



Maximizing Value: Cost-Effective Laparoscopic Transabdominal Preperitoneal Repair for Ventral Hernia

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Abstract

Introduction: The conventional laparoscopic repair of ventral hernias often involves intra-abdominal mesh placement, posing risks of complications such as adhesions, bowel obstruction and fistula formation. In Transabdominal Preperitoneal (TAPP) repair for ventral hernia, the closure of the defect with mesh placement leads to adhesion between the peritoneum and posterior transversalis fascia. This technique minimizes the structural disruption to the abdominal wall architecture and reduces the chances of adhesions.

Materials and Methods: In our study 52 patients were included who underwent Laparoscopic TAPP repair for primary ventral hernia and port site hernias with defect size less than 4 cm between January 2023 to January 2024. The study was conducted prospectively at a tertiary care hospital where all demographic and patient specific data were collected from a computerised database. This technique can be done for all types of ventral hernias such as epigastric, right iliac fossa, left iliac fossa, umbilical, paraumbilical, spigelian hernia and port site hernias. All patients were operated for TAPP Plus repair by the same team and followed up for 1 week, 1 month, 3 months and 6 months after surgery.

Results: Based on our study with 52 patients, our research indicates that the Laparoscopic TAPP repair approach emerges as a cost-effective solution, facilitating expedited hospital discharge and mitigating postoperative pain, thus contributing to an enhanced quality of life for patients.

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Keywords: TAPP: Transabdominal Preperitoneal approach; IPOM: Intraperitoneal Onlay Meshplasty; TAPP Plus: Transabdominal preperitoneal repair with closure of defect.



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Conclusion: The Laparoscopic Transabdominal Preperitoneal Technique offers a modern, cost-effective, and minimally invasive way to repair ventral hernias while reducing post operative complications. Positioning the mesh in the preperitoneal plane keeps it away from intra-abdominal contents, ensuring the abdominal wall's integrity and promoting a smoother, quicker recovery for patients.

Introduction

Over the past 25 years, there has been a growing utilization of laparoscopic ventral hernia repair, accompanied by enhancements in mesh overlap and a reduction in postoperative complications. In minimal invasive inguinal hernia repair, the Transabdominal Preperitoneal Approach (TAPP) takes the direct path to the preperitoneal space by incising the peritoneum from within the peritoneal cavity and separating the peritoneum from transversalis fascia. Transferring the concept of TAPP repair from the inguinal to the periumbilical region has paved the way for the evolution of a laparoscopic TAPP technique. This method harnesses the advantages of laparoscopic minimally invasive access, incorporates the benefits of hernia orifice closure similar to the Intraperitoneal Onlay Mesh (IPOM) repair approach and reinforces the posterior aspect of the abdominal wall defect using a mesh, all without necessitating the use of the retro muscular or intraperitoneal space. Additionally, it facilitates the straightforward placement of a large mesh despite the relatively narrow hernia orifice. Laparoscopic transperitoneal sublay mesh repair/Preperitoneal repair for the treatment of small- and medium-size ventral and incisional hernias can be done based on careful patient selections without much postoperative complications [1].

To prevent mesh contact with bowel and abdominal organs, various techniques have been employed, including the Trans-Abdominal Preperitoneal (TAPP) approach for ventral hernia, Totally Endoscopic Sublay repair (TES), Endoscopic Mini/less Open Sublay technique (EMILOS), Retrorectus Sublay mesh repair, Subcutaneous Onlay Laparoscopic Approach (SCOLA), and Extended view—Totally Extraperitoneal approach (e-TEP RS) [2]. Using a polypropylene mesh in the preperitoneal space significantly reduces costs compared to using a composite mesh and tackers for fixation in the standard IPOM technique [3,4].

Ventral TAPP repair appears to be a safe technique in epigastric and umbilical hernia repair with improved outcomes when compared with conventional techniques [5]. Also Mesh placed in the preperitoneal or sublay position require more surgical experience and skill but avoids extensive subcutaneous dissection and reduces seroma formation [6]. The key to a successful TAPP plus repair is to use trocar entry points positioned as far as possible from expected adhesion sites with correct triangulation [7]. Ventral hernias such as Iliac fossa, Spigelian and Epigastric hernias can be operated by TAPP Plus technique with a polypropylene mesh and can have reduced post operative complications when compared to IPOM [8].

