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Comparative Study of Open Pre-peritoneal Mesh Repair Versus Laparoscopic Intra-peritoneal Mesh Repair for Ventral Hernia

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ABSTRACT

This study aims to compare the outcomes of two surgical approaches, open pre-peritoneal mesh repair and laparoscopic intra-peritoneal mesh repair, in the treatment of ventral hernia. A prospective comparative analysis was conducted at NHL Medical College, V.S. Hospital, Ahmedabad, Gujarat, India involving 40 patients diagnosed with ventral hernia. Patients were divided into two groups based on their choice of surgical approach: open pre-peritoneal mesh repair (Group A) and laparoscopic intra-peritoneal mesh repair (Group B). Various clinical parameters, including post-operative pain, duration of hospital stay, operative time and early complications, were assessed. Data analysis was performed using appropriate statistical methods. The study found that laparoscopic intra-peritoneal mesh repair was associated with significantly lower post-operative pain and a shorter duration of hospital stay compared to open pre-peritoneal mesh repair. Operative times did not significantly differ between the two groups. Early complications, including wound seroma, pain, wound infection and hematoma, were more common in the open repair group. Patients undergoing laparoscopic surgery returned to their routine activities earlier. In the treatment of ventral hernia, laparoscopic intra-peritoneal mesh repair offers advantages such as reduced post-operative pain, shorter hospital stays and earlier return to normal activities when compared to open pre-peritoneal mesh repair. This study provides valuable insights for clinicians and patients in selecting the most suitable surgical approach for ventral hernia repair.

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Key Words
Surgical mesh, hernia, laparoscopy

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INTRODUCTION

The adoption of laparoscopic ventral hernia repair was initiated as a strategic response to mitigate the escalated morbidity rates and elevated recurrence frequencies associated with the traditional open surgical approach. In 1993, LeBlanc and Booth introduced the laparoscopic method for ventral hernia repair, drawing upon the foundational principles of open preperitoneal repair initially elucidated by Rives and Stoppa[1-3]. As surgeons gained increasing proficiency in laparoscopic procedures and innovative mesh technologies emerged, laparoscopic ventral hernia repair has evolved into an established and widely accepted surgical technique. It holds significant potential to emerge as the preferred procedure, given its advantages synonymous with minimal access surgery.

Nevertheless, during laparoscopic mesh placement, several novel fascial defects are generated within the abdominal wall due to the use of multiple port sites. This has the potential to lead to the development of future incisional hernias[4]. This recognition has prompted the exploration of alternative techniques and the development of new composite mesh patches reinforced with absorbable support[4-6]. These mesh patches can be inserted intraperitoneally through a single incision in an open procedure. While numerous studies have documented the outcomes of laparoscopic ventral hernia repair[7-10], lingering uncertainty exists regarding the comparative efficacy of laparoscopic versus open intraperitoneal onlay mesh (IPOM) repair for small primary ventral hernias measuring less than 4 cm[11]. Consequently, our study is designed to elucidate the disparities in outcomes between these two surgical techniques.

MATERIALS AND METHODS

This prospective observational study was conducted at NHL Medical College and V. S. Hospital, a tertiary care teaching hospital located in Ahmedabad, Gujarat, India. The study protocol obtained approval from the institute's Ethics Committee.

The study took place at the tertiary care hospital between July 2015 and September 2017, involving 40 patients diagnosed with ventral hernia who met the selection criteria. These patients were offered two options for hernia repair: open hernia repair (preperitoneal meshplasty) for 20 patients and laparoscopic hernia repair (intraperitoneal meshplasty) for the other 20 patients, based on their preference. Patients who were willing to participate and commit to scheduled follow-up visits on the 7th, 30th and 90th days after surgery were enrolled in the study. Analysis of the study focused on patients who completed the 90th-day follow-up.

Inclusion criteria encompassed patients older than 13 years with uncomplicated ventral hernias, patients admitted to our unit and patients agreeing to a 90-day follow-up. Exclusion criteria included patients under 13 years of age, those with associated inguinal hernias, individuals with complicated hernias (such as obstructed or strangulated hernias) and patients who were medically or anesthetically unfit for surgery.

Pre-operative orders required patients to be nil by mouth the night before surgery, provide written and informed consent for anesthesia and surgery, undergo shaving from the nipple to the knee, private parts and back and catheterization for patients undergoing laparoscopic repair. Prophylactic antibiotics were administered to patients half an hour before anesthesia induction on the day of surgery.

Anesthesia protocols varied between the two types of repair. Laparoscopic repair involved general anesthesia with oral intubation using a portex endotracheal tube, with induction using Propofol and maintenance with Isoflurane. Open repair utilized spinal anesthesia with a 23G spinal needle and Lignocaine 2% W/V according to the patient's weight. The operative methods employed either open preperitoneal meshplasty or laparoscopic intraperitoneal meshplasty.

