

Laparoscopic Intraperitoneal Onlay Mesh (IPOM) Repair in Management of Inguinal Hernia: A Retrospective Cohort Study

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ABSTRACT

Laparoscopic intraperitoneal Onlay Mesh (IPOM) technique for management of primary inguinal hernia repair has shown conflicting results in previous studies. Main concerns associated with this technique are intestinal adhesion and recurrence of hernia. However, these concerns need to be balanced with advantages, that include: ease of performance, short operative and anesthesia time, and lower incidence of injuries to spermatic cord and adjacent structures. We performed a retrospective study on a small series of IPOM repair in management of primary inguinal hernia. In our study no additional complications related to intestinal adhesion on mesh were noted. Also, discontinuation of hernia sac significantly reduced the recurrence rate. However, pain during follow up was associated with recurrence.

KEYWORDS

Laparoscopic surgery, Inguinal hernia repair, Intraperitoneal Onlay Mesh, IPOM

INTRODUCTION

Laparoscopic Intraperitoneal Onlay Mesh (IPOM) repair technique is underutilised as surgical option in managing primary inguinal hernia repair. Two main concerns with IPOM repair are intestinal adhesion to the exposed mesh and recurrence. An early report of laparoscopic inguinal hernia IPOM repair in pigs in 1994, displayed strong evidence that indirect inguinal hernias in male pigs can be successfully repaired via laparoscopic placement of polypropylene prosthesis over the indirect inguinal hernia

defect. The researchers noted significant reduction in the rates of adhesion formation when prosthesis was placed laparoscopically compared to open surgery. No prosthesis erosion into viscera was observed, even with placement of uncovered mesh [1]. Phillips et al. [20] analyzed a series of 3229 laparoscopic inguinal hernia repairs utilizing various surgical techniques in on a large sample size (n= 2559), with 345 of patients undergoing IPOM repairs. The IPOM group had 2% recurrence rates and 14% complication rates, compared to Trans-Abdominal Pre-

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Peritoneal (TAPP) laparoscopic repair; with 1% recurrence and 7% complications. No intestinal obstruction or complication related to mesh adhesion in IPOM group were reported [2].

Laparoscopic placement of Intraperitoneal Onlay Mesh (IPOM) technique for ventral and incisional hernia repair has been successfully taught and practiced [3]. This method is an acceptable alternative to open repair of anterior abdominal wall hernias. Recent studies, including large series of patients, have not found statistically significant difference in the rates of pain and recurrence of hernia between IPOM and open sub-lay anterior abdominal wall hernia repair; with no additional complications related to intestinal adhesion to the mesh being reported [4]. Considering the results of laparoscopic IPOM repair for ventral hernia, we can sensibly assume that applying this technique for primary inguinal hernia repair may produce similar results.

The recently developed composite polypropylene meshes covered with collagen, have shown promising results with minimal propensity to form adhesions. Advantages of IPOM in inguinal hernia repair include ease of performance, shorter anesthesia and operation time, and reduction in injuries to adjacent viscera in deep inguinal ring, namely the bladder, vascular and cord structures. Herein, we report a small series of IPOM repair for patients with primary inguinal hernia, mainly focusing on assessment of recurrence and bowel adhesion to mesh, with the aim to assess safety and practicality of IPOM technique and generate preliminary results for any future studies with a larger sample size.

MATERIALS AND METHODS

This is a retrospective cohort study performed in a tertiary care university hospital. No clinical intervention was performed by the researchers. Patients' personal data remained totally confidential. As though, ethical approval was not necessary. Patients diagnosed with inguinal hernia

and managed surgically from April 2017 to July 2020 were enrolled. Those who met the inclusion criteria were evaluated for eligibility. Data was collected by using outpatient clinics files as well as patient telehealth follow ups (Table1).

Inclusion Criteria

All patients with laparoscopic IPOM inguinal hernia repair operated from 04/01/2017 to 07/01/2020 were included.

Exclusion Criteria

Patients with missing data and those lost on follow up were excluded.

Data Extraction

Data on surgical complications and recurrence were extracted from the inpatient as well as outpatient clinic file records during the follow up appointments. Surgical site complication was defined as any new regional complaint that developed after surgery. Recurrence was defined as frank reappearance of hernia bulge or ultrasonographic finding. The end point of follow up period was at the end of first postoperative period. This cut off point was chosen based on the observation that new complication or recurrence did not occur after 12 months in those followed for longer periods based on data extracted in this study. Data collection was finalized at 07/23/2021. All the patients were contacted by phone and asked about complications, recurrence and any other specific concern of the patient, before finalizing the study. If there was any uncertainty, patients were asked to visit our clinic for physical examination, and imaging if indicated. The range of postoperative follow up was 56-222 weeks.

