

Laparoscopic transabdominal preperitoneal repair versus laparoscopic intraperitoneal onlay mesh repair for umbilical/para umbilical hernia- an institutional review

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Abstract:

Background: Laparoscopy has gained popularity over open surgery in the treatment of umbilical and para-umbilical hernia repair over the last decade due to better defining and cover of the abdominal defect, shorter post-operative stay, less pain and lesser complications. The aim of our study was to compare the two procedures in terms of duration of surgery, cost outcome, complications, recovery time, and recurrence.

Materials and Methods: This was a prospective cum retrospective study conducted in patients undergoing laparoscopic surgery for umbilical or para-umbilical hernia in Kasturba hospital, Manipal, aged from 18 to 65 years. The two groups studied were laparoscopic transabdominal preperitoneal hernioplasty (TAPP) group and laparoscopic intraperitoneal onlay mesh hernioplasty (IPOM) group. The IPOM group was further subdivided into IPOM (I) when trans-parietal sutures were used and IPOM (II) when only tackers were used. Observations included intra-operative/post-operative complications, post-operative pain evaluated by using visual analogue scale (VAS) and recurrences. Cost of surgery, mean operating time and length of stay in hospital was evaluated.

Result: 120 patients were included. 34 and 59 underwent TAPP and IPOM respectively. IPOM was less time consuming as compared to TAPP ($p=0.021$). TAPP proved to be a significantly cost effective procedure, ($p<0.01$). Both procedures had no recurrences.

Conclusion: Laparoscopic repair of umbilical hernia by IPOM method is less time consuming but expensive. TAPP allows safe use of less expensive polypropylene mesh, fewer tackers and hence is cost effective. TAPP and IPOM are feasible operations with low morbidity and no recurrences when performed by experts. Both procedures are comparable in terms of length of stay in the hospital, intra-operative, post-operative complications and pain.

Keywords: Hernia, laparoscopy, mesh, para-umbilical, umbilical

I. Introduction

The umbilicus is one of the potential weak areas of the abdomen and a relatively common site of herniation. Umbilical hernias in adults are largely acquired.^[1] Umbilical hernias occur more frequently in women, with obesity and repeated pregnancies being the most common precursor.^[2] In the laparoscopic technique, the mesh is placed in an intraperitoneal location (IPOM) and less often in the preperitoneal location (TAPP). An increase in the intra-abdominal pressure thus helps to keep the mesh in place rather than displace it, as is the case in conventional overlay repairs. The laparoscopic approach affords the surgeon the ability to clearly and definitively define the margins of the hernia defect and to identify additional defects that may not have been clinically apparent preoperatively. The laparoscopic approach allows for easier placement of a larger prosthesis with good overlap. Laparoscopic repair of umbilical hernia has largely replaced open method and become popular among the surgeons and patients due to statistically fewer wound complications, short hospital stay and low recurrence rate.^[3,4] The entire under-surface of abdominal wall can be examined, which often reveals multiple secondary defects that might not be appreciated in an open approach. IPOM is technically easy to perform but an expensive procedure as it uses barrier mesh whereas TAPP is a very cost effective procedure but technically difficult surgery to perform. Also, studies in the past were done on laparoscopic ventral hernia repair, which included mainly incisional hernias.^[5,6] Umbilical hernia was studied as a part of primary ventral hernia in all these studies.^[7,8] Hence, the central premise of this study is to compare these two

procedures for umbilical and para-umbilical hernia repairs in terms of duration of surgery, cost outcome, post-operative pain, complications, post-operative hospital stay and recurrence in a tertiary care hospital.

II. Aims And Objectives

To compare laparoscopic IPOM and laparoscopic TAPP repair for umbilical/para-umbilical hernia in terms of cost-outcome, duration of surgery, intra-operative and post-operative complications, post-operative pain, hospital stay and recurrence.