During the post-operative period, patients operated under spinal anesthesia were kept nil by mouth for 6 hrs, with foot-end elevation. They were allowed to take liquids after 6 hrs, followed by a gradual transition to a light diet and then a full diet starting the next day. Patients operated under general anesthesia were kept nil by mouth for 1 day or until bowel sounds returned. The head end of the patient's bed was elevated with oxygen support until full consciousness was regained. Intravenous drips were administered until oral liquids could be introduced and early ambulation was encouraged.

Antibiotic protocols included a single preoperative dose of Inj. Ceftriaxone (1 g) administered half an hour before induction. Postoperatively, a single dose of Inj. Ceftriaxone (1 g) was repeated for open hernioplasty, while IV antibiotics were continued for laparoscopic repair on the day following surgery, followed by oral antibiotics.

Analgesic protocols consisted of IV Analgesic (inj. Dynapar 1 ampoule) on the first postoperative day, followed by oral analgesics (tablet Diclofenac 1 BDS) for 4 to 5 days from the next day onwards.

Patients were discharged once they passed flatus, stool and urine without discomfort and significant pain and were able to consume a full diet orally. They were prescribed oral antibiotics and analgesics as needed and advised to follow up in the outpatient department on the 7th post-operative day.

Dressing protocols involved the first dressing being done on the third postoperative day (after 48 hrs), with stitches typically removed on the 10th day.

The follow-up protocol required patients to return on the 7th, 30th and 90th days postoperatively, or as needed in between. During follow-up visits, examinations for scars, pain and any complications, particularly recurrence, were conducted. All patient data was recorded in a planned proforma and analyzed using Microsoft Excel Office 2013. Early recurrence was defined as the reappearance of swelling within 6 months of hernia surgery.

RESULT AND DISCUSSION

In our prospective study, a total of 40 patients were operated ventral hernia repair. Of these, 20 patients repaired by laparoscopic intraperitoneal meshplasty and 20 for open preperitoneal meshplasty (Table 1).

The data presented in the aforementioned table reveals several key observations. Notably, approximately 65% of patients who underwent ventral hernia repair fell within the age group of 40-60 years. Within both the laparoscopic and open hernia repair cohorts, the majority of patients (65%) were distributed within the 40-60 years age bracket, with a calculated mean age of 49.6 years for the entire patient population under consideration.

The composition of the study group encompassed 16 male and 24 female patients. It is noteworthy that a higher proportion of female patients (60%) sought medical attention for hernia-related complaints in our clinical setting. The male-to-female ratio was calculated to be 2:3, underscoring a slight female preponderance in this cohort.

In terms of hernia type distribution within the study, a breakdown reveals the following: 2 cases (5%) presented with epigastric hernias, 22 cases (55%) were diagnosed with umbilical hernias, 1 case (2%) exhibited a spigelian hernia and 15 cases (38%) manifested incisional hernias.

Furthermore, when scrutinizing the repair techniques employed, it is noteworthy that among the 20 patients who underwent open hernia repair, 18 individuals received Soft Prolene mesh, while the remaining 2 patients were treated with Vypro mesh. On the other hand, among the 20 patients who underwent laparoscopic mesh repair, 15 patients were managed with Soft Prolene mesh, 3 patients received Vypro mesh and 2 patients were repaired using Proceed mesh (Table 2 and 3).

Within the scope of this investigation, out of the 20 patients who underwent open hernia repair, 18 individuals received surgical repair utilizing Soft Prolene mesh, while the remaining 2 patients underwent the same procedure with Vypro mesh as the chosen biomaterial.

Table 1: Distribution of patient according to various parameters

Parameters	Laparoscopic	Open	Total	Percentage
Age				
20-30	1	1	2	5
31-40	2	4	6	15
41-50	6	8	14	35
51-60	7	5	12	30
61-70	4	2	6	15
>70	0	0	0	0
Gender				
Male	9	7	16	40
Female	11	13	24	60
Hernia				
Epigastric	1	1	2	5
Umbilical	13	9	22	55
Lumbar	0	0	0	0
Incisional	6	9	15	38
Spigelian	0	1	1	2

Table 2: Distribution of patients according to Laparoscopic and open

Surgery	No. of patients	Percentage
Laparoscopic	20	50
Open	20	50
Total	40	100

Table 3: Types of mesh used

Mesh type	Laparoscopic	Open	Total
Soft prolene	15	18	33
Vypro	3	2	5
Proceed	2	0	2

Table 4: Postoperative vas in patients of ventral hernia repair

Visual analogue score	Laparoscopic				Open			
	POD1	%	POD3	%	POD1	%	POD3	%
P1 (Mild) (1-3)	12	60	17	85	5	25	17	85
P2 (Moderate) (4-6)	8	40	3	15	13	65	3	15
P3 (Severe) (7-10)	0	0	0	0	2	10	0	0
Total	20	100	20	100	20	100	20	100

Fisher test	Degree of freedom	p-value
AT 24 hrs (POD-1)		
6.073	2	0.048

Similarly, among the 20 patients subjected to laparoscopic mesh repair, 15 of them were subjected to the surgical intervention employing Soft Prolene mesh, while 3 patients had their hernias repaired using Vypro mesh and 2 patients had Proceed mesh employed as the mesh material during the procedure (Table 4).

