

ORIGINAL RESEARCH

A study to assess results of laparoscopic ventral hernia repair using mesh insertion

¹Dr. Manoj Kumar Sharma, ²Dr. Brajendra Swaroop, ³Dr. Rajesh Kumar Badal

¹Assistant Professor, Department of General Surgery, G.M.C Datia, M.P, India

²Assistant Professor, Department of General Surgery, Government Medical College, Datia, MP, India

³Assistant Professor, Department of General Surgery, G.M.C. Datia, M.P, India

Corresponding author

Dr. Rajesh Kumar Badal

Assistant Professor, Department of General Surgery, G.M.C. Datia, M.P, India

Received: 18 June, 2023

Accepted: 17 July, 2023

ABSTRACT

Background: To evaluate laparoscopic ventral hernia repair using mesh insertion.

Materials & Methods: A study was conducted for 30 successive patients afflicted with ventral hernias who had undergone a laparoscopic procedure. The data obtained was subjected to analysis employing the SPSS software to derive meaningful insights and conclusions.

Results: Out of the patients, 4 individuals (13%) necessitated the placement of two distinct meshes to effectively cover the hernia region. Among these cases, one patient had an unusual requirement: two meshes measuring 20 x 30 cm each were stitched together, forming a composite mesh measuring 30 x 40 cm to adequately address their hernia defect. Mean operative time was 123.2 minutes while 6.67 percent of the cases were converted to open repair. Complications were seen in 6.67 percent of the patients while mean length of hospital stay was 1.4 days.

Conclusion: The utilization of the Proceed mesh for laparoscopic ventral hernia repair in human patients has been demonstrated to be viable, showcasing a minimal occurrence of complications.

Keywords: Laparoscopic ventral hernia, mesh insertion, repair.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution- Non Commercial- Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

One result of the 2 million laparotomies performed in the United States each year is an incisional hernia rate of 3% to 20%,¹ necessitating repair of approximately 90,000 ventral hernias annually. Factors associated with formation of an incisional hernia include wound infection, immunosuppression, morbid obesity, previous operations, prostatism, and surgery for aneurysmal disease. Abdominal wall defects are typically observed within the first 5 years after the surgical incision is made, but they may develop long afterward.² These hernias play a significant role in the prolonged morbidity associated with traditional surgical procedures. Until strategies for preventing hernias are firmly established, addressing these defects through repair will continue to be a crucial challenge for abdominal surgeons across the board. Ventral hernia of the abdomen is defined as a protrusion of the abdominal viscera through a non-hiatal, non-inguinal defect in the fascia of the abdominal wall. They are commonly seen in clinical practice. Patients usually present with swelling or bulge over the abdomen, which is usually reducible on lying down. Sometimes it may be associated with dull aching pain.³ Ventral hernias are usually

repaired by an open or laparoscopic approach. Recently many surgeons prefer a hybrid approach, mainly for incisional hernia repair.⁴ Laparoscopic hernia repairs are usually associated with less postoperative pain, wound infections, and significantly improved quality of life in the long term.⁵ A ventral hernia occurs due to a weakness in the musculofascial layer of the anterior abdominal wall.⁶ Ventral hernia includes paraumbilical, epigastric, Spigelian, and incisional hernias.⁷ These hernias mainly present as swelling and rarely result in complications, such as strangulation and incarceration, and present with respective manifestations. Commonly, hernias are clinically diagnosed and do not require any special investigations.⁸ Hernia repair can be carried out as an open repair or a laparoscopic repair. Mesh prostheses are composed of biologic materials from human and animal dermis (autoplastic) or synthetic materials (alloplastic). Synthetic mesh prostheses are further divided into 3 groups based on porosity.⁹ Type I mesh is macroporous with pore sizes >10 microns, e.g., polypropylene. Type II mesh is microporous with pore sizes <10 microns, e.g., expanded polytetrafluoroethylene (e PTFE). Type III mesh is a

composite structure with both micro- and macroporous components. Polypropylene material causes a local inflammatory response when in contact with host tissues. This combined with its large pore sizes allows for maximal in-growth of connective tissue and blood vessels from the abdominal wall into the mesh material, increasing the strength of ventral hernia repairs. Expanded PTFE is biologically inert and does not cause a host inflammatory response. The submicronic pore sizes of ePTFE mesh materials further impede in-growth of host tissues, thereby, limiting adhesion formation.¹⁰ Hence, this study was conducted to evaluate laparoscopic ventral hernia repair using mesh insertion.