Material and methods

Patients

We share our experience for patients with primary ventral hernia and Port site hernia with defects less than 4 cm. We have done a total of 52 cases from January 2023 to January 2024. Institutional ethical committee clearance and informed consent was obtained from the participants. Patients with defects less

than 4 cm without any divarication and port site hernia was operated for TAPP plus repair and after defect closure with non-absorbable suture, adequately sized mesh was placed covering 5cm away from the defect on all sides and peritoneum was closed with 2-0 PDS suture. This technique can be done for all types of ventral hernias such as epigastric, right iliac fossa, left iliac fossa, umbilical, spigelian hernia and port site hernias. All patients were operated for TAPP Plus by the same team and followed up for 1 week, 1 month, 3months and 6 months after surgery.

Inclusion and exclusion criteria for the study

Patients with Body Mass Index below (BMI) 25 kg/m² were excluded. Patients with complications such as obstruction and strangulated hernia were excluded. Patients who did not consent to participate or were lost to follow-up were also excluded. Only patients with a ventral hernia diameter of less than 4 cm were included.

Port placement

Initially 10 mm camera port is placed 15-18 cm from the defect, the working ports 5 mm each are placed subsequently on either side of the camera port facilitating good triangulation (Figure 1). Once intraabdominal, the peritoneum is checked for tenting and proceed to TAPP plus repair (Figure 2). Care must be taken during placement of working ports in such a way that it allows ergonomic suturing to address the ventral defect.

Perioperative care

All operations were performed under general anaesthesia. Thirty minutes before the surgery, each patient received antibiotic prophylaxis with Injection Cefotaxime 1 gm and one dose on POD 1 of surgery. No drains were placed after the surgery. After the surgery, compression dressing was placed in the hollow of the skin with gauze packs and a tamponade of the defect was performed. Post operatively pain was managed with Injection Paracetamol every 6 hours till POD 1 and followed by Tablet Paracetamol. All the patients were advised to use abdominal binders for a period of 2 weeks after surgery. Follow up was done for 1 week, 1 month, 3 months and 6 months after surgery.

Operating technique

The patient is kept in supine position. Pneumoperitoneum is created with Veress needle at palmer's point. The first 10 mm optical trocar is inserted 10 cm away from the defect and the next two 5 mm ports, generally 1-2 cm below the level of the camera port, ensuring adequate triangulation. The assistant and the operator stand on the side of the patient, the same as in an IPOM procedure and the monitor is positioned on the opposite side. The three ports can be placed in the epigastric location and bilateral midclavicular lines (in case of umbilical and paraumbilical hernias) or in the lateral abdominal wall (in epigastric hernias). After releasing any adhesions with the hernia ring and reduction of the contents taking care not to injure the peritoneum, the surgeon marks the incision line of the peritoneum with electrocautery approximately 7-8 cm away from the defect. If content is irreducible and risks peritoneal injury the flap is brought down with the content. Then the peritoneum is grasped and incised carefully, avoiding injury to the posterior lamina of the rectus abdominis sheath (Figure 2). The peritoneum is transacted over a length of about 12–15 cm horizontally and a peritoneal flap is gradually raised, developing it towards

the defect. Dissection is preferably started where preperitoneal fat can be appreciated. This prevents peritoneal tear at the onset of dissection. The separation of the peritoneum also continues to the contralateral side, below and around the defect with gentle sharp and blunt dissection (Figure 3 & 4). The hernia sac is preserved and brought down along with the peritoneal flap, as this allows tension free closure of defect after dissection. The hernia orifice is now sutured intracorporeally with a continuous non-absorbable barbed suture (1 PBT) (Figure 5). A Polypropylene mesh is introduced and placed evenly around the hernia defect ensuring a minimum overlap of 5 cm in all directions (Figure 6). Mesh is fixed with 2 sutures on either side of midline using 2-0 PDS sutures. The primary peritoneal incision is sutured with a continuous absorbable barbed suture (2-0 V-LOC) (Figure 7). Port closure of 10 mm port was done using 1-0 ethilon, skin closed using subcuticular sutures and a compression dressing was done by placing pads all over defect region for a period of 24 hours.

