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A Comparative Prospective Study of Open Method Repair Versus Laparoscopic Intraperitoneal On Lay Mesh (IPOM) Plus Repair For Small-Small-Ventral Hernia

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ABSTRACT

Background: Any hole in the abdominal wall in the midline (vertical center) is considered a small-ventral hernia. There are two types: natural (primary) and learned (secondary). Epigastric hernia, which affects the stomach area, Umbilical hernia, which affects the belly button, and Incisional hernia, which affects the abdominal wall, are the three most common types of small-ventral hernia**. Objective:** To conduct a comparative analysis between laparoscopic e-TEP and IPOM techniques for small-ventral hernia repair. **Methods:**The present investigation was conducted as a prospective observational comparative study. The study's sample size consisted of 30 participants, with 15 instances sourced from e-TEP and the remaining 15 cases sourced from IPOM. The trial duration spanned from December 2020 to December 2022. The study employed a stratified sample strategy, which involved establishing an age eligibility condition for the respondents. The participants who underwent hernia repair treatment were included in this study through a random selection process**. Results:** The e-TEP group had a shorter operative time of 105.32 ± 21.44 days compared to the IPOM group's 73.83 ± 6.35 days. There were no intraoperative problems and no drains were inserted. Patients in the e-TEP group experienced a significant reduction in pain levels at both 12-hour and 24-hour time points, while the IPOM Plus group had a higher cumulative parenteral analgesia demand. The mean hospital stay was 1.11 days, significantly less than the IPOM Plus group's 1.7 days. No surgical site infections, postoperative ileus, or mesh infections were observed. Three patients had asymptomatic postoperative seroma, and conservative management was employed. No readmissions occurred in the IPOM Plus group, but two patients in the e-TEP group were admitted due to recurrence within a 6-month follow-up period. Both patients were treated using the IPOM Plus technique, and adhesiolysis procedures were successfully performed without intestinal injury. **Conclusion:**The e-TEP treatment is a dynamic technique that can be likened to IPOM Plus in relation to factors like as postoperative discomfort, painkiller usage, mesh expenses, and duration of hospitalization.

Key Words: *TEP, Intraperitoneal ,IPOM • Prospective ,Retromuscular , Small-ventral hernia.*

INTRODUCTION

A small-ventral hernia is a type of hernia that can manifest at any point along the midline of the abdominal wall.According to scholarly sources, a hernia can be defined as the protrusion of tissues via a weakened hole in the muscles of the abdominal wall [1]. The classification can be divided into two categories: spontaneous (primary) and acquired (secondary). Additionally, it is important to note that small-ventral hernias can be classified into three main categories. Epigastric hernia, also known as a stomach area hernia, is a condition characterized by the protrusion of abdominal contents through weakened muscles in the region spanning from just below the sternum to the umbilicus or umbilical region. An umbilical hernia, also known as a belly button hernia, manifests in the region of the umbilicus, while an incisional hernia arises at the location of a prior surgical incision. According to the University of California, San

Francisco (UCSF), it has been shown that around one-third of individuals who have undergone abdominal surgery are at risk of developing an incisional hernia at the location of their surgical scar. This complication might manifest at any point following the abdominal surgery. The integrity of the scar tissue diminishes or becomes thinner, resulting in the development of an abdominal protrusion. The observed bulge is the result of tissue or organs exerting pressure on the abdominal wall. This phenomenon is prevalent among individuals of both genders, occurring in proximity to the abdominal wall. Hernias primarily arise as a result of factors such as obesity, the presence of various co-morbid conditions, wound infections, immunosuppression, and prostatism. The user's text does not provide any information to rewrite.

Research has indicated that hernia repair is a prevalent surgical intervention, with an annual global incidence exceeding 20 million cases. The user has provided a numerical range of [4,5].

The utilization of minimally invasive (laparoscopic) techniques in small-ventral hernia surgery has experienced a boom in popularity over the past two decades. However, there remains a contentious debate about the most effective approach for this procedure. The laparoscopic procedure for repairing anterior wall hernias presents significant problems resulting from the direct interaction between intraperitoneal viscera and the implanted mesh. These consequences include small intestinal obstruction caused by adhesions, mesh infection, erosion, and the formation of enterocutaneous fistula [6]. Based on available data, it has been observed that open retromuscular mesh plasty, namely the Rives-Stoppa technique, exhibits certain advantages in comparison to alternative techniques in terms of mitigating mesh-related problems. The user's text does not contain any information to rewrite [7]. In 2012, Jorge Daes provided a description of the enhanced view fully extraperitoneal (e-TEP) repair technique for inguinal hernia. Subsequently, this approach was subsequently implemented for the treatment of small-ventral hernia [8]. The user's text is already academic and does not require any rewriting. The approach, known as endoscopic Rives and Stoppa (eRS) or eTEP, has gained significant popularity among surgeons specializing in minimal access procedures in contemporary times. Thus far, the outcomes have shown promise; however, there is a dearth of conclusive research in this area. This study aims to compare the short-term outcomes of the e-TEP and IPOM Plus procedures for small-ventral hernia repair, with the objective of shedding light on the advantages, shortcomings, and feasibility of the e-TEP technique.

