

A case series of IPOM-AS – intraperitoneal mesh fixation technique for ventral hernia using straight needle suture nylon 2–0



Arvind K Shukla¹, Saranshi Shrivastava², Sagar Arora³, Avinash Gautam⁴, Jujar Kapadia⁵, Rahul Tayal⁶, Rajesh Maida⁷

¹Associate Professor, ²Senior Resident, ^{3,5,6,7}Postgraduate Resident, ⁴Assistant Professor, Department of Surgery, MGM Medical College and M.Y. Hospital, Indore, Madhya Pradesh, India

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ABSTRACT

Intraperitoneal onlay mesh (IPOM) technique of mesh fixation using tackers for ventral hernia is widely done. But using tackers is costly (266.29 USD) and causes early and late post-operative pain. The aim of the study was to choose the better method of surgery for ventral hernia using composite mesh and straight needle suture nylon 2–0 for intraperitoneal mesh fixation (IPOM-AS) and will compare it with conventional IPOM technique in which Fixation of mesh is done by Tacker. Ten patients who were diagnosed with ventral hernia between November 2022 and December 2022 in the Department of Surgery, MGM Medical College and MY Hospital, Indore were taken in our study and IPOM-AS technique was performed using three ports on the left side of the abdomen, after reducing the contents of hernia, the axis for internal attachment of composite mesh is identified and marked with pair of sutures (vicryl and rapid vicryl) and intraperitoneal transabdominal fixation of mesh is done using straight needle suture nylon 2–0 with the help of suture passer. This technique was taken in our study and was assessed for cost-effectiveness, early and late post-operative pain, learning curve, early mobilization, early discharge, early return to work, and long-term complications. All the patients had less early and late post-operative pain according to VAS score (mean VAS score 2 on post-operative 1 and 1 on post-operative 2, no pain during the follow-up period), patients were discharged earlier (mostly on post-operative 1) and early return to work was possible and this technique of intraperitoneal mesh fixation using straight needle suture (2.03 USD) is more cost-effective when we compared these patients with those in whom conventional IPOM was done with the help of a tacker (266.29 USD). Good patient compliance was seen. IPOM using composite mesh and straight needle suture (IPOM-AS) for intraperitoneal mesh fixation in ventral hernia is better accepted by patients than the conventional IPOM using tacker for mesh fixation.

Key words: IPOM; Straight needle suture; Composite mesh; Tacker

INTRODUCTION

Hernia is derived from the Latin word for rupture.¹ A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.² Ventral hernias in the anterior abdominal wall include both spontaneous or primary hernias (e.g., umbilical, epigastric, supraumbilical, and Spigelian) and, most commonly, incisional hernias after an abdominal operation.³ The use of mesh has

revolutionized the repair of abdominal wall hernias. Anterior placement of polypropylene mesh as an on-lay to the primary repair is widely done. LeBlanc and Booth first described a laparoscopic ventral hernia repair (LVHR) in 1993.⁴ The popularity of the procedure coincided with the development of barrier-coated meshes that could be placed in the peritoneal cavity, which allowed tissue ingrowth against the posterior abdominal wall and the ability to decrease adhesions with the viscera. Causes of ventral hernia include

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Address for Correspondence:

Dr. Saranshi Shrivastava, Senior Resident, Department of Surgery, MGM Medical College and M.Y. Hospital, Indore - 452 001, Madhya Pradesh, India. **Mobile:** +91-8827993293. **E-mail:** saranshi94@gmail.com

chronic cough, chronic constipation, heavy weight lifting, pregnancy, ascites, prior surgery, obesity, or any other condition which increases intra-abdominal pressure.⁵ The indications for an LVHR are similar to those for an open procedure. The presence of symptoms associated with the hernia such as pain and discomfort, bulging from the defect, and obstructive symptoms such as nausea, constipation, and emesis. The distinct advantage is that the laparoscope allows for clear visualization of the abdominal wall to address all fascial defects, wide mesh coverage of the defect(s) without a large open incision, decreased surgical site occurrence/infection, and low recurrence rate. There are two major disadvantages to LVHR. The first is that it requires almost complete lysis of adhesions for trocar placement and wide mesh overlap. In patients with a known history of dense adhesions or a history of bowel injury from a hernia repair, there is a higher incidence of enterotomy compared to an open approach.⁶ The second major disadvantage is the inability to close the defect in larger hernias.