We have performed TAPP plus repair for spigelian, iliac fossa, epigastric and paraumbilical hernias (M1 to M5, L1 to L4). The main advantage is that peritoneal flaps can be raised in any location and even near bony prominences with safe extraperitoneal placement of meshes using minimum fixation, thus significantly mitigating the postoperative pain, while saving costs incurring from costly composite meshes and tackers.

In our study, 7 patients were converted to IPOM plus intra-operatively due to thin peritoneum leading to multiple tears. The remaining 45 patients underwent TAPP plus repair using polypropylene mesh in the preperitoneal plane. Mesh size was selected according to the defect size a location with a minimal overlap of 5 to 7 cm. The operative duration for procedure ranged between 118 and 145 min.

Postoperative follow up

All cases did well in the initial postoperative days and their pain score were significantly less. The visual analogue pain score ranged between 2 and 3. All patients were mobilized and started on oral liquids within six hours of surgery and discharged within 24 h after surgery. Follow up was done at one week, one month, three months, six months and one year after surgery. No complications or alarming symptoms were noted at the end of six month follow up in all cases.

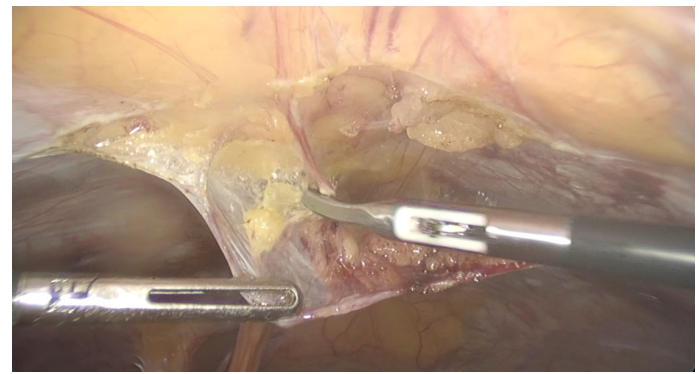


Figure 2: Incision over peritoneum by tenting (Epigastric hernia being shown).

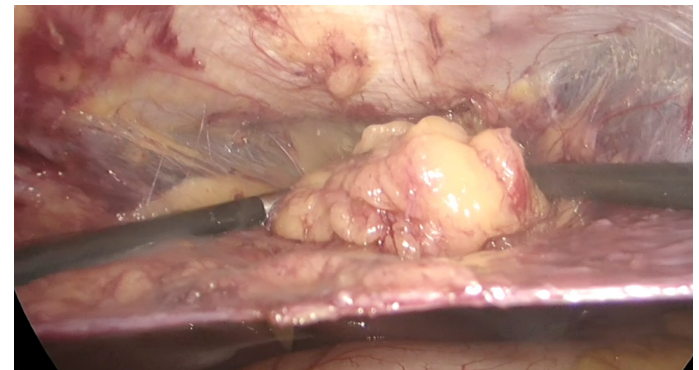


Figure 3: Peritoneal flap created till defect and contents being reduced.

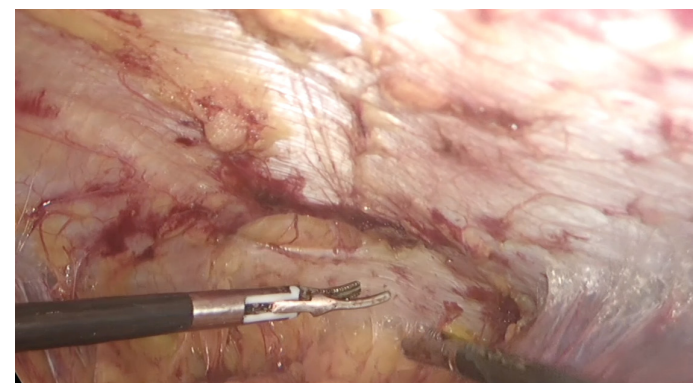


Figure 4: Peritoneal flap created beyond the defect.

