.9)	
	HTN	5 (14.7)	2 (5.9)	
	MPGN	0 (0)	1 (2.9)	
Size of defect (MM) (Mean ± SD)		33.9 ± 5	32.8 ± 3.9	0.347
Duration of procedure (MIN) (Mean ± SD)		74.4 ± 7.2	52.5 ± 9.5	<0.001*
Length of stay (Days) (Mean ± SD)		3.9 ± 1.4	6.9 ± 3.5	<0.001*
Pain Score N (%)	Day 1	3.3 (0.6)	4.2 (0.8)	<0.001*
	Day 2	2.2 (1.1)	3.3 (0.8)	<0.001*
	Day 3	1.2 (0.5)	1.9 (0.8)	<0.001*
Complications N (%)	ANT ABD Abscess/ Surgical site infection	2 (5.9)	3 (8.8)	0.171
	Seroma	1 (2.9)	1 (2.9)	
Follow up N (%)	Chronic Pain	2 (5.9)	3 (8.8)	0.825
	Lost to follow up	4 (11.8)	5 (14.7)	
	Normal	28 (82.4)	26 (76.5)	
Total N (%)		34 (100)	34 (100)	
<i>Note: *means significant at 5% level of significance (p<0.05); DM-Diabetes mellitus; HTN-Hypertension; MPGN-Mesangioproliferative glomerulonephritis</i>				

The two groups were adequately matched with respect to the age and BMI of the patients. All the data was analysed using SPSS software. The

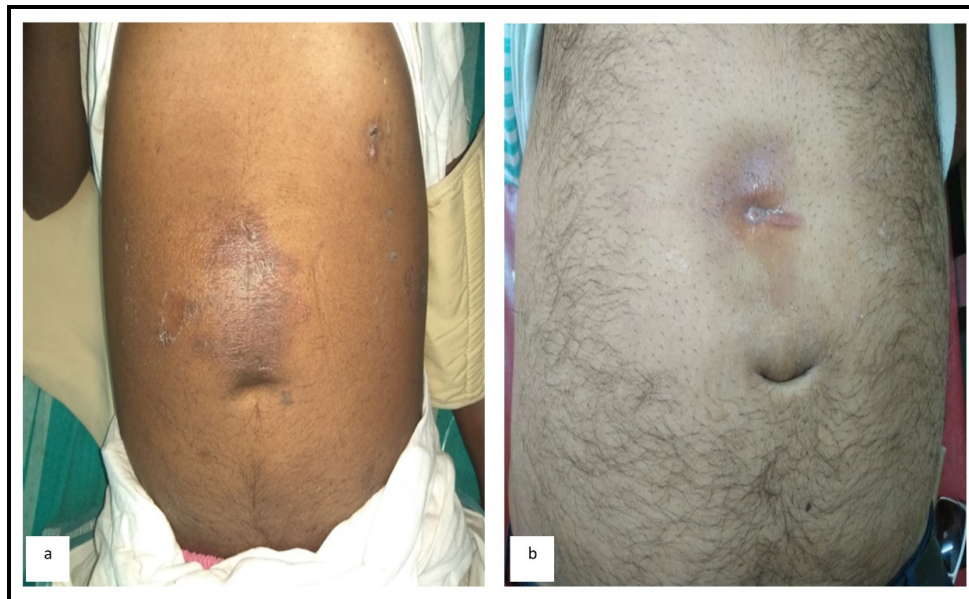
mean age of patients in the laparoscopic and open mesh repair group was 46.6 years and 47.9 years respectively. It was seen that

majority of the patients (31 out of 64) were in the age group 41-50 yrs. The mean BMI of patients in the laparoscopic and open group was 26.9 and 27.6 respectively. The mean duration of procedure (Table 1) from the time of port insertion/skin incision to port closure/ skin closure was recorded. It was observed that in the laparoscopic repair group the mean duration of the procedure was 74.4 +/- 7.2min which was much higher than that of the open mesh repair group which was 52.5 +/- 9.5min. This difference was statistically significant.

