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Laparoscopic intra-peritoneal onlay mesh plus repair for ventral abdominal wall hernias - is there substance to the hype?

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Abstract

Aim: To summarize our experience in laparoscopic intra-peritoneal onlay mesh (IPOM) plus repair for ventral abdominal wall hernias over a 10-year period.

Methods: All patients posted for laparoscopic repair of midline lower abdominal ventral hernia on an intention to treat basis were included in the study. Patients unfit for general anesthesia, patients posted for open repair or a hybrid approach (open reduction and closure of defect followed by laparoscopic IPOM repair) were excluded. Pre-operative patient demographics were noted. Intra-operative and post-operative data was recorded and analyzed.

Results: A total of 278 patients were posted for elective laparoscopic repair of lower midline ventral hernias between January 2007 and January 2017, of which, 56.1% were para-umbilical hernias and 43.9% were incisional hernias. These included 155 female patients. The average body mass index was 27 kg/m². Thirty-five patients were being operated for a recurrent ventral hernia. The average defect width was 1.2 cm for paraumbilical hernias and 2.2 cm for incisional hernias. The mean operating time was 55 min for para-umbilical hernias and 71 min for incisional hernias. In 13.1%, the fascia could not be sutured. There were no conversions to open surgery. Average length of hospital stay was 2.04 days with average follow-up period of 4.6 years. Overall morbidity was 7.9% with 2 recurrences. There was no mortality or mesh infection.

Conclusion: Thus, IPOM plus repair is a safe, feasible and effective technique for the treatment of ventral abdominal wall hernias.



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Keywords: Laparoscopic ventral hernia repair, intra-peritoneal onlay mesh plus repair, closure of defect in the fascia, abdominal wall hernia, incisional hernia repair, para-umbilical hernia repair

INTRODUCTION

Ventral abdominal wall hernia surgery is a common procedure in the armamentarium of surgeons. The commonest forms of these surgical procedures in adults are repair of incisional hernias and surgery for paraumbilical hernia. Incisional hernias after previous abdominal surgeries occur in a varying range, reported from 11% to 20%^[1-3]. Laparoscopic repair of such hernias has an advantage of shorter hospital stay, lower wound infection, earlier recovery and recurrence rates less than 5%^[4-6]. Paraumbilical hernias compromise 10%-12% of abdominal wall hernias^[7]. As compared to open repair, laparoscopic repair of adult paraumbilical hernias has also shown favorable outcomes^[8]. Since its first description in 1993, laparoscopic repair of ventral hernias is gaining acceptance and becoming more popular by the day worldwide^[9]. However, the standard laparoscopic repair of ventral hernias consisted of bridging the defect from the peritoneal side with a composite mesh, known as the intra-peritoneal onlay mesh (IPOM) repair, which is placement of the mesh in the underlay position through the laparoscopic intraperitoneal approach. Such repair is associated with a significant incidence of post-operative bulging or eventration of mesh, seromas, recurrences and non-restoration of abdominal muscle function^[10-12]. To circumvent these problems, sutured closure of the defect in the fascia with intra-peritoneal mesh reinforcement has been described, termed the IPOM plus repair^[13]. This repair is now the recommended procedure in the guideline of International Endohernia Society^[14].

In this paper, we summarize our experience of the IPOM plus repair over a period of 10 years, beginning from January 2007 to January 2017.

METHODS

All patients posted for laparoscopic repair of midline lower abdominal ventral hernia on an intention to treat basis were included in the study. Patients unfit for general anesthesia, patients posted for open repair or a hybrid approach (open reduction and closure of defect followed by laparoscopic IPOM repair) were excluded. This approach removed patients with incarcerated, obstructed or strangulated hernias from this study as these patients were managed either by open repair or a hybrid approach. This also excluded patients with domain loss (width of the gap in fascia in resting supine position) of more than 8 cm. as these patients were electively posted for open repair prior to 2015 or given a choice of open/laparoscopic component separation reconstruction of abdominal wall after 2015.

The width of the defect was measured as the maximum distance between the medial edges of the defect in the fascia when the patient is in a resting supine position. The average defect width was 1.2 cm (range: 0.8-2.4 cm, SD 0.29 cm) for paraumbilical hernias and 2.2 cm (range: 1.0-7.5 cm, SD 0.49 cm) for incisional hernias.