MATERIALS & METHODS

A study was conducted for 30 successive patients afflicted with ventral hernias who had undergone a laparoscopic procedure. The surgeries were exclusively executed by a solitary surgeon employing a consistent technique encompassing transabdominal suture fixation along with tacks. In each case, a standardized laparoscopic ventral hernia repair was carried out utilizing the Proceed mesh, secured by tackers using a double crown technique. Following the surgeries, patients were released based on established discharge criteria. Subsequent to the

procedure, follow-up was conducted by cross-referencing the national patient database and manually examining the patients' records. The data obtained was subjected to analysis employing the SPSS software to derive meaningful insights and conclusions.

RESULTS

Out of the patients, 4 individuals (13%) necessitated the placement of two distinct meshes to effectively cover the hernia region. Among these cases, one patient had an unusual requirement: two meshes measuring 20 x 30 cm each were stitched together, forming a composite mesh measuring 30 x 40 cm to adequately address their hernia defect. The majority of patients experienced a relatively short post-operative hospital stay, typically spanning from 0 to 2 days (with a median stay of 1 day). Notably, 4 patients were discharged on the same day as their surgery, and only 3 patients remained hospitalized for a period surpassing 10 days. Mean operative time was 123.2 minutes while 6.67 percent of the cases were converted to open repair. Complications were seen in 6.67 percent of the patients while mean length of hospital stay was 1.4 days.

Table: 1 Types of hernia and mesh size

Variables	Number	
Type of hernia	Umbilical	3
	Incisional	19
	Parastomal	5
	Linea alba	3
Size of mesh (cm)	4 x 4	1
	7 x 7	1
	10 x 10	5
	10 x 20	2
	15 x 15	14
	15 x 20	2
	20 x 20	2
	20 x 25	2
	20 x 30	3
	30 x 30	1
30 x 40	1	

Graph: 1 Types of hernia and mesh size

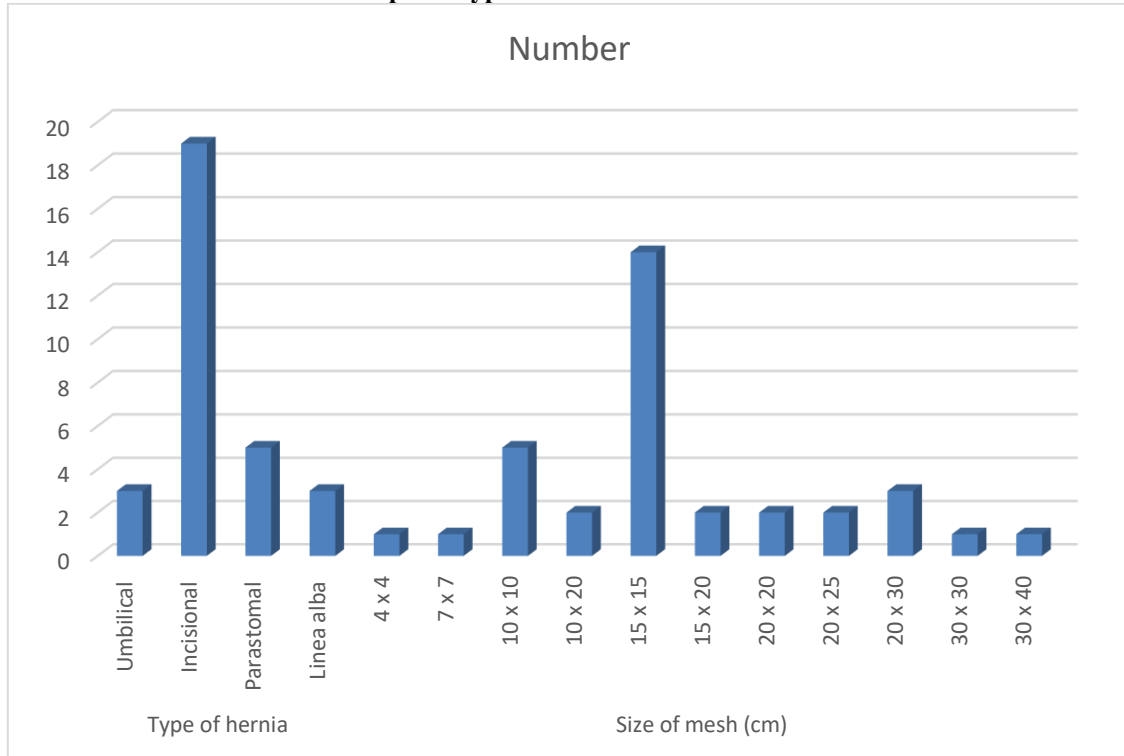


Table 2: Clinical variables

Variable	Number/ Mean	Percentage/ SD
Operative time (mins)	123.2	42.2
Conversion to open	2	6.67
Complications	2	6.67
Length of hospital stay (days)	1.4	0.5