Study Groups

In some patients the hernia sac was left untouched and the mesh was laid over the defect, while in others the hernia sac was cut circumferentially at the internal inguinal ring and excised if small or left to retract distally if large; and mesh laid over the defect, (Figure 1). Hernia defect was covered by a 10x15cm composite collagen coated

polypropylene mesh. Mesh was fixed by 3-5 tackers along the upper margin. In some patients medial, lateral, and lower margins of mesh were also fixed by tackers to prevent up-rolling. Upper and lower margins of mesh were placed at roughly equal distances from the upper and lower edges of hernia defect. Medial margin of the mesh laid over medial umbilical ligament and lateral margin extended to anterior superior iliac spine.

Data analysis: The participants' data were stratified into two groups, those with untouched hernia sac and those with excised or bridged and discontinued hernia sac. Some demographic factors such as age and BMI, type of inguinal hernia (primary vs. recurrent) and the side of hernia were analyzed between the two groups. The data was analyzed using Statistical Package for the Social Sciences (SPSS) software, version 26. The independent sample t-test and chi-square were used for the analysis. The 95% confidence interval and p-value less than 0.05 were considered statistically significant.

RESULTS

From April 2017 to July 2020, 22 patients with inguinal hernia were operated by laparoscopic IPOM repair technique. Three patients were lost to follow up and excluded, (n=19). All patients were male, with age ranging from 21 to 65yo (Mean: 47.95, SD: 12.581), and BMI ranging 23.68- 28.65 kg/m² (Mean: 26.4889, SD: 1.26377). Confounding factors, such as hernia risk factors including; obstructive lung disease (i.e., chronic cough), increased intra-abdominal pressure (e.g., chronic constipation), obstructive uropathy (e.g., prostatic enlargement), and heavy physical activity (e.g., heavy manual worker) were not present in either patient group. Also, no diabetes or smoking habit was found in these patients. Most likely this homogeneity in the study population demographic factors was due to narrow selection criteria and eligibility for IPOM technique repair.

There was no conversion to open surgery. The untouched sac group included 5 patients. Patients with excised or bridged and discontinued sac, included 14 patients. Groups were matched by age, BMI, side of hernia, and incidence of primary or recurrent hernia, (Table 2). Total recurrence number was 6 out of 19 (31.5%). Recurrence number in those with untouched sac was 4 out of 5 (80%), vs. 2 out of 14 (14.2%) in those with discontinued sac, with results showing statistically significant reduction in patients managed IPOM and discontinued sac method (p-value= 0.017). No complication related to intestinal adhesion to the mesh was observed in both groups. Surgical site complications were as follows. Two patients with untouched sac had surgical site pain and developed recurrence 2 weeks after surgery. Another patient with discontinued sac and pain developed recurrence 13 weeks after surgery. Statistical analysis showed that surgical site pain had a significant correlation with recurrence (p value= 0.021). Two patients, one with dysuria and another with dysuria plus urinary frequency, both with discontinued sac did not develop recurrence on long term follow up i.e., more than 12 months. Their complaints were managed by medical treatment.

DISCUSSION

The largest comparative systemic review on outcome analysis of laparoscopic inguinal hernia repair comparing 345 IPOM repairs to 2559 of other types of laparoscopic hernia repairs, was published in 1995 [2]. Since then there has been no similar large scale study to guide the best evidence based approach. A smaller study encompassing a series of 52 IPOM inguinal hernia repairs in 50 patients, reported 2 recurrences (near 4%) and no complications related to mesh adhesion, during 7-31 months follow up [5]. Hatzitheofilou and his team, concluded that IPOM method was less time consuming, associated with minimal postoperative pain, shorter hospital stays, and lower hospital costs [5]. During the same period, a prospective randomized clinical trial including 59 TAPP and 56 IPOM repairs demonstrated 11.1% early recurrence for IPOM

and no recurrence for TAPP ($p < 0.01$). No complications related to mesh adhesion to intestines was reported, leading the research team to conclude that TAPP was an excellent technique with no early recurrence, and suggesting to avoid IPOM laparoscopic hernia repair when possible [6]. One study recommended IPOM for inguinal hernia repair in patients with chronic obstructive pulmonary disease under spinal anesthesia; when there is risk of ventilator dependence following general anesthesia. Similar to preceding studies no recurrence or mesh related complication after six months follow up was recorded [7].