The mean length of hospital stay (Table 1.) following the surgery was found to be 3.9 ± 1.4

days in the laparoscopic mesh repair group which was significantly shorter compared to 6.9 ± 3.5 days in the open mesh repair group. Two patients in the laparoscopic repair group (5.9%) developed anterior abdominal wall abscess (Figure 1a.) and one of these patients happened to develop a chronic discharging sinus (Figure 1b.). Both these patients underwent repeat open surgery for mesh removal followed by anatomical repair. One patient in each group developed a seroma and 3 patients (8.8%) in the open mesh repair group developed surgical site infection which was controlled with antibiotics.

Fig-1: Patient with anterior (a) abdominal wall abscess and (b) sinus following laparoscopic mesh repair.



Patients were followed up for a minimum period of 3 months with first visit for suture removal on day 7-10 followed by a visit at 1 month and later on at 3 months. 2 patients in the laparoscopic repair group and 3 in the open mesh repair group had chronic pain which was mild and did not limit daily activities and persisted even at 3 months. 28 patients in the laparoscopic repair group and 26 in the open mesh repair group were normal at the 3 months follow up and had resumed their routine activities and were asymptomatic. A total of nine patients, 4 in the laparoscopic repair group and 5 in the open mesh repair group were lost to follow up.

The cost of surgery for laparoscopic group was significantly higher which was mainly accounted

for by the use of spiral titanium fixation devices (tacks). Detailed cost analysis was not done in our study. Further how much the reduction in the hospital stay and early return to routine activities contributes to compensating the increased cost of the procedure needs to be calculated in terms of the cost benefit ratio.

Discussion

In our clinical comparative study a total of 68 patients with paraumbilical or umbilical Hernia underwent surgery of which 34 underwent laparoscopic intraperitoneal onlay mesh repair (Figure 2.) and the rest 34 open mesh repair (Figure 3). The two groups were

analysed and compared in view of the clinical features, patient characteristics operating time and postoperative complications with an attempt

to establish the efficacy, safety and patient compliance of the two surgical approaches.

Fig-2: (a) Laparoscopic port placement (b) Visualisation of the defect (c) Mesh being secured with tacks (d) Strapping over the umbilicus with elastic adhesive plaster.

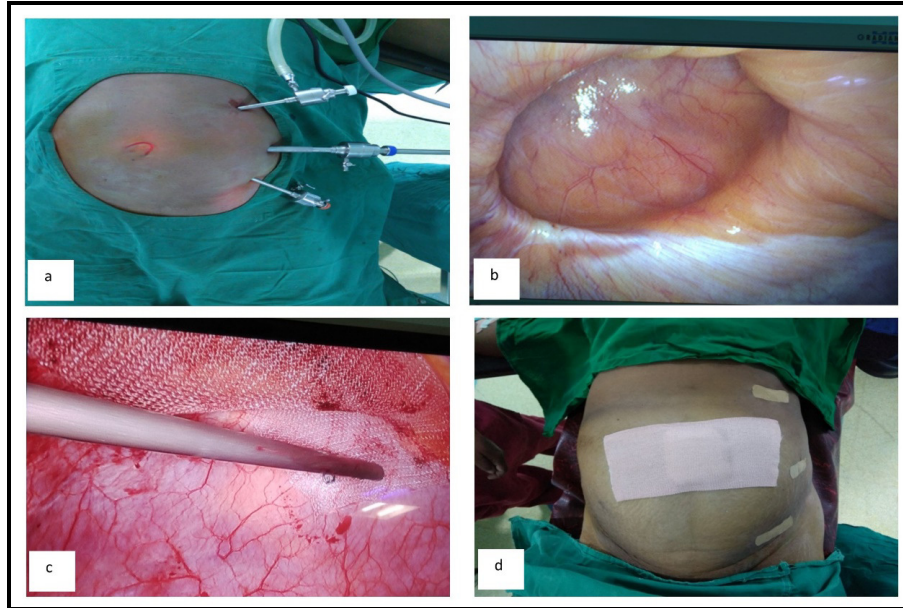
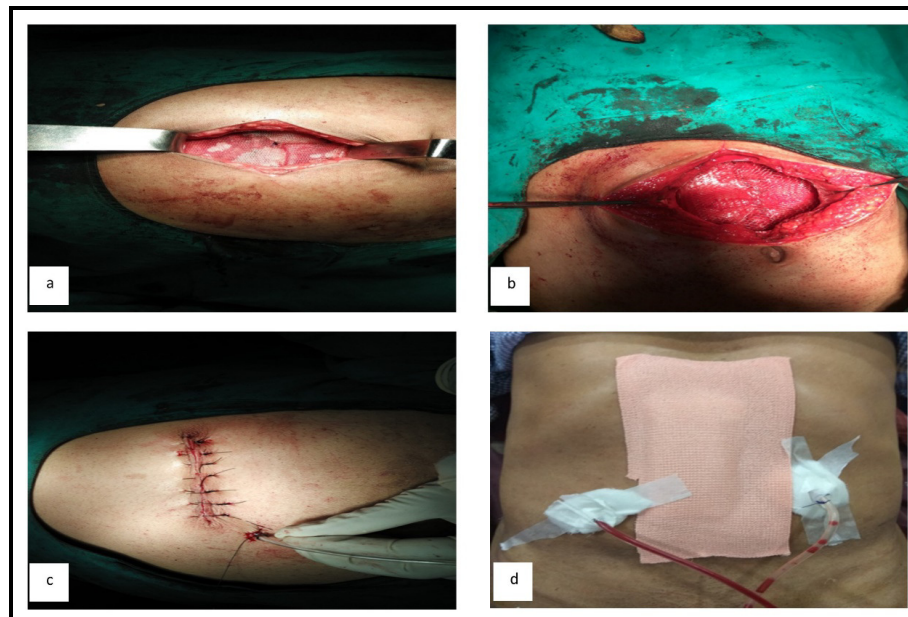