DISCUSSION

A ventral hernia is a common surgical problem with an increase in the repair rate annually. Ventral hernia incorporates a group of hernias that occur in the anterior abdominal wall, including incisional, umbilical, epigastric, and paraumbilical hernias.¹¹ Hernias are commonly managed by laparoscopic or open surgery, either by tissue repair or mesh repair.¹² Laparoscopic ventral hernia repair was started by LeBlanc in 1993. After that, evaluations were done to make laparoscopic hernia easier and safer for ventral hernia repair.¹³ The laparoscopic approach avoids large incisions and drain placement and thus there is a reduction in wound-related complications.¹⁴ Hence, this study was conducted to evaluate laparoscopic ventral hernia repair using mesh insertion. In the present study, out of the patients, 4 individuals (13%) necessitated the placement of two distinct meshes to effectively cover the hernia region. Among these cases, one patient had an unusual requirement: two meshes measuring 20 x 30 cm each were stitched together, forming a composite mesh measuring 30 x 40 cm to adequately address their hernia defect. A study by Byrd JF et al, studied that composite mesh was placed intraperitoneally in 16 pigs through an open laparotomy and explanted at 2, 4, 8, and 12

weeks. Intraabdominal adhesions were measured laparoscopically. Host tissue in-growth was assessed histologically and tensiometrically. No adhesions were formed in 50% of the grafts explanted at 8 weeks and 25% of grafts explanted at 12 weeks. There were significantly more vascular structures at 8 weeks, 73.5±28, compared with 2 weeks, 6.75±2 (P<.01). The T-peel force at the mesh-host tissue interface was not significantly different among time points. The absorbable PDO ring underwent complete degradation by 12 weeks. The composite mesh was associated with minimal intraab dominal adhesions, progressive in-growth of host tissues, and complete degradation of a novel internal PDO ring that aided mesh positioning. This composite hernia mesh showed a favorable performance in a porcine model of open ventral hernia repair.¹⁵ In the present study, the majority of patients experienced a relatively short post-operative hospital stay, typically spanning from 0 to 2 days (with a median stay of 1 day). Notably, 4 patients were discharged on the same day as their surgery, and only 3 patients remained hospitalized for a period surpassing 10 days. Another study by Rosenberg J et al, patients presenting for laparoscopic ventral hernia repair in our department from September 2004 to October 2006 were included in the

study. The study included 49 patients with a median age of 64 years (range 30-89) and body mass index of 27.8 (19.4-50.5). The dimensions of the mesh varied from 4 x 4 cm to 30 x 40 cm (median 15 x 15 cm). One patient developed an uncomplicated wound infection and none of the 49 patients developed mesh infections or postoperative seroma requiring surgical intervention. Thus, there were no mesh-related complications. During the follow-up period of 17 months (3-27), we have not seen any postoperative recurrences. The median length of stay was 1 day (range 0-63), and there was no mortality. Laparoscopic ventral hernia repair in humans using the Proceed mesh is feasible and has a low complication rate even in obese patients or those with pulmonary disease.¹⁶ Loha M et al, a hospital-based prospective observational study conducted from January 2020 to December 2021, which included a total of 70 patients with ventral hernias. Thirty-nine patients underwent open repair and 31 patients underwent laparoscopic repair. The distribution of different types of hernias observed in study included 34% incisional hernias, 33% umbilical and paraumbilical hernias, and 33% epigastric hernias. The incidence of complications was significantly less in laparoscopic repair compared to open repair. Also, satisfaction at 1 month was significantly more in the laparoscopic group compared to the open group. However, there is no significant difference in the postoperative pain, postoperative hospital stay, return to activity, satisfaction at discharge, and quality of life at 1 month in both the laparoscopic and open repairs. Laparoscopic ventral hernia repairs are associated with lesser complications and higher satisfaction. The use of tackers and trans-fascial sutures can significantly increase postoperative pain in laparoscopic repair and is the major factor affecting the short-term quality of life in laparoscopic repairs. As there is no difference in postoperative pain, hospital stay, and return to activity, laparoscopic repairs should be preferred wherever possible in view of fewer complications and higher satisfaction.¹⁷ Mean operative time was 123.2 minutes while 6.67 percent of the cases were converted to open repair. Complications were seen in 6.67 percent of the patients while mean length of hospital stay was 1.4 days. Laparoscopic ventral hernia repair and novel biomaterials have evolved together over the past decade, with each entity lending some facet to the other to propel its development. The most commonly used mesh in laparoscopic ventral hernia repair has been an expanded polytetra fluoroe thy lene material with a smooth, micropor ous (3- μ m pores) surface on one side and a corrugated (rough) surface on the other (Gore tex Dual Mesh). The smooth side faces the intestine and serves as an adhesion barrier, while the rough side is applied against the abdominal wall and promotes mesh fixation via cellular and collagen ingrowth. Other meshes have been developed along the same lines: tissue ingro wth material on one side

and nonadhesive on the other. Two popular meshes have combined a PTFE coating on a polypropylene base (Composix, Bard, Inc.) and Seprafilm on polypropylene (Sepramesh, Gen zy me, Inc.). A study sponsored by a Society of American Gastrointestinal Endoscopic Surgeons' grant compared these products in a randomized, blinded trial in rabbits. The products combined with polypropylene had significantly more intestinal adhesions and no greater abdominal wall in growth than the pure e-PTFE product.¹⁸