Pain assessment in this study was conducted using the numeric rating scale of the Visual Analogue Scale (VAS), which assigns values ranging from 0 to 10, representing the spectrum from no pain to maximum pain. The VAS scores were recorded on postoperative day POD 1 and POD 3.

The data presented in the table indicates a calculated p-value of 0.048, signifying statistical significance. This observation suggests that patients who underwent open preperitoneal meshplasty experienced a higher degree of pain severity compared to those who underwent laparoscopic intraperitoneal meshplasty within the first 24 hrs following surgery. However, no statistically significant difference in pain levels was observed on the 3rd postoperative day.

The mean VAS scores at 24 hrs and 72 hrs post-surgery were computed as follows: among patients who underwent laparoscopic surgery, the mean VAS score was 3.7 at 24 hrs and decreased to 1.5 at 72 hrs.

Table 5: Duration of surgery

	Laparoscopic		Open	
Duration (min)	Cases	%	Cases	%
90-120	16	80	15	75
121-150	3	15	4	20
151-180	1	5	1	5
>180	00	00	00	00
TOTAL	20	100	20	100

Table 6: Duration of hospital stay

Duration (days)	LAP.	%	Open	%
1-6	18	90	11	55
7-12	2	10	8	40
12	0	0	1	5
Total	20	100	20	100
Fisher test		Degree of freedom		p-value
6.290		2		0.0431

Table 7: Complications that occurred in our study

Complications	Lap.	Open	Total	%
Respiratory distress	-	-	-	-
Urinary retention	-	-	-	-
Wound seroma	-	2	2	10
Stitch site infection	-	6	6	30
Port site infection	2	-	2	10
Mesh infection	-	-	-	-
Sinus/Fistula	-	-	-	-
Bowel injury	-	-	-	-
Recurrence	-	0	0	0

In contrast, for patients who underwent the open surgical approach, the mean VAS score was 4.75 at 24 hrs and decreased to 2.15 at 72 hrs after surgery (Table 5).

The data presented in the table indicates that 80% of patients who underwent laparoscopic surgery and 75% of those who underwent open surgery had surgical procedures completed in under 120 min. The mean duration of surgery for laparoscopic hernia repair was calculated as 108.5 min, while for open hernia repair, it was computed as 113.5 min. This finding implies that there is no statistically significant disparity in operating time between the two surgical approaches.

These results align with the findings of Gonzalez's study, which investigated both laparoscopic and open hernia repair procedures. In Gonzalez's study, no significant difference in operating time was observed between the laparoscopic and open hernia repair groups (Table 6).

The presented table yields a noteworthy p-value of 0.0431, denoting statistical significance. This finding indicates that the overall duration of hospitalization was notably shorter for patients who underwent laparoscopic repair, with a mean duration of 4.3 days, compared to the longer mean duration of 7.25 days observed in the open repair group. Furthermore, it is pertinent to highlight that within the laparoscopic repair group, 18 out of 20 patients (90%) were discharged within the initial six days of hospitalization, whereas in the open repair cohort, only 11 out of 20 patients (55%) were discharged within the same time frame.

In a relevant context, Chalabi[12] and colleagues, in their analysis, arrived at the conclusion that the length of hospital stay did not exhibit a statistically significant difference between the Laparoscopic and Open groups. Conversely, Castro and associates, in their study comparing Laparoscopy and Laparotomy for ventral hernia repair, determined that the Laparoscopy group experienced a reduced duration of hospitalization in comparison to the Laparotomy group for the correction of ventral hernias (Table 7)[13].

Based on the data presented, it is evident that laparoscopic ventral hernioplasty is associated with fewer complications compared to open hernioplasty. Specifically, a lower incidence of post-operative pain was observed in patients undergoing laparoscopic repair compared to those undergoing open ventral hernia repair. Another complication assessed in ventral hernioplasty was wound seroma, with a higher occurrence noted in the open ventral hernia repair group, affecting 2 out of 20 patients (10%).

In the open surgery group, 6 out of 20 patients (30%) experienced stitch line infections, all of whom were successfully managed with antibiotics and dressings. None of these patients developed mesh infections or required hospitalization for wound infections. There were no instances of respiratory distress or urinary retention after the removal of urinary catheters, which were typically removed on the day following surgery. Furthermore, there were no reported cases of inadvertent bowel injuries or hernia recurrence.

