

Laparoscopic Repair of Primary Ventral and Incisional Hernias: A Case Series

MUKUND PRABHAKAR KULKARNI¹, RAGHAVENDRA HAVANNAVAR²

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ABSTRACT

Primary ventral hernia and incisional hernia constitute a significant proportion of surgical practice. With a better understanding of anatomy and the availability of mesh and fixation devices, there is continuous evolution of techniques from Intraperitoneally placed composite mesh to extraperitoneal regular proline mesh placement over either a peritoneal flap or posterior rectus sheath flap, or more recently, a totally extraperitoneal approach without entering the peritoneal cavity. Laparoscopic techniques ensure reduced postoperative pain, reduced wound infections, and generally a gratifying outcome. In this case series of 129 patients who underwent laparoscopic repair of incisional and primary ventral hernias, females constituted the majority (97 patients), and prior gynaecological surgeries were the most common cause of hernia. Only 35 had primary ventral hernias. Intraperitoneal Onlay mesh with defect closure (IPOM PLUS) placement was the most commonly performed procedure due to its wide applicability, followed by Transabdominal Retromuscular (TARM) mesh repair. All procedures resulted in successful outcomes, with no instances of conversion to open surgery and no major postoperative complications. A single recurrence was noted at the one-year follow-up.

Keywords: Extraperitoneal, Fixation devices, Mesh, Preperitoneal, Retromuscular, Seroma

INTRODUCTION

Hernia has always dominated any surgical meetings and discussions due to the huge burden of cases and ongoing refinements in the techniques to provide a safe, durable, and economically acceptable solution. Ever since Stoppa RE et al., described the prosthetic replacement of the visceral sac by placing mesh in the preperitoneal space for the repair of groin hernias, there has been a continuous effort to adapt it to minimally invasive surgery [1]. Transabdominal Preperitoneal (TAPP), Total Extraperitoneal (TEP), and extended view TEP (e-TEP) repairs are techniques for inguinal hernia [2]. The principles of e-TEP are used to treat incisional and ventral hernias in midline or medial to the semilunar line with Transverse Abdominis Release (TAR) as required. The principles of TAPP inguinal hernia are used in treating incisional and primary ventral hernias [3]. The Trans-Abdominal Retromuscular Repair (TARM) is another technique similar to TAPP and addresses the problem of tearing the thin peritoneal flap as in TAPP [4]. With so many techniques available, the choice needs to be individualised and adjusted according to the hernia characteristics, hernia contents, patient body habitus, and the presence and size of divarication.

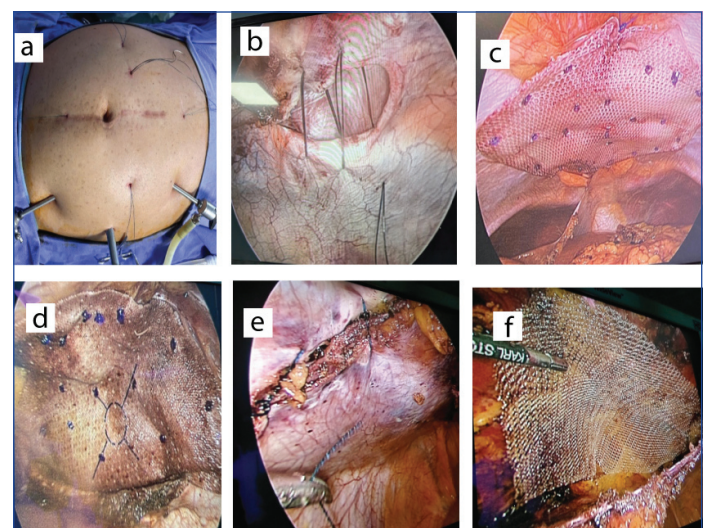
CASE SERIES

All the patients who underwent laparoscopic repair of incisional and primary ventral hernias at the Karnataka Medical College and Research Institute, Hubli, Karnataka, India, from October 2010 to December 2023 were included. Patients who were unfit to undergo surgery under general anaesthesia, patients with obstruction and strangulation, ascites, significant domain loss and those following burst abdomen requiring abdominal wall reconstruction were excluded. Patients who had an associated enteric fistula, ileostomy or colostomy were excluded.