Procedure (Intraperitoneal only mesh [IPOM]-AS)

Patients with a ventral hernia after taking detailed history, clinical examination, investigations, and pre anesthetic check-up were posted for surgery. Written informed consent was taken and bowel preparation done. The patient kept NBM for 6 h. The patient placed in supine position with nasogastric tube *in situ* after induction. Perioperative antibiotic given.⁷ After painting and draping under aseptic precautions, the 10 mm video scope port is placed first in the left lumbar region, using the Veress needle technique. After the abdomen is entered safely and the port secured with stay sutures, the pneumoperitoneum is created with carbon dioxide. All four quadrants of the abdomen are explored visually and hernia and its contents are evaluated. Omental and other adhesions to the anterior abdominal wall around the hernial defect are visualized (Figure 1).⁸ For working ports, skin is incised and the abdominal wall is transilluminated with the videoscope to show any regional vessels within the abdominal musculature. The 5-mm operating ports are placed, one in the left hypochondriac region and the other port between the suprapubic and left iliac fossa, with visualization (Figure 2). A zone of about 4–6 cm must be made clear around the rim of the hernial defect for the wide attachment of the mesh beyond the borders of the actual defect.⁹ The omentum is grasped near the abdominal wall with the forceps or the dissecting instrument and gentle traction is applied. Using laparoscopic scissors, the junction of the omentum with the peritoneum is separated. After the abdominal wall adhesions are taken down, the omentum is removed from the hernial sac, which is left intact. This is done by inversion of the hernial sac using several fingers externally. A visual measurement of the perimeter of the defect is done. An adequately clear zone of 4–6 cm for attachment of the mesh and its sutures



Figure 1: Port placement in left lumbar

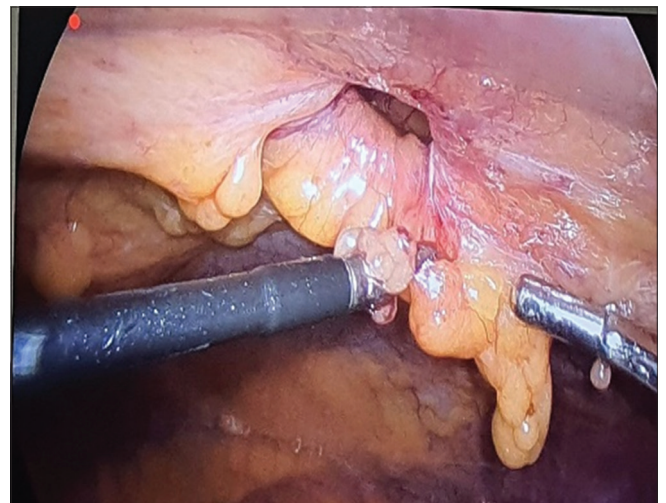


Figure 2: Reducing the contents left hypochondriac and left iliac of hernia sac



Figure 3: Mesh measured

is sufficient.⁹ An important next step is to lower the intra-abdominal CO₂ gas pressure to about 6–8 mmHg, which

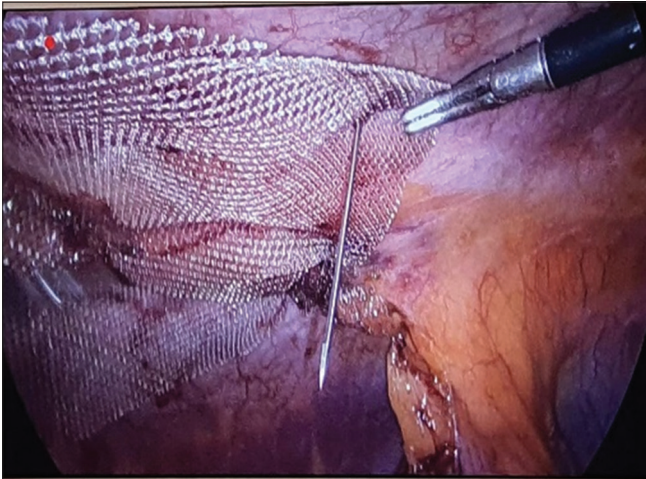


Figure 4: Fixing the mesh with placement of sutures on mesh straight needle suture nylon