Fig-3: (a & b) Onlay mesh placement during open repair of umbilical hernia. (c & d) Post operative photograph with drains placed after open repair.



The laparoscopic approach for repair of ventral hernia including umbilical hernia was first popularized by Blanche in the year 1993 and has since then been progressively propagated and implemented because of several benefits

associated with it like reduced postoperative pain, reduced Hospital stay, faster recovery, Low recurrence rate and high quality of life [8].

In our study majority of the patients were males 43. But the worldwide statistics shows higher incidence of umbilical hernia in females (1.8 to 1.5 times more in females) [9]. This discrepancy may be due to the fact that the cases were randomly selected and allotted to the two groups as the core objective of the study was to compare the two surgical approaches and not the demographic characteristics. Further it was seen that more women (68%) than men (39.5%) opted for laparoscopic procedure which can be explained by the cosmetic superiority of the laparoscopic procedure. The literature also shows that of late there has been a trend of increase in the frequency of fractions of the female patients undergoing surgery opting for laparoscopic repair and the use of newer prosthetic materials. The adoption is increasing at different rates [10]. About 67.6% (46 out of 68 patients) had BMI above the normal range (18.5 to 24.9). Out of these 46 patients 14 (i.e 20.5%) of the total patients had BMI above 30 (i.e obese). This data is in accordance to the facts observed by various researchers stating that obesity appears to be a much greater risk for hernia formation [11].

In our study we noted the ultrasound reported size of the defect which was later confirmed during the surgery before placing mesh of appropriate size. We excluded defects of size more than 5 cm from our study. The Italian laparoscopic ventral/incisional hernia guidelines recommend a minimum of 3 cm overlap but also prefer extending to at least 5 cm overlap especially for larger defects [12]. The preferred method of mesh fixation during laparoscopic surgery is a matter of controversy. Tacks or transfacial sutures have been used conventionally in mesh fixation. In our study we used a combination of spiral Titanium tacks (figure 2.) and transfacial sutures. The proponents of transfacial sutures give an explanation that considering the thickness of mesh as 1 mm a perfectly placed tack which is 4 mm long can be expected to penetrate only about 2 mm beyond the mesh. Hence tacks may not give the same strength as transfacial sutures [13-14].