These findings align with AlChahabi and colleagues' analysis, which concluded that the recurrence rate was similar between the laparoscopic and open groups, while wound infection was more prevalent in the open repair group. Additionally, the length of hospital stay did not exhibit statistical differences[12]. In contrast, Castro and associates, in their study comparing Laparoscopy and Laparotomy for ventral hernia repair, determined that laparoscopy reduced the risk of surgical wound infection and seroma formation while also resulting in a shorter duration of hospitalization compared to laparotomy for the correction of ventral hernias. However, laparoscopy was associated with a higher incidence of enterotomy when compared with laparotomy. No significant differences were noted in terms of abscess, hematoma, or hernia recurrence[13].

CONCLUSION

In the early post-operative period, laparoscopic intraperitoneal meshplasty demonstrated significantly lower pain levels compared to open preperitoneal meshplasty. Additionally, the duration of hospital stay was notably shorter in laparoscopic intraperitoneal

meshplasty compared to the open approach. There was no significant difference in operative time between the two methods.

Furthermore, early complications such as wound seroma, pain, wound infection and hematoma were more commonly observed in the open surgical approach compared to the laparoscopic method. Patients undergoing laparoscopic surgery also returned to their routine activities sooner.

In summary, this study indicates that laparoscopic intraperitoneal meshplasty offers advantages such as reduced post-operative pain, shorter hospital stays and earlier return to work when compared to the open approach. However, no other significant differences were observed between the two groups.

REFERENCES

1. LeBlanc, K.A. and W.V. Booth, 1993. Laparoscopic repair of incisional abdominal hernias using expanded polytetrafluoroethylene: Preliminary findings. Surg. Laparosc. Endosc., 3: 39-41.
2. Rives, J., J.C. Pire, J.B. Flament, J.P. Palot and C. Body, 1985. Treatment of large eventrations. new therapeutic indications apropos of 322 cases. Chirurgie, 111: 215-225.
3. Dietz, U.A., S. Menzel, J. Lock and A. Wiegering, 2018. The treatment of incisional hernia. Dtsch. Arztebl. Int., 115: 31-37.
4. Shao, J.M., S.A. Elhage, T. Prasad, P.D. Colavita, V.A. Augenstein and B.T. Heniford, 2020. Outcomes of laparoscopic-assisted, open umbilical hernia repair. Am. Surgeon, 86: 1001-1004.
5. Ponten, J.E.H., W.K.G. Leclercq, T. Lettinga, J. Heemskerk, J.L.M. Konsten, N.D. Bouvy and S.W. Nienhuijs, 2019. Mesh or patch for hernia on epigastric and umbilical sites (morpheus-trial). Ann. Surg., 270: 33-37.
6. Berrevoet, F., C. Doerhoff, F. Muysoms, S. Hopson and M.G. Muzi *et al*., 2019. Open ventral hernia repair with a composite ventral patch - final results of a multicenter prospective study. BMC Surg., Vol. 19, No. 98 .10.1186/s12893-019-0555-z
7. Purushotham, B. and S. Madhu, 2015. Comparative study between laparoscopic and open repair of umbilical and para umbilical hernia. Int. Surg. J., 2: 204-213.
8. Heniford, B.T., A. Park, B.J. Ramshaw and G. Voeller, 2003. Laparoscopic repair of ventral hernias. Ann. Surg., 238: 391-400.
9. Megas, I.F., C. Benzing, A. Winter, J. Raakow, S. Chopra, J. Pratschke and P. Fikatas, 2022. A propensity-score matched analysis of ventral-tapp vs. laparoscopic ipom for small and mid-sized ventral hernias. comparison of perioperative data, surgical outcome and cost-effectiveness. Hernia, 26: 1521-1530.
10. Li, J., Y. Wang and L. Wu, 2022. The comparison of etep and ipom in ventral and incisional hernia repair: A systematic review and meta-analysis. Surg. Laparosc. Endosc. Percutan. Tech., 32: 252-258.
11. Köckerling, F., W. Brunner, F. Mayer, R. Fortelny and D. Adolf *et al*., 2020. Assessment of potential influencing factors on the outcome in small (< 2 cm) umbilical hernia repair: A registry-based multivariable analysis of 31, 965 patients. Hernia, 25: 587-603.
12. Chalabi, H.A., J. Larkin, B. Mehigan and P. McCormick, 2015. A systematic review of laparoscopic versus open abdominal incisional hernia repair, with meta-analysis of randomized controlled trials. Int. J. Surg., 20: 65-74.
13. Zhang, Y., H. Zhou, Y. Chai, C. Cao, K. Jin and Z. Hu, 2014. Laparoscopic versus open incisional and ventral hernia repair: A systematic review and meta-analysis. World J. Surg., 38: 2233-2240.