The operating time was calculated from the insertion of the first trocar to exsufflation. The technical details of the surgery are briefly described. The patient was placed supine with both upper limbs by the side. The monitor was at the foot end of the operation table. The surgeon stands near the head of the patient with the camera surgeon to his left.

Ryle's tube is inserted to ensure a deflated stomach. Pneumoperitoneum is achieved by insufflating through a Veress needle inserted either below the xiphisternum, slightly to the left of the midline or at Palmer's point. Three ports are inserted [Figure 1]. Port A is optional, required only if there is adhesiolysis to be done. In such a situation, port B serves as the camera port, while port A and C are the right and left hand working ports. For suturing the defect and mesh placement, port C is the camera port while port B and D are the working ports.

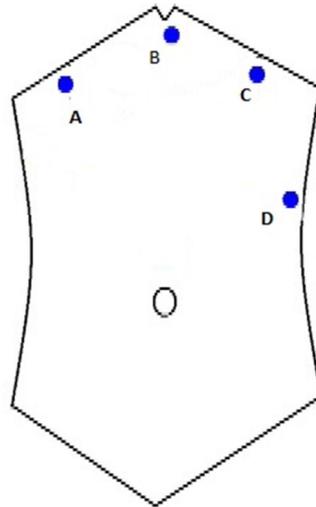


Figure 1. Port positions



Figure 2. Para-umbilical hernia after adhesiolysis

After adhesiolysis, the hernia sac is excised [Figure 2]. The defect is closed intra-corporeally with continuous sutures, using polyamide no 1 suture for para-umbilical hernia and polyamide no 1 loop for incisional hernias. The intra-peritoneal pressure may be reduced at this time to 8-10 mm of mercury to facilitate this step [Figures 3 and 4]. Composite mesh (Parietex Optimized Composite Mesh, Medtronic, USA) is introduced for intra-peritoneal placement of a size sufficient to ensure a minimum of 5 cm overlap of the edges of the defect. The mesh is first oriented with 5 transfascial sutures - 1 central and 4 peripheral, with the central sutures passed through the center of the defect to ensure proper alignment. Up to 2010, the 4 peripheral sutures were placed at the 4 corner of the mesh. However, we discovered that better alignment was obtained by placing the 4 peripheral sutures in a cross shaped pattern, along the vertical and horizontal axes of the mesh and have been doing so since then. Thereafter, interrupted intracorporeal sutures are placed at a distance of 1-1.5 cm with polyester 2-0 to complete the mesh fixation [Figure 5]. Hemostasis is ensured before desufflation.

The Ryle's tube is removed before extubation of the patient. The patients are mobilized and liquids orally are allowed once they are fully awake and non-sedated, usually 3-4 h after the surgery.

If multiple Swiss cheese types of defects are there in the fascia or the fascia is very thinned out and the fascial closure sutures tend to cut through, an IPOM repair is done. Patients are discharged after 24-48 h once they are fully mobile and comfortable on oral analgesics.

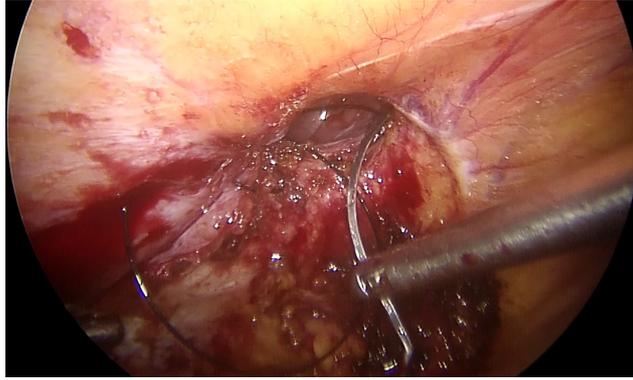


Figure 3. Intra-corporeal suturing of the fascial defect



Figure 4. After closure of the fascial defect



Figure 5. Intra-peritoneal onlay mesh placement and fixation

Patients are called for routine follow-up after 7 days, 1 month, 3 months, 6 months, 1 year and yearly thereafter. If patients do not physically attend their follow-up date, attempt is made to contact them telephonically. During follow-up visits, patients' complaints, if any, are noted and physical examination is done. Any suspicious bulge at the site of the previous lesion is investigated with an ultrasonography scan.