III. Methodology

This was a prospective cum retrospective study conducted From Jan 2008 to June 2015 (retrospective study period: Jan2008 to July 2013, prospective study period: August 2013 to June 2015) after departmental and institutional ethics committee clearance was taken. All patients with umbilical or para-umbilical hernia who underwent laparoscopic surgery in the department of General Surgery during this period in Kasturba Hospital, Manipal, aged from 18 to 65 years were included. Those who had an incisional hernia, surgery combined with other surgeries or incarcerated or strangulated hernia were excluded. The two groups studied were laparoscopic transabdominal preperitoneal hernioplasty(TAPP) group and laparoscopic intraperitoneal onlay mesh hernioplasty (IPOM) group. The IPOM group was further subdivided into IPOM (I) if trans-parietal sutures plus spiral tackers were used and IPOM (II) when only spiral tackers were used. Nature of procedure and complications associated with the procedure were explained to the patient. A single surgeon performed all laparoscopic TAPP for umbilical hernia. Random surgeons in the department of General surgery performed laparoscopic IPOM for umbilical hernia. All the patients in TAPP group received 2nd generation cephalosporin (cefuroxime 1.5g) and IPOM group received 2nd/3rd generation cephalosporin, which was given at the time of induction of anesthesia and were continued for 2-3 days depending on surgeon's choice. Nature of parenteral analgesic was of usually opioid congeners/NSAIDs at the standard dose required. Intra operative complications if any, were noted. Post-operative pain was evaluated by using visual analogue scale (VAS) at 12 and 24 hours post operatively. Post-operative complications such as occurrence of seroma, hematoma, urinary retention, ileus, port-site infection, mesh infection, intra abdominal sepsis and prolonged pain were observed. All clinical and laboratory data were collected from the medical records of the patients. All statistical calculations were carried out using IBM SPSS Statistics 20.0 software. Evaluation of the categorical values was done using the Fischer exact test, student T test and Chi-square test. P value <0.05 was chosen to be significant for all tests.

IV. Results And Observations

Total 120 patients underwent laparoscopic umbilical hernia repair in the given time period. 27 patients underwent other surgeries in combination with umbilical hernia, thus were excluded from the study. 34 and 59 patients underwent laparoscopic TAPP and IPOM respectively and were followed up within a range of 1-48 months. Out of the 59 patients in the IPOM group, 31 underwent IPOM with trans-parietal sutures plus tackers and sub grouped as IPOM (I) while the remaining 28 were sub grouped as IPOM (II) as only tackers were used during the procedure for mesh fixation. Patients were equally distributed in terms of age and sex, the predominant age group being 31-40 years with a female predilection in all the groups. Mean fascial defect size and the size of mesh used to repair these defects were comparable between the two groups (TABLE 1). Mean cost of the mesh in TAPP group in comparison to the IPOM group and subgroup was significantly lower ($p < 0.01$). Fixating devices, especially tackers were used more in number in IPOM(I) and (II) which in turn added to the cost of the procedure, while TAPP required less number of tackers (average of 8-10 in number). Mean cost of the tackers was hence significant in favour of TAPP group (TABLE 1). Mean operating time in TAPP group was 105 ± 19.8 minutes, where as it was 89.5 ± 26.4 and 80.8 ± 25.9 minutes in IPOM (I) and IPOM(II) respectively. It was statistically significant in favour of IPOM ($p = 0.021$). However, between the IPOM subgroups there was no significant difference ($p = 0.505$).

In terms of intra operative complications, two patients in TAPP had omental bleed while performing adhesiolysis, which was managed laparoscopically, and a drain was placed and removed on 1st post-op day. One patient in IPOM (I) group had inferior epigastric vessel injury that was controlled by clip application. None had any intra-operative complication in IPOM(II). The post-operative pain assessed using the visual analog scale (VAS) at 12 and 24 hours showed slightly higher values in IPOM(I) group however it was not statistically significant in comparison to the other groups (TABLE 2). Post operative complications in the TAPP group included seroma in one patient that was managed with compression dressing. In IPOM(I) group, one patient had a seroma that persisted for six weeks and had to be managed by needle aspiration, compression bandaging and antibiotics. Two patients had prolonged ileus and developed features of sub acute intestinal obstruction, CECT abdomen was done to rule out adhesive complications secondary to mesh and were subsequently managed conservatively. However there were no instances of haematoma, urinary retention, intra-abdominal sepsis, mesh infection and port-site infection in any of the groups. Four patients had prolonged pain (>6 months) at the site of

insertion of tackers and required long-term analgesics in IPOM (I) group. In IPOM(II) group two patients had prolonged pain post-operatively managed with analgesics. Mean length of hospital stay was comparable in both groups. There were no recurrences of hernia in any of the groups (TABLE 2).