Laparoscopic IPOM repair was found to be as effective as open tension free repair even in physically active young men and heavy-duty workers, some with bilateral and recurrent hernias [8]. At the end 12-month follow up period there were minor complications unrelated to mesh and no recurrence, however at the 18-months follow up, a 3.3% recurrence following IPOM repair and no major visceral complication was reported [8,9]. Composite meshes were successfully fixed by fibrin glue in IPOM technique with no recurrence at near 2 years and only one trocar site hematoma, while decreasing mean operative time by 10-minutes [10]. Feasibility of IPOM was assessed in patients with previous lower abdominal surgeries as an alternative to Total Extra-Peritoneal (TEP) laparoscopic repair which is deemed surgically complex in this group of patients. One out of 43 cases developed recurrence. There was no major mesh related complication [11]. IPOM repair is suggested for patients with preperitoneal fibrosis as an alternative to Lichtenstein tension free open repair, resulting in equal or better profile in terms of re-recurrence and chronic pain. No major complication related to intestinal adhesion to mesh was found [12]. Single-incision laparoscopic (SIL) intraperitoneal onlay mesh (IPOM) repair was successfully performed in a small series of patients with recurrent hernia after conventional anterior and laparoscopic repairs. There were no intra-/postoperative

complications, port site hernias, chronic groin pain, or recurrence of the hernia during a mean follow-up of 24 months [13]. Once again, fibrin glue is suggested for fixation of lower edge of IPOM along with tackers at the upper edge, with no complications or recurrence at the end of one year follow up [14]. IPOM repair has been successfully used for inguinal hernia repair following radical prostatectomy when TAPP was impeded by dense preperitoneal fibrosis. Follow up, for a median period of 36 months, showed no recurrence; whilst complications following IPOM were comparable to those after TAPP with no major mesh related visceral complication [15]. In a retrospective comparative series, 176 patients undergoing TAPP repair with their peritoneal flaps left open were compared to 231 patients with peritoneal closure over the mesh. Coated mesh was inserted in both groups. The follow-up average range was 21.6 ± 23.8 months, within this period recurrence rates were similar and post-operative complications were not significantly higher in non-closure group, p -value = 0.68 and p -value = 0.36 respectively. No bowel obstruction or unplanned reoperation due to intestinal adhesion to mesh were reported [16].

A major concern with IPOM has been intestinal adhesion to mesh and its consequences. However, the first animal experiment as well as more recent studies, have shown that the real incidence is much less than presumed. This is especially true with new generation of coated meshes. In fact, mesh fixation leads to more complications than mesh adhesion [17]. All of the meshes used in our series were collagen coated and no complication related to intestinal adhesion to mesh was observed in our study.

Dissection of hernia sac during IPOM inguinal hernia repair has been reported as early as 1992 [18]. But we could not find any report about the role of hernia sac dissection on recurrence. Although incision of medial umbilical ligament (fold) to facilitate flat mesh placement and dissection of underlying area to expose cooper

ligament for fixation of mesh is recommended [19]; discontinuation of hernia sac at internal ring is not a common practice. During TAPP, TEP and tension free open inguinal hernia repair, the sac is always transacted. This study shows that adding the same step to IPOM technique leads to significantly lower recurrence rate, p -value=0.017. It can be hypothesized that; discontinuation of hernia sac leads to better mesh adhesion to underlying un-epithelialized raw surface. Therefore, we conclude that when IPOM technique is chosen for inguinal hernia repair, the sac should be dissected and discontinued, but not necessarily excised.

There was no complication related to intestinal adhesion to mesh in this study. A recent study also showed the safety of TAPP with little or no peritoneal coverage over the mesh [16]. We found that laparoscopic IPOM repair for primary inguinal hernia did not result in complications related to intestinal adhesion to mesh, when composite collagen coated polypropylene mesh was used. Also, recurrence after laparoscopic IPOM repair for primary inguinal hernia was significantly less when hernia sac was excised or discontinued. Therefore, we suggest laparoscopic IPOM repair for primary inguinal hernia with discontinuation of hernia sac. Another statistically significant finding of this study was that; surgical site pain after laparoscopic IPOM repair was always associated with recurrence, (p value= 0.021). Thus, it can be assumed as a predictor of recurrence.

The main limitations of this study are retrospective nature of the study, small number of patients and low diversity in patient's pre-op comorbidities. Ideally, to generalise this recommendation, further research such as a randomized controlled trial with calculated samples with minimum bias and confounding, and a larger and more diverse patient demographics is required. That will be able to assist clinicians in stratifying patients and making a patient-focused surgical approach.

CONCLUSION

Laparoscopic IPOM repair for primary inguinal hernia do not result in visceral adhesion to mesh and due complications, when composite collagen coated polypropylene mesh is used. Recurrence after laparoscopic IPOM repair for primary inguinal hernia are significantly less when hernia sac was excised or discontinued. Surgical site pain after laparoscopic IPOM repair can be a predictor of recurrence.

ACRONYMS AND ABBREVIATIONS

IPOM	:	Intraperitoneal Onlay Mesh
TEP	:	Total Extra-Peritoneal
TAPP	:	Trans-Abdominal Pre-Peritoneal
BMI	:	Body Mass Index

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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ETHICAL APPROVAL

This is a retrospective cohort study and no intervention was performed on the patients. Patients' personal data remained totally confidential. Therefore, ethical approval was not necessary.

CONSENT

Not applicable since it is retrospective study.

CONTRIBUTOR SHIP

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