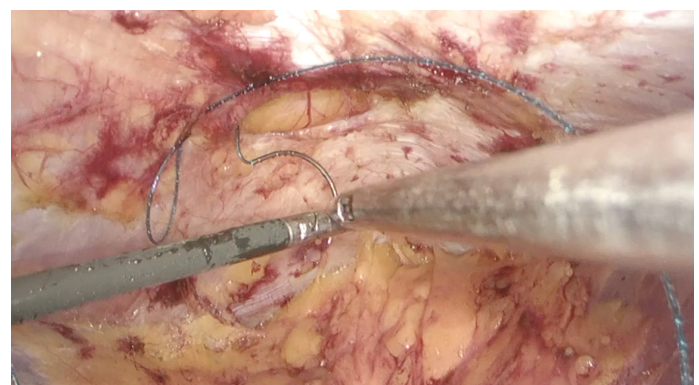


Figure 5: Defect closure with Non absorbable suture (1-0 Barbed PBT).

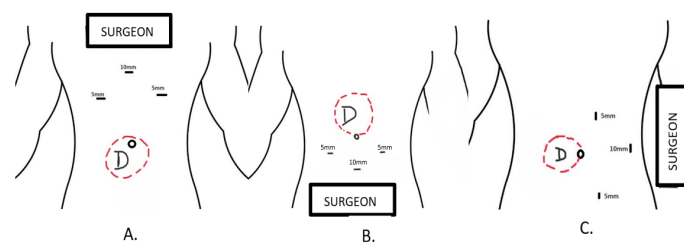


Figure 1: Port placement for ventral hernia and triangulation; (A) For umbilical and paraumbilical hernia; (B): For supraumbilical and epigastric hernia; (C) For paraumbilical hernia lateral to midline; (D) Defect; Surgeon position for hernia depicted as per hernia location).

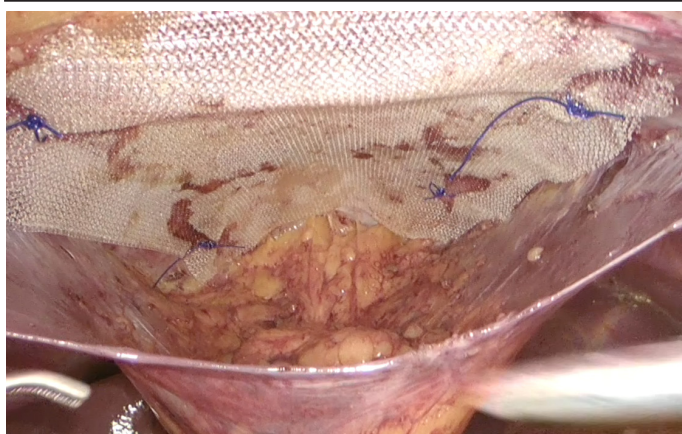


Figure 6: Placement of mesh.

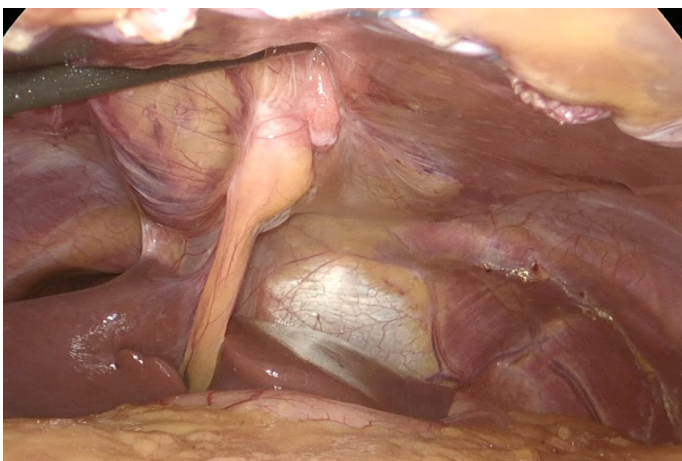


Figure 7: Closure of peritoneal flap Using 2-0 PDS barbed suture S.