V. Tables

Table 1

	TAPP	IPOM (I)	IPOM(II)	p value
Mean Mesh size (cm ²)	141.2(100-225)	137.5(100-225)	134.8(100-225)	0.47
Mean mesh cost(Rs)	1788(1200-3000)	21532(12500-25000)	29642(25000-35000)	0.54
Number of tackers used (n)	8-10	10-12	15-25	0.152
Mean tackers cost(Rs)	12600(11200-14000)	22400(14000-28000)	28000(21000-35000)	<0.01
Total cost (Rs)	14388	43752	57642	<0.01
Operating time (minutes)	105 +/- 19.8	89.5+/- 26.4	80.8+/- 25.9	0.021

Table 2

	TAPP	IPOM (I)	IPOM(II)	pvalue
Intra-operative complications (n%)	2(5.9 %)	1(3.2%)	0	0.42
Post Operative pain (Mean VAS score at 12hrs)	4.875 (3-8)	5.285 (4-9)	5.055 (2-7)	0.762
Post Operative pain (Mean VAS score at 24 hrs)	3.925 (2-6)	4.860 (4-7)	4.125 (3-6)	0.344
Post-operative complications (n %)	1 (2.9%)	7 (22.6%)	2 (7.1%)	0.22
Length of hospital stay in days (Mean+/-SD)	2.8 +/-1.02	3.4 +/- 1.3	2.7 +/- 1.4	0.277
Recurrences (n)	0	0	0	1

VI. Discussion

Umbilical hernias in adults are largely acquired. These hernias are more common in women and in patients with conditions that result in increased intra-abdominal pressure, such as pregnancy, obesity, ascites, or chronic abdominal distention. The mean age of patients is lower in both laparoscopic transabdominal preperitoneal hernioplasty(TAPP) and conventional laparoscopic intraperitoneal onlay mesh hernioplasty(IPOM) in our study. The percentage of females is higher in both the groups as compared to the study by Gonzalez et al and Hilling et al.^[9,10] This is probably owing to the high BMI in Indian women and multiple pregnancies that attribute to umbilical hernia. Mean defect size is more in our study as compared to above-mentioned studies, also probably due to the high BMI of our patients. In concordance, mean mesh size in our study is larger due to the higher mean fascial defect size and surgeon's preference.

There are no studies till date comparing the cost outcome of laparoscopic umbilical hernia repair, however there are encouraging results being reported in comparative studies regarding the cost analysis of laparoscopic versus open repair of umbilical hernias. In a recent series, laparoscopic umbilical hernia repair using a dual-layer polypropylene mesh and transfascial sutures significantly reduced surgical site infections, length of hospital stay, and costs as compared to open mesh repair.^[11] Types of mesh used and fixating devices can make sizeable differences in cost calculations as evident in our study.

In TAPP repair, less expensive prolene mesh is used and number of tackers required on an average is only 8 to 10 accounting to average cost of Rs.12400-17000. Comparatively, in IPOM repairan expensive barrier mesh is required as the mesh is placed intraperitoneally. As a pre-requisite, the visceral side should be smooth, nonerosive, anti-adhesive and not easily susceptible to infection making it costly. Number of tackers required to fix the mesh in IPOM(I) is 12-14. In IPOM (II) a physio-mesh is fixed with double crowning of the tackers where 15-25 tackers are used which further adds to the high cost. Hence the average range of cost in both the techniques of IPOM is high. We observed that IPOM (I) ranged between Rs.26500- 41800 while IPOM (II) ranged between Rs.46700-70000. Thus, in our study there was significant difference observed between the cost outcome between TAPP and IPOM mainly in terms of overall cost outcome.