Figure 5: Mesh fixed at all quadrants

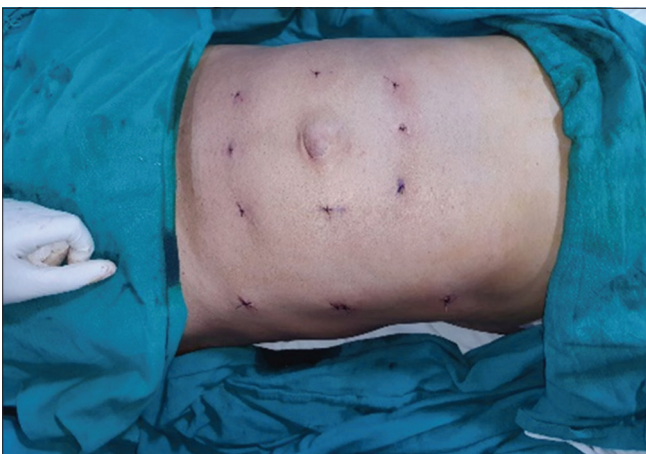


Figure 6: Final view after skin corners. Closure (prominent markings due to skin markers)

minimizes the stretching of the abdominal wall and hernia. If measurements of the defect are made with the abdomen fully inflated at 15 mmHg, the mesh will be too large.¹⁰ It will become very wrinkled and loose when the CO₂ is removed at

the end of the operation. The size of the defect is measured. A long needle is passed perpendicularly at the edge of the fascial defect in each of the four quadrants. The entrance site at the internal edge of the hernial defect is verified with the videoscope and the external sites are marked with ink. The pattern of the defect is outlined so as to determine the size and shape of the mesh. A 3–4-cm margin is drawn out from this defect (Figure 3). The titanium mesh is prepared with the placement of four 00 sutures, one in each quadrant, using a pair of parallel sutures in one axis (vicryl) and perpendicular sutures in the other axis (rapid vicryl). In this manner, the axis for internal attachment is identified when the mesh is not round. Each suture is tied in its midpoint and the long tails are left intact. The mesh is rolled snugly so as not to create tension. The mesh is unrolled and oriented. The mesh is first secured with one of the pre-attached sutures at the four quadrants. Then, our previously marked skin sites are incised with a No. 11 scalpel blade, which makes <2-mm skin opening. A suture passer is passed perpendicularly through the abdominal wall. The needle tip is opened and one of the suture ends is grasped as it closes. The loose suture end is brought out through the abdominal wall and secured with a hemostat. The suture passer is passed again through the abdominal incision, but this time it is aimed to enter the abdominal space about <1 cm away from the first site. The other half of the tied suture is grasped and brought out. The suture is tied down through the skin incision, setting the knot deeply. This secures the mesh to the abdominal wall fascia. This transabdominal suturing continues with the placement of the two lateral sutures and then, last, the opposite suture (Figure 4). The four corners of the mesh are also sutured using a straight suture needle nylon 2–0 with help of a suture passer and holding the needle with Maryland in the same manner. In general, the mesh should be slightly loose but not wrinkled rather than precisely tight (Figure 5).¹¹ Careful inspection is made for any bleeding sites. Each of the operating ports is removed under direct vision. As intra-abdominal gas is vented, the final view of the loosely applied mesh is seen. The fascia of any 10-mm port site is closed with 00 delayed absorbable sutures.¹² The skin is approximated with subcuticular sutures (Figure 6). Adhesive skin strips and dry sterile dressings are applied.

Post-operative Care: The nasogastric tube is removed before the patient awakens. The patient is mobilized on the same day of surgery. Clear liquids are resumed within 1 day and the diet is advanced as tolerated. Some surgeons recommend the use of an abdominal binder for 1 month after surgery.

CASE 1

A 36 year-old male presented with a complaint of swelling above the umbilicus for 1 year associated with

intermittent mild pain. Swelling reduces on lying down and aggravates standing or coughing. Not associated with any other co-morbidities. On USG, 10 mm defect is seen in the anterior abdominal wall musculature in supra-umbilical region with omentum as its content suggestive of Supraumbilical hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and the patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 2

A 38-year-old female presented with a complaint of swelling lateral to umbilicus on the left side for 6 months. Swelling is not associated with pain and reduces on lying down. The patient has a history of LSCS done 1 year back and history of hypertension since 1 year, well controlled. On USG 2 cm defect is seen in the anterior abdominal wall musculature with omentum and bowel as its content suggestive of incisional hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and few adhesions were found of previous surgery. The patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 3

A 46-year-old male presented with a complaint of swelling around umbilicus for 1 year and chronic constipation for 1 year. Swelling reduces on lying down and aggravates on coughing. The patient is a bodybuilder for the last 2 years. On USG 9 mm defect is seen in the anterior abdominal musculature in umbilical region with omentum as its content suggestive of Umbilical Hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed. The patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 4

A 42 y/F presented with a complaint of swelling lateral and below umbilicus on the right side since 1.5 years associated with mild intermittent pain and swelling reduces on lying down. The patient has a history of LSCS done 20 years ago. On USG 2.4 cm defect is seen in the anterior abdominal wall musculature with omentum and bowel as its content suggestive of Incisional Hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and adhesions were seen of previous surgery.