For Intraperitoneal Onlay Mesh (IPOM), the ports were placed in the flanks along the anterior axillary line [Table/Fig-1a] after creating the pneumoperitoneum with a Veress needle at the Palmer's point. Adhesiolysis was performed, and the hernia contents were reduced by traction, aided by external pressure. A loop nylon needle was introduced by a small 2 mm stab at the farthest end of the defect, and the needle and suture were drawn inside the abdomen. The defect was closed with a running suture toward the camera and

then again backwards [Table/Fig-1b]. The needle is extracted from the same skin stab but through different locations in the peritoneum and tied with a knot in subcutaneous tissue. The composite mesh was introduced through a 10 mm port and fixed with four corner trans fascial fixation sutures and thirty absorbable tacks all over [Table/Fig-1c]. Pneumoperitoneum was deflated and port sites closed. A ball of gauze and cotton was placed over the hernia site and tightly strapped with plaster for 15 days to prevent seroma formation. For defects located away from midline a peritoneal, or Musculo peritoneal flap was raised to place the mesh so that there is no need to put transfascial sutures over there [Table/Fig-1d].

In the case of TAPP, a peritoneal flap was raised at least 7cm from the defect, creating a large space. The hernia defect was closed with loop nylon, and the peritoneal defect was closed with polygalactin. A 15x15 cm macroporous polypropylene mesh was placed to cover the defect widely. The peritoneal flap was closed with barbed suture [Table/Fig-1e].



[Table/Fig-1]: a) Port placement and trans fascial four corner mesh fixation sutures. b) Defect closure by loop nylon; c) Intraperitoneal Onlay Mesh (IPOM); d) Musculo-aponeurotic flap to place mesh near bony prominence; e) peritoneal flap to cover mesh in preperitoneal space in TAPP; f) Transabdominal Retromuscular Mesh Placement (TARM).

In the case of TARM, the ports were placed in the upper abdomen for defects at and below the umbilicus and in the lower abdomen for epigastric defects. The posterior rectus sheath was incised transversely on both sides, and the retrorectus space was created and joined in the midline by incising the linea alba. The defect closure, mesh placement and flap repositioning were similar to TAPP [Table/Fig-1f].

A total of 129 patients had undergone laparoscopic hernia surgery during this period. There were more female than male patients [Table/Fig-2]. Most of the hernias were lower abdominal [Table/Fig-3]. TARM was performed in 20 patients and TAPP in 10 patients [Table/Fig-4].

Clinical data	values
Age (years) Mean±SD	52±12
Sex (Male: Female)	32: 97
BMI Mean (SD)	29 ±3.5. 15 patients had BMI above 30.
Cardiac problem	34 (26%) (Hypertension= 22, IHD=8, AS=2, MS=2)
Diabetes	22 (16.9%)
Chest problem	8 (6.1%) (COPD=7, Pulmonary hypertension=1)
Hospital stay in days, Mean±SD	3.5±1.2

[Table/Fig-2]: Characteristics of 129 patients (N=129).

IHD: Ischaemic heart disease; AS: Aortic stenosis; MS: Mitral stenosis; COPD: Chronic obstructive pulmonary disease; BMI: Body mass index

Parameters	n
Primary ventral hernia	35
Incisional hernia	84
Recurrent incisional hernia after previous open mesh repair	10
Location	
Umbilicus	45
Epigastric	11
Lower abdomen	60
Left iliac fossa	3
Right iliac fossa	10
Type of defect	
Single defect	63
Multiple defects	66
Defect size in cm as per CT scan, Mean (SD)	4.5±2.7

[Table/Fig-3]: Hernia characteristics (N=129).

CT: Computed tomography

Laparoscopic repair	n (%)
IPOM	9 (6.9)
IPOM Plus	90 (69.7)
TAPP	10 (7.7)
TARM	20 (15.5)

[Table/Fig-4]: Type of laparoscopic repair (N=129).