The mean operative time for laparoscopic transabdominal preperitoneal repair of umbilical hernia is higher in our study as compared to previous studies. We think that this is possibly due the larger space that had to be created and meticulous dissection in the preperitoneal space in order to place a bigger mesh. Also while performing TAPP, two patients who had previously under gone hysterectomy for pelvic inflammatory disease with dense omental adhesions, had omental bleeding while performing adhesiolysis and took longer to repair thus resulting in higher mean operative time in our study. Similarly while performing IPOM, one patient had an

inferior epigastric vessel injury while fixing the mesh with tacker. This was controlled by clip application, probably owing to the longer mean operative time in our study. In this study, the only complication in one patient in the TAPP group was seroma, unlike previous studies where patients developed hematoma, ileus and urinary retention. This is probably because, preperitoneal mesh placement of the mesh not only avoids the direct contact with viscera, but also provides additional security of fixation and thus, minimises complications. In IPOM group, two patients developed prolonged ileus and developed features of sub acute intestinal obstruction. CECT abdomen was done in both the patients and both were managed conservatively.

There are no studies available in the literature comparing the post-operative pain in laparoscopic umbilical hernia repair using the visual analogue scale. Some authors argue that the use of tackers significantly reduces post-operative pain. Pain is generally worse after repair with sutures than with tackers. Sutures penetrate the full thickness of abdominal wall musculature and fascia. This has been theorized to cause local muscle ischemia resulting in severe pain post-operatively.^[12] Cobb et al also proposed that intercostal nerves might become entrapped within the transabdominal sutures causing chronic, persistent neuropathic pain.^[13] In our study post-operative pain was slightly higher in the group where transfascial sutures were used as evidenced by slightly higher VAS score at 12 hours and 24 hours after the operation in IPOM (I) group. Series of repairs using transfascial sutures report persistent pain and discomfort in 1% to 6% of patients.^[14] Most authors feel that oral anti-inflammatory medications or injections of a local anesthetic can alleviate the symptoms in the majority of cases.^[15] Others have reported re-explorations for persistent pain, finding immediate relief after the release of a suture from the site of symptoms.^[16] In our study 4 (19%) patients in IPOM (I) and 2(11%) patients in IPOM(II) had prolonged pain(>6 months) at the site of insertion of tackers managed with analgesics intermittently. One patient persistently had pain in the left iliac region at the site of transfascial suture. As the pain persisted even after 6 months, transfascial suture at left iliac fossa was removed under anesthesia with a small incision at the site of transfascial suture. The pain still persisted even after 36 months but the intensity had reduced. The patient was offered laparoscopic adhesiolysis but he refused.

The mean hospital stay in patients undergoing conventional laparoscopic IPOM in our study was also slightly higher compared to the study by Gonzalez et al.^[9] This could possibly be attributed to the two patients with prolonged ileus suspected to have sub acute intestinal obstruction who stayed for 10 days and 12 days post-operatively accounting for increased length of hospital stay as well as cost outcomes in our study. The mean hospital stay in TAPP group was slightly higher in our study as compared to the study by Hilling et al.^[10]

Numerous studies using the laparoscopic approach for ventral hernias have reported a recurrence rate of 10% which included mainly incisional hernias and a few umbilical hernias.^[17,18] Mechanisms of recurrence of umbilical hernia described in the literature, in decreasing order of frequency are infection, lateral detachment of the mesh, inadequate mesh fixation, inadequate mesh, inadequate overlap, missed hernias, increased intra-abdominal pressure, and trauma.^[14,19,20] However in our study both repairs have shown promising results. No recurrences were seen with either of them during a mean follow-up period of 32 months. Overall, we felt that the credibility of our study lies in the fact that there were no studies available in the literature comparing between the two techniques discussed above for umbilical hernia repair with special mention to cost effectiveness and VAS score for post-operative pain. In our study conventional laparoscopic IPOM was further sub classified into IPOM-I(dual mesh fixed with transfascial sutures and tackers) and IPOM-II(dual mesh fixed with only tackers). Hence all the variables like cost outcome, post-operative complications and prolonged pain were observed without bias.

VII. Conclusion

Laparoscopic repair of umbilical hernia by conventional onlay method (IPOM) method is highly promising and less time consuming but expensive. Laparoscopic transabdominal pre-peritoneal mesh hernioplasty (TAPP) allows safe use of conventional and less expensive polypropylene mesh and fewer tackers. TAPP and IPOM are safe and feasible operations with low morbidity and no recurrence when performed by experts. Both procedures are comparable in terms of length of stay in the hospital, intra-operative, post-operative complications and pain.

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