Chronic pain was defined as pain persisting at operative site beyond 6 months for which the patient needs to consume analgesic for relief.

Table 1. Patient demographics

Demographics	Data
Total number of patients in the series (<i>n</i>)	278
Male:female	123:155
Body mass index (kg/m ²)	27 (range: 21-41)
Diabetes mellitus, <i>n</i> (%)	58 (20.9%)
Smoker, <i>n</i> (%)	17 (6.1%)
COPD, <i>n</i> (%)	26 (9.4%)
Mean ASA score	2.2 (range: 1-4)

COPD: chronic obstructive pulmonary disease; ASA: American Society of Anesthesiologists

Table 2. Operative and immediate post-operative findings

Characteristics	Data
Operating time (min)	
Para-umbilical hernia	55 (range: 36-68)
Incisional hernia	71 (range: 55-105)
Conversion to open	Nil
Intra-operative bowel injury, <i>n</i> (%)	5 (1.8%)
Inability to suture the defect due to thinned out fascia (IPOM repair only) (incisional hernias), <i>n</i> (%)	16/122 (13.1%)
Length of stay (days)	2.04 (range: 1-5)

IPOM: intra-peritoneal onlay mesh

RESULTS

Between January 2007 and January 2017, a total of 278 patients were posted for elective laparoscopic repair of lower midline ventral hernias which, 156 (56.12%) were para-umbilical hernias and 122 (43.88%) were incisional hernias. Majority of incisional hernias (*n* = 94, 77.1%) were in women following either a lower segment caesarean section or hysterectomy or surgery for other gynecological pathology. In case of former two instances, though the scar on skin was Pfannenstiel, the defect in the fascia was oriented in the midline vertical craniocaudal plane. Males outnumbered females in the group with para-umbilical hernias (*n* = 105, 67.3%). The patient demographics are summed up in [Table 1](#).

A total of 35 patients had undergone prior hernia repair, of which 11 para-umbilical hernias had all suffered a failed open repair. Of these, 8 were anatomical repairs while 3 were mesh repairs. Of the 24 incisional hernias which were recurrent, 20 had undergone previous open repair while 4 had undergone laparoscopic repair. Eighteen of the open repairs and all 4 of the laparoscopic repairs had received polypropylene mesh augmentation as part of their primary repair. The width of the defect is reported separately for para-umbilical hernias and incisional hernias. In case of para-umbilical hernias, the defect ranged 1-2.5 cm, with an average of 1.2 cm. For incisional hernias, the defect width ranged 1-8 cm, with an average of 2.2 cm (SD 0.74 cm). The operative and immediate post-operative findings are summarized in [Table 2](#).

Diligent follow-up was maintained with an average follow-up of 4.6 years (range: 1-8 years). The outcomes are summarized in [Table 3](#).

DISCUSSION

This paper summarizes our experience in laparoscopic repair of lower midline ventral abdominal hernias with the intention of carrying out an IPOM plus repair - closure of the fascial defect with reinforcement from the peritoneal side with a composite mesh. The closure of the fascial defect has been described by various techniques - interrupted or continuous, intracorporeal or extracorporeal^[15]. The extracorporeal technique consists of placing multiple stab wounds on either side of the defect to pass the suture material

Table 3. Outcomes of follow-up

Outcomes	Data, <i>n</i> (%)
Overall morbidity	22 (7.9%)
Seroma	13 (4.7%)
Chronic pain	5 (1.8%)
Recurrence	2 (0.72%)
Mesh bulge/eventration	1
Mesh infection/rejection	Nil

and take interrupted stitches^[16]. This may increase the risk of suture granuloma, infection or cosmetic dissatisfaction^[17]. We prefer to suture the defect intracorporeally with the knots placed extracorporeally at the two ends.

Measuring the defect preoperatively in the resting supine position allows us to select an adequately sized mesh for placement, allowing a minimum of 5 cm overlap of the edges of defect. Literature on the subject reveals that different centers select the mesh size depending on the original defect or the closed defect^[16]. However the consensus is that whichever way the defect is measured, there should be an overlap over the fascial edges of the defect of at least 5 cm in all directions.