CONCLUSION

The utilization of the Proceed mesh for laparoscopic ventral hernia repair in human patients has been demonstrated to be viable, showcasing a minimal occurrence of complications. This holds true even for individuals classified as obese or those afflicted with pulmonary conditions.

REFERENCES

1. Read RC, Yoder G. Recent trends in the management of incisional herniation. *Arch Surg.* 1989;124:485-488.
2. Hesse link VJ, Luijendijk RW, de Wilt JH, et al. An evaluation of risk factors in incisional hernia recurrence. *Surg Gynecol Obstet.* 1993;176:228-234.
3. Smith J, Parmely JD. *Stat Pearls* [Internet] Treasure Island: Stat Pearls Publishing; [Jun; 2022]. 2022 Jan-. Ventral hernia.
4. Hybrid approach for ventral incisional hernias of the abdominal wall: a systematic review of the literature. Sharma A, Sinha C, Baijal M, Soni V, Khullar R, Chowbey P. *J Minim Access Surg.* 2021;17:7-13.
5. Laparoscopic versus open ventral hernia repair: a comparative study. Basheer M, Negm A, El-Ghadban H, Samir M, Hadidy A, Dawoud I. https://journals.lww.com/ejos/Fulltext/2018/37040/Laparoscopic_versus_open_ventral_hernia_repair__a.8.aspx Egypt J Surg. 2018;37:465-471.
6. A prospective study comparing laparoscopic and open ventral hernia repair. Rubby SA, Ranga swami P, Sundar P. *Int Surg J.* 2016;4:170-176.
7. Open versus laparoscopic mesh repair of ventral hernias: a prospective study. Sant hosh UK, Murthy N, Rao KD. *Int J Surg Sci.* 2021;5:105-107.
8. A clinical study on ventral hernia at a tertiary care hospital. Clement SH, Bharath PV, Om kar HM, Reddy BK. *Int Surg J.* 2018;5:714-718.
9. Amid P. Classification of Biomaterials and Their Related Complications in Abdominal Wall Hernia Surgery. *Hernia.* 1997; 1: 15-21
10. White RA. The effect of porosity and biomaterial on the healing and long-term mechanical properties of vascular prostheses. *ASAIO Trans.* Apr-Jun 1988; 34(2): 95-100.
11. A comparison of suture repair with mesh repair for incisional hernia. Luijendijk RW, Hop WC, van den Tol MP, et al. *N Engl J Med.* 2000;343:392-398.
12. Robot-assisted laparoscopic mesh repair of incisional hernias with exclusive intracorporeal suturing: a pilot study. Tayar C, Karoui M, Cherqui D, Fagniez PL. *Surg Endosc.* 2007;21:1786-1789.
13. Comparative analysis of open versus laparoscopic ventral hernia repair. Badiger S, Koppad SN, Kulkarni A, Kodliwadmth H. *Int Surg J.* 2016;3:1167-1172.

14. Factors affecting wound complications in repair of ventral hernias. White TJ, Santos MC, Thompson JS. <https://pubmed.ncbi.nlm.nih.gov/9520825/> Am Surg. 1998;64:276-280.
15. Byrd JF, Agee N, Nguyen PH, Heath JJ, Lau KN, McKillop IH, Sindram D, Martinie JB, Iannitti DA. Evaluation of composite mesh for ventral hernia repair. JSLS. 2011 Jul-Sep;15(3):298-304.
16. Rosenberg J, Burcharth J. Feasibility and outcome after laparoscopic ventral hernia repair using Proceed mesh. Hernia. 2008 Oct;12(5):453-6.
17. Lodha M, Patel D, Badkur M, Meena SP, Puranik A, Chaudhary R, Choudhary IS, Sairam MV, Chauhan AS, Lodha R. Assessment of Quality of Life After Ventral Hernia Repair: A Prospective Observational Study at a Tertiary Care Centre. Cureus. 2022 Jun 20;14(6):e26136.
18. Matthews BD, Mostafa G, Carbonell AM, et al. An evaluation of adhesion formation and host tissue response to polytetrafluoroethylene mesh and bio-surgical composites. Los Angeles, CA: Society of American Gastrointestinal and Endoscopic Surgeons, 2003.