In one patient, an enterotomy was encountered during the adhesiolysis. Being the fifth attempt at hernia repair in an elderly lady, there was a dilemma regarding conversion to open surgery and whether to place mesh. The bowel bearing enterotomy was brought out by making a small opening through the dome of the hernia itself. The bowel was repaired and returned to the abdomen, and the sheath was closed through the wound using an open technique. Pneumoperitoneum was reintroduced, and a thorough wash was given laparoscopically before placing the dual mesh intraperitoneally.

For intraperitoneal onlay, the mesh used was a 15 cm circular composite mesh in most patients and a 15×20 cm composite mesh in five patients to cover larger defects. In all TAPP and TARM

repairs, 15×15 cm macroporous Prolene mesh was placed. The mean operative time was 90 minutes ranging from 60 minutes to 210 minutes.

There was seroma in four patients, managed conservatively by observation alone in three patients and by seroma excision after failed aspiration in one. Two patients had excessive pain preventing early mobilisation and discharge from the hospital. One patient had an asymptomatic recurrence at one-year follow-up. He had an IPOM Plus repair for an epigastric ventral hernia [Table/Fig-5].

Complications	n (%)
Enterotomy	1 (0.7%)
Excessive pain	2 (1.5%)
Seroma	4 (3.1%)
Infection	0
Recurrence (at 1-year follow-up)	1 (0.7%)
Follow-up	Median=14 months, Range 8 to 36 months

[Table/Fig-5]: Complications.

DISCUSSION

The technique of hernia repair is ever evolving. With a better understanding of the abdominal wall's composition and its aponeurotic and fascial layers, the principles of repair are evolving [5]. The TAPP and TARM are attempts to reduce the cost of hernia surgery and reduce complications by doing away with composite mesh and tacker and reducing bowel adhesion to mesh [6].

The complication rates in the literature vary from one series to another. In the series reported by Eker HH et al., the overall perioperative complication rate for laparoscopic repair (10%) was significantly higher than that for open repair (2%) ($p=0.049$) [7]. The operative complications included enterotomy, serosal bowel injury, and bladder perforation. In another series by McGreevy JM et al., the complication rate was 8% [8]. Perrone JM et al., reported a complication rate of 27.3% [9]. In the present case series, the low complication rate is attributable to case selection, use of a harmonic energy device for adhesiolysis, and better experience. The authors had one small bowel enterotomy (0.8%) in the entire series. In the series by Sharma A et al., 33 cases with intraoperative enterotomy were identified [10]. Postoperative mortality was 6.1% (2 patients), and complications occurred in 16 patients (48.5%) during a 6-month follow-up.

Similarly, in the study by Gray SH et al., enterotomy or bowel resection was associated with a fourfold increase in complications, hospital stay, and operative time [11].

For an intraoperatively recognised enterotomy, the options are biological mesh, postponement of mesh placement by a few days or only anatomical repair. LeBlanc KA et al., opined that the septic complications can be improved by careful technique, minimising the contamination along with the use of antibiotic-impregnated meshes and prophylactic antibiotics [12].

The recurrence affects the quality of life, resource utilisation, and the need for repeat surgery. In this study, the 5-year recurrence rate after ventral hernia repair was greater than 40% and 70% in patients with and without mesh, respectively [13]. Higher body mass index; immunosuppressants; incisional and parastomal hernias; a robotic approach; greater hernia width; use of a biologic or resorbable synthetic mesh; and complications, such as surgical site infections and reoperation, were associated with higher odds of hernia recurrence [13]. The present case series had a low recurrence rate due to the case selection and routine use of four-corner transfascial fixation sutures.

CONCLUSION(S)

Laparoscopic hernia repair yields favourable outcomes when feasible. Advances in imaging, anatomy, and mesh technology support the careful integration of newer techniques into routine practice.