The patient was mobilized on post-operative 1 and was discharged on post-operative 2 with no complaints of pain or any other complications.

CASE 5

A 55-year-old male presented with a complaint of swelling in epigastric region for 4 years which reduces on lying down and aggravates on coughing associated with chronic cough. No complaints of pain. On USG 12 mm defect is seen in the anterior abdominal wall musculature with omentum as its content suggestive of Epigastric hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and the patient was mobilized on post-operative 1 and was discharged on post-operative 2 with no complaints of pain or any other complications.

CASE 6

A 36-year-old male presented with complaint of swelling in umbilical region for 6 months associated with mild pain. Swelling reduces on lying down and aggravates coughing. Not associated with any comorbidities. On USG 2 cm size defect is seen in umbilical region with bowel and omentum as its content and it is reducible suggestive of umbilical hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and the patient was mobilized on post-operative 1 and was discharged on post-operative 2 with no complaints of pain or any other complications.

CASE 7

A 23-year-old male presented with a complaint of swelling above umbilicus for 8 months with a history of heavy weight lifting and chronic constipation, not associated with pain. Swelling reduces on lying down and aggravates on coughing. On USG 2.5 cm defect is seen in the supraumbilical region with omentum and bowel as its content suggestive of Supraumbilical hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and the patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 8

A 40-year-old female presented with a complaint of swelling 3 cm below umbilicus for 2 years with a previous history of suprapubic cystolithotomy 5 years back. Swelling is reducible and not associated with pain. Swelling aggravates coughing and straining and reduces on lying

down. On USG 2.2 cm defect is seen 3 cm below umbilicus with bowel as its content which is reducible suggestive of Incisional hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and few adhesions of previous surgery were seen and the patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 9

A 50 year-old male presented with a complaint of swelling in epigastric region since 4 years associated with chronic cough and a history of heavy weight lifting. Swelling is not associated with pain and is reducible. On USG 1 cm defect is seen in the epigastric region with fat as its content suggestive of Epigastric hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and few adhesions of previous surgery were seen and the patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

CASE 10

A 30-year-olds male presented with complaints of swelling in umbilical region since 2 years associated with pain and history of chronic cough. Swelling is partially reducible. On USG 1.7 cm defect is seen in umbilical region with omentum as its content suggestive of Umbilical hernia. The patient was taken for surgery after the workup and consent. IPOM-AS was performed and the patient was mobilized in the evening and was discharged on post-operative 1 with no complaints of pain or any other complications.

RESULTS

In our study, we have taken 10 patients of ventral hernia (2 supraumbilical hernias, 3 incisional hernia, 3 umbilical hernia, 2 epigastric hernia) and performed IPOM-AS (IPOM using composite mesh and intraperitoneal mesh fixation using straight needle suture nylon 2–0), and assessed this on the basis of early and late post-operative pain, cost-effectiveness, early mobilization, early discharge, compared this technique with conventional IPOM using composite mesh and tacker.

DISCUSSION

In this study, the aim was to choose the better method of surgery for different types of ventral hernia using composite mesh and straight needle suture nylon 2–0

(IPOM-AS) for intraperitoneal mesh fixation and will compare it with conventional IPOM technique in which Fixation of mesh is done by Tacker.