Discussion

Basic laparoscopic hernia repair involves an intraperitoneal technique in which a mesh prosthesis is used to secure the hernia defect. Traditionally IPOM is the most commonly performed procedure for these types of hernias with the disadvantage of higher cost and increased postoperative pain. In TAPP repair for ventral hernia, mesh placement is between the peritoneum and posterior fascia, avoiding intraperitoneal foreign body. This procedure involves minimal to no fixation of mesh which reduces the pain significantly. This technique minimizes the trauma to the abdominal wall musculature leading to less pain and minimum chances of adhesions.

Enhanced ergonomics in TAPP surgery can be achieved through a few straightforward adjustments. Firstly, tilting the operating table approximately 30° to the opposite side is beneficial. Furthermore, tilting the patient's left hand in a cephalic direction creates more space for both the surgeon and assistant, thereby improving manoeuvrability. It is advisable to avoid positioning the left hand along the torso, as this may obstruct instrument movement during the dissection of the proximal peritoneal flap. To prevent strain on the surgeon's wrists, raising the table height above the level of the surgeon's elbows is essential. Employing port triangulation and 30-degree optics further enhances the comfort and effectiveness of the procedure. Self-locking threads facilitate closer approximation of the hernia ring using the shoe-lacing technique, ensuring even tension distribution [9].

Kaushik Et Al found that ventral-TAPP approach despite having longer operative time had shorter hospital stay, improved

pain scores and was a more cost-effective treatment overall similar to our study [10].

Michael Et Al observed that robotic TAPP repair with primary closure had reduced recurrence and is a technically feasible procedure for the repair of ventral hernia [11]. L Sarli Et Al in their study compared Tapp versus IPOM and showed that TAPP technique for laparoscopic hernia repair had less recurrence and less post operative complications. M Maatouk Et Al in his analysis found that TAPP repair for ventral hernia appears to be safe and effective, superior or similar to other minimally invasive techniques for perioperative characteristics and short-term outcomes [5]. Pravin Et Al compared open versus Laparoscopic TAPP and found that Laparoscopic TAPP ventral hernia repair gives equal results in terms of recurrence and less complications than open ventral hernia repair [12].

Pain scores are significantly reduced with this technique, as it avoids the use of transfascial sutures or tacks for mesh fixation. Research has shown that multiple transfascial sutures and tackers can lead to increased long-term and chronic postoperative pain due to nerve entrapment [1]. Furthermore, this method presents cost-saving benefits by utilizing affordable polypropylene mesh rather than costly composite meshes. Placing the mesh in the extra-peritoneal space also minimizes the risk of contact with visceral organs and hence the formation of adhesions, postoperative ileus and intestinal obstruction [14,15].

In summary, besides its extended operating time, the ventral-TAPP procedure presents numerous advantages by being more cost-effective, having reduced pain post-surgery leading to a reduced hospital stay and enhanced quality of life. A few limitations in our study are highlighted. First, being a single centre study, it limits the generalizability of our findings. Second, the short follow-up duration of 6 months also presents a limitation in predicting the durability. Further research is also needed to assess the long-term outcomes of TAPP Plus repair. We are planning to publish a complete study with a longer follow up and more cases in near future.

Conclusion

The transabdominal preperitoneal repair for primary ventral hernia and smaller hernias as discussed is a cost-effective technique with physiological placement of mesh in the preperitoneal space minimizes abdominal trauma ensuring reduced post operative pain. Preperitoneal placement avoids direct contact of mesh with the bowel avoiding postoperative ileus and other long term mesh related complications. The surgeon's orientation during the creation of the peritoneal flap is a crucial aspect. By this technique benefit of preperitoneal repair can be extended to Spigelian, Epigastric, Umbilical and port site hernias.

Author Statements

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Conflict of Interest

CIBHI SP, PINAK DASGUPTA, NIRANJAN R and AJAY PAI declare that they have no conflict of interest.

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