Smoking was observed in almost a fifth of our patients while co-morbidities like diabetes mellitus (DM) and chronic obstructive pulmonary disease (COPD) were seen in less than 10%. COPD is a relative contra-indication for laparoscopic repair due to the possibility of retention of carbon dioxide during surgery. However, all our patients were well controlled with pre-operative bronchodilators and nebulization to minimize the risks during the immediate post-operative period. Smoking, DM and COPD are also considered as risk factors for post-operative infection and recurrence^[18-20]. However, other authors do not consider them as contributory factors in recurrence after umbilical hernia repair^[21]. The average BMI in our series was 27 kg/m², indicating that we had a larger proportion of obese patients. Obesity is a risk factor for the occurrence of incisional hernia^[22] as well as recurrence after laparoscopic repair^[23,24]. We reported operating times separately for para-umbilical hernias and incisional hernias as the fascial defect sizes would be different for both of these ventral midline hernias and hence, time taken for closure of defects would also be different. Our reported timings are in accordance with what is reported in literature^[15,25].

Intra-operative bowel injury occurred in five of our patients. This is in keeping with the rates reported in literature^[6,26]. All the patients were being operated for incisional hernia, the bowel injured was small intestine and all the injuries occurred during sharp adhesiolysis. In 4 of the patients, the injuries were seromuscular in nature while 1 was a full thickness enterotomy. All the injuries were repaired intracorporeally with 3-0 polyglactin 910 and the surgery was completed as planned. The practice of proceeding with the IPOM repair in presence of small bowel enterotomy without gross peritoneal contamination is also reported by other authors^[5]. In around 13% of our patients with incisional hernias, the fascia was thinned out or there were multiple “Swiss-cheese” type of defects where the fascial sutures would not hold. Though the defect sizes would vary, we considered the hernia to be of the size of the original scar and the mesh was selected accordingly. Hence, if even a part of the original scar was intact with multiple “Swiss cheese” defects in the remaining, the entire scar was reinforced with a mesh. In these cases, we opted for a bridging repair without closure of the fascia, a practice supported by literature^[27,28]. Such bridging repairs are known to give rise to post-operative bulging of the mesh, even eventration of the mesh into the defect, as seen in 1 of our patients^[15,29].

Average hospital stay in our series was around 2 days. In general, laparoscopic repair is associated with a shorter hospital stay than open repairs of ventral hernias^[26]. Seroma formation was seen in around 5% of

our patients. The reported incidence of seroma in literature is directly proportional to the methods used to detect its presence, with the highest incidence seen when routine ultrasonography is performed for all patients^[30]. The rate of this event occurring in IPOM plus is reported as 0-11.43%^[15]. Its occurrence IPOM plus as compared to standard IPOM surgery is controversial as different studies have reported IPOM plus to have better outcomes^[27], similar outcomes^[31] or worse outcomes^[32] as compared to IPOM surgery. Chronic pain, i.e., pain perceived at operative site beyond 6 months, was reported by 5 of our patients. While it has been postulated that closure of the fascia under tension may lead to higher pain perception by patients^[15], Clapp *et al.*^[27] reported similar rates of chronic pain after both IPOM plus and standard IPOM in their series. Two of our patients had recurrence, of which one patient had undergone an IPOM plus repair for paraumbilical hernia and the other had undergone an IPOM repair for incisional hernia. Both these patients were re-operated and an inadequately sized mesh was found to be the culprit, as after shrinkage, it had left the original defect exposed partially. In both the cases, IPOM plus repair was done laparoscopically. Literature favors IPOM plus with a lower incidence of recurrences as compared to standard IPOM surgery^[32,33].

Improvement in functional status of abdominal muscles has been reported after an IPOM Plus repair. Both Den Hartog *et al.*^[34] and Clapp *et al.*^[27] reported improved isokinetic strength of the trunk flexor muscles and better functional activity after closure of the fascial defect. Thus, IPOM plus repair is safe, feasible and with possible advantages over a standard IPOM repair as reported in literature.

DECLARATIONS

Authors' contributions

Jani K contributed solely to the paper.

Data source and availability

The data is with the author and is available for scrutiny.

Financial support and sponsorship

None.

Conflicts of interest

There are no conflicts of interest.

Patient consent

Informed consent of all patients was taken for the procedure as well as for non-identifying inclusion in academic study.

Ethics approval

The approval of hospital ethics committee was taken for the inclusion of patients' data in the study.

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