We observed that the mean operating time was significantly higher in the laparoscopic mesh repair 74.4 minutes compared to open mesh repair group 52.5 minutes. We also observed that the initial laparoscopic procedures took longer

time and this reduced with subsequent procedures there by pointing to the learning curve associated with the laparoscopic technique. This result was comparable to the study conducted by B Purshotham and S Madh who reported mean completion time of open mesh repair as 38.5 minutes and laparoscopic repair as 62 minutes [15]. Another study by Othman et al. also showed a longer operating time in the laparoscopic repair group (58.1 ± 15.5 minutes) compared to open mesh repair group (42.2 ± 10.3 minutes) [16].

In our study all the 34 patients who underwent laparoscopic intraperitoneal onlay mesh received regular polypropylene mesh (Figure 2c.) The ideal mesh for intraperitoneal placement has been a matter of debate. Some surgeons use bilayered mesh or Titanium coated polypropylene mesh for intraperitoneal placement due to a fear of development of adhesions with use of prolene mesh. But several plastic surgeons have performed reconstruction of complex abdominal wall defects using polypropylene mesh without complications [5].

Virijland et al published a report in 2000 where in they had conducted a retrospective study involving 136 patients with intraperitoneal polypropylene mesh (median follow-up of 34 months). 6% developed wound infection and 1.5% developed sinus and none had any fistula. Mesh removal was not indicated in any patients. They concluded that regardless of the peritoneal closer or omental coverage enterocutaneous fistula formation following intraperitoneal misplacement is rare [17].

In our study 2 of the 34 patients 5.9% undergoing laparoscopic intraperitoneal onlay mesh repair developed anterior abdominal wall abscess which in one patient evolved into a sinus. Both the patient underwent mesh removal and open anatomical repair. One patient 2.9% in the laparoscopic intraperitoneal only mesh group developed Seroma which subsided by itself. The mean length of hospital stay in the laparoscopic group was 3.9 days \pm 1.4 which was significantly less compared to 6.9 ± 3.5 days

in open mesh repair group. This was comparable to studies conducted elsewhere. A study by Arshad Mehmood Malik shows mean hospital stay of 4.38 ± 0.903 days for laparoscopic umbilical hernia repair and 11.5 ± 4.57 days for open umbilical hernia repair [18].

The mean pain score on the first three post operative days in the laparoscopic group was 3.3, 2.2 and 1.2 respectively which was lower than the pain score in open mesh repair 4.2, 3.3, 1.9 and with $P < 0.001$ the difference was significant. This is in accordance to the observation of Purshotham Be. Et al who stated that post operative VAS score was greatest on first day in open umbilical hernia repair group in comparison to laparoscopic

group [15]. Some authors argue that the use of tacks reduces pain. Use of sutures is generally associated with greater pain which may be due to the local muscle ischemia caused by transfascial sutures [19].

Recently it has been shown that mesh fixation with fibrin sealant in the lap umbilical hernia repair results in less postoperative pain, discomfort and shorter convalescence than tack fixation or transabdominal sutures [20]. Laparoscopic repair also offers better cosmetic results as the scar of open surgery is avoided and the normal contour of the umbilicus is maintained and this is evident from the post operative images in figure 4.

Fig-4: Post operative images following Laparoscopic IPOM (a,b,c,d)



Conclusion

The laparoscopic intraperitoneal onlay mesh repair using prolene mesh is a sophisticated procedure requiring longer time and requires acceptance of a learning curve. Although the use of mesh fixation device contributes to the higher cost of laparoscopic IPOM repair and the operating time is also longer laparoscopic repair of umbilical and paraumbilical hernia offers advantage to the patient in terms of reduced hospital stay, decreased postoperative pain and intraperitoneal placement of polypropylene mesh

is safe and has a comparable complication rate to the widely practiced open mesh repair. Further, the use of polypropylene mesh for IPOM repair is not associated with a significantly higher complication rate and is a feasible alternative to the costlier new composite mesh available in the market. Laparoscopic IPOM with polypropylene mesh is technically safe, effective and feasible with a better clinical outcome in patients requiring treatment for umbilical and paraumbilical hernia.

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