REFERENCES

- [1] Stoppa RE, Rives JL, Warlaumont CR, Palot JP, Verhaeghe PJ, Delattre JF. The use of Dacron in the repair of hernias of the groin. *Surg Clin North Am*. 1984;64(2):269-85. Doi: 10.1016/s0039-6109(16)43284-6. PMID: 6233733.
- [2] Daduk Y, Ozdas S. Customized TEP inguinal hernia repair: innovative approaches with outstanding surgical outcomes. *Curr Probl Surg*. 2025;69:101815. Doi: 10.1016/j.cpsurg.2025.101815.
- [3] Maatouk M, Kbir GH, Mabrouk A, Rezgui B, Dhaou AB, Daldoul S, et al. Can ventral TAPP achieve favorable outcomes in minimally invasive ventral hernia repair? A systematic review and meta-analysis. *Hernia*. 2023;27(4):729-39. Doi: 10.1007/s10029-022-02709-4.
- [4] Masurkar AA. Laparoscopic trans-abdominal retromuscular (TARM) repair for ventral hernia: a novel, low-cost technique for sublay and posterior component separation. *World J Surg*. 2020;44(4):1081-85. Doi: 10.1007/s00268-019-05298-z.
- [5] Wang M, Chen W, Xie Z. Evolution of research in hernia repair materials: a 20-year bibliometric and visualization study. *Medicine (Baltimore)*. 2025;104(26):e43021. Doi: 10.1097/MD.00000000000043021.
- [6] Olanrewaju OA, Saleem A, Ansah Owusu F, Pavani P, Ram R, Varrassi G. Contemporary approaches to hernia repair: a narrative review in general surgery. *Cureus*. 2023;15(12):e51421. Doi: 10.7759/cureus.51421.
- [7] Eker HH, Hansson BM, Buunen M, Janssen IM, Pierik RE, Hop WC, et al. Laparoscopic vs open incisional hernia repair: a randomized clinical trial. *JAMA Surg*. 2013;148(3):259-63. Doi: 10.1001/jamasurg.2013.1466.
- [8] McGreevy JM, Goodney PP, Birkmeyer CM, Finlayson SR, Laycock WS, Birkmeyer JD. A prospective study comparing the complication rates between laparoscopic and open ventral hernia repairs. *Surg Endosc*. 2003;17(11):1778-80. Doi: 10.1007/s00464-002-8851-5.
- [9] Perrone JM, Soper NJ, Eagon JC, Klingensmith ME, Aft RL, Frisella MM, et al. Perioperative outcomes and complications of laparoscopic ventral hernia repair. *Surgery*. 2005;138(4):708-15. Doi: 10.1016/j.surg.2005.06.054.
- [10] Sharma A, Khullar R, Soni V, Bajjal M, Kapahi A, Najma K, et al. Iatrogenic enterotomy in laparoscopic ventral/incisional hernia repair: a single center experience of 2,346 patients over 17 years. *Hernia*. 2013;17(5):581-87. Doi: 10.1007/s10029-013-1122-7.
- [11] Gray SH, Vick CC, Graham LA, Finan KR, Neumayer LA, Hawn MT. Risk of complications from enterotomy or unplanned bowel resection during elective hernia repair. *Arch Surg*. 2008;143(6):582-86. Doi: 10.1001/archsurg.143.6.582.
- [12] LeBlanc KA, Elieson MJ, Corder JM 3rd. Enterotomy and mortality rates of laparoscopic incisional and ventral hernia repair: a review of the literature. *JSLs*. 2007;11(4):408-14.
- [13] Bhardwaj P, Huayllani MT, Olson MA, Janis JE. Year-over-year ventral hernia recurrence rates and risk factors. *JAMA Surg*. 2024;159(6):651-58. Doi: 10.1001/jamasurg.2024.0233.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Surgical Gastroenterology, Karnataka Medical College and Research Institute, Hubli, Karnataka, India.
2. Assistant Professor, Department of Surgical Gastroenterology, Karnataka Medical College and Research Institute, Hubli, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Mukund Prabhakar Kulkarni,
Ashok Nagar, Hubli-580032, Karnataka, India.
E-mail: mukundaiims@gmail.com

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