1. In our study, we have taken 10 cases of different types of ventral hernia including, incisional Hernia (03), epigastric hernia (02), umbilical hernia (03), supraumbilical hernia (02)
2. In our study, we have used titanium coated polypropylene mesh.¹³ Titanium coating made the mesh biologically compatible hence eliminating adhesions with visceral structures and comparatively stiffer, hence the margins of the mesh did not roll down while fixing on the abdominal wall
3. In our study, Mesh was fixed using straight needle suture nylon 2–0 suture instead of tacker. As Table 1, Cost of tacker is around 266.29 USD while straight needle suture costs around 2.03 USD hence making the surgery more cost effective. Also, for surgeon using straight needle suture is far easy than a tacker. While fixing mesh proximal to working port with a tacker it is difficult to form an angle for tacker to fire and there is risk of bending of tacker while we manipulate it for placement. Hence learning this modified fixation technique is easy as compared to learning fixing the mesh with tacker
4. In past straight needle sutures were used in Gynecological procedures and plastic surgeries for subcuticular suturing.¹⁴ The use of straight needle suture in laparoscopic procedures is uncommon. These straight needle nylon sutures are manufactured by Jhonson and Jhonson private limited (no commercial interest)
5. As shown in Table 2, mean VAS score of patients operated by IPOM-AS technique using straight needle suture was 2 on POD 1 and mean VAS score of 1 on POD 2. Patients had no complaint of pain in the follow up period

Table 1: Comparison of conventional IPOM using tacker with IPOM-AS using straight needle suture nylon 2–0 and composite mesh

Parameters	Conventional IPOM using Tacker	IPOM- AS using straight needle suture nylon 2–0 and composite mesh
Cost	Tacker – 266.29 USD	Straight needle suture- 2.03 USD
Post-operative pain (By VAS score)	POD 1.6 POD 2.5 POD 7.2 POD 28.1 POD 42.1	POD 1.2 POD 2.1 POD 7.0 POD 28.0 POD 42.0
Skin hematoma	Seen in 10% cases	None
Patients mobilized on	POD 1	POD 0
Patients discharged on	POD 3	POD 1

Table 2: Mean VAS score of patients on post-operative day and follow up

Postoperative day	Mean VAS score
Day 1	2
Day 2	1
Day 7 (Follow-up)	0
Week 4 (Follow-up)	0
Week 6 (Follow-up)	0

Table 3: Patients mobilized and discharged after surgery

Patient mobilized/ discharged	POD 0	POD 1	POD 2
Patients mobilized on	06	04	00
Patients discharged on	00	07	03

- When we compare postoperative pain using VAS Score in patients in whom mesh fixation using straight needle suture was done as compared to mesh fixation using tacker there is significant reduction in post operative pain in both early postoperative period and late postoperative period. Due to reduction in postoperative pain patients were able to mobilize earlier and hence were discharged earlier thus increasing patient acceptance of this technique.¹⁵ Bansal et al., reported a mean VAS of 1.3 at 6 weeks post-operatively in cases of tackers only mesh fixation. They have concluded that tackers are more painful at all measurement points.¹⁵
- As shown in Table 3, out of 10 patients, 06 patients were mobilized on the same day of surgery in the evening due to reduced post operative pain. Out of 10 patients, 07 patients were discharged on POD 1. There was early return to work
- In mesh fixation using tacker there is significant chance of development of hematoma especially in lean and thin individuals. Fixation by using straight needle suture eliminates the risk of development of hematoma.¹⁶

CONCLUSION

With the help of our study, we have reached to the conclusion that IPOM-AS technique of fixation of composite mesh using straight needle nylon suture is more cost effective, early and late post operative pain is less, with less post operative complications, is more convenient for the operating surgeon and results in early mobilization, early discharge and early return to work, with better patient acceptance.

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Authors' Contributions:

AKS- Concept and design of the study, interpreted the results, reviewed the literature and manuscript preparation; **SS**- Prepared first draft of manuscript, statistical analysis and interpretation, reviewed the literature, manuscript revision; **SA**- Reviewed the literature, manuscript preparation, preparation of draft; **AG**- Concept of the study, statistical analysis, coordination; **JK**- Reviewed the literature, manuscript preparation, manuscript revision; **RT**- Manuscript preparation, statistical analysis and interpretation; **RM**- Manuscript preparation, statistical analysis and interpretation.

Work attributed to:

Department of General Surgery, MGM Medical College and M.Y. Hospital, Indore - 452 001, Madhya Pradesh, India.

Orcid ID:

Dr. Arvind K Shukla - <https://orcid.org/0000-0001-6441-0701>

Dr. Saranshi Shrivastava - <https://orcid.org/0000-0002-9790-1811>

Dr. Sagar Arora - <https://orcid.org/0009-0005-4792-6294>

Dr. Avinash Gautam - <https://orcid.org/0000-0002-0644-6965>

Dr. Jujar Kapadia - <https://orcid.org/0009-0004-2657-8246>

Dr. Rahul Tayal - <https://orcid.org/0009-0007-3110-5592>

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