OBJECTIVE

The objective of this study was to conduct a comparative analysis between laparoscopic e-TEP and IPOM techniques for small-ventral hernia repair.

METHODS AND MATERIALS

The present investigation was conducted as a prospective observational comparative study. The study's sample size consisted of 30 participants, with 15 instances sourced from e-TEP and the remaining 15 cases sourced from IPOM. The trial duration spanned from December 2020 to December 2022. The study employed a stratified sample strategy, which involved establishing an age eligibility condition for the respondents. The participants who underwent hernia repair treatment were included in this study through a random selection process.

Inclusion Criteria:

- Adult patient
- Primary small-ventral or incisional hernia defects
- Midline defect with an expected hernia width equal to or less than 7 centimeters
- Elective hernia repair
- Considered eligible for hernia repair through a minimally-invasive approach
- Able to tolerate general anesthesia
- Able to give consent for participation

Exclusion Criteria:

- Defects greater than 7 centimeters,
- Hernia defects considered to require an open approach
- Prior mesh placement in the retro rectus space
- Patients not able to understand and sign a written consent form

Data Collection and Analysis:

After fulfilling the inclusion criteria of the study, written informed consent were taken about their willingness to participate in study and also, they were informed regarding method by which they would be operated upon. Then the data was collected regarding the clinical history, examination, diagnosis, investigations, detail of previous operative procedure from the proper authority. The data underwent statistical analysis using established procedures. The data recording and analysis in this study were conducted using SPSS version 23 for Windows software, developed by SPSS Inc, based in

Chicago, IL, USA. As this study employed a descriptive research design, the analysis involved the determination of percentages and frequencies.

RESULTS

Table 1 presents the demographic characteristics of the participants. In the age range of 20-29, 3 individuals (20%) participated in e-TEP, while 2 individuals (13.33%) participated in IPOM. This was followed by 4 individuals (26.67%) and 5 individuals (33.33%) in the age group of 30-39. The highest involvement in both techniques was observed in the age group of 40-49, with 5 individuals (33.33%) and 7 individuals (46.67%) respectively. Lastly, 3 individuals (20%) and 1 individual (6.67%) were over the age of 49. Within the cohort of participants, it was observed that 9 individuals, constituting 60% of the total, received e-TEP treatment. In contrast, 11 participants, accounting for 73.33% of the sample, underwent IPOM treatment. The remaining individuals were female, with 6 individuals (40% of the total) receiving e-TEP treatment and 4 individuals (26.67% of the sample) undergoing IPOM treatment. The average age, represented as Mean ± SD, was 43.25 ± 7.38 for the e-TEP group and 44.72 ± 7.65 for the IPOM group. The mean ± standard deviation (SD) of the body mass index (BMI) was 25.3 ± 3.9 for the enhanced open methodtechnique and 27.3 ± 2 for the intraperitoneal onlay mesh (IPOM) technique**.**

Table 1: Baseline Characteristics of the Patients

Demographic Characteristic		e-TEP(n=15)		IPOM(n=15)	
		Frequency	Percentage	Frequency	Percentage
Age	20-29	3	20.00%	2	13.33%
	30-39	4	26.67%	5	33.33%
	40-49	5	33.33%	7	46.67%
	> 49	3	20.00%	1	6.67%
(mean ± SD)		43.25±7.38		44.72±7.65	
Gender	Male	9	60,00%	11	73.33%
	Female	6	40.00%	4	26.67%
Mean BMI (kg/m^2)		29.70± 5.15		31.52 ± 4.32	

Table 2 presents the clinical history of the participants. The study revealed the existence of co-morbidities in both the enhanced-view open methodand intraperitoneal onlay mesh (IPOM) techniques. The prevalence of high blood pressure was observed in 40% of cases in the e-TEP group and 40% of cases in the IPOM group. Additionally, stroke occurred in 22.22% of cases in the IPOM group and 25% of cases in the e-TEP group. Hypothyroidism was present in 6.67% of cases in the IPOM group, while diabetes was found in 26.67% of cases in the IPOM group and 46.67% of cases in the e-TEP group. The hernia was found to be located on the right side in 6 cases, accounting for 40% of the total, and in 4 cases, accounting for 46.67% of the total. On the left side, the hernia was seen in 9 cases, representing 60% of the total, and in 11 cases, accounting for 73.33% of the total. Upon evaluating the disease status, it was observed that small-ventral hernia was present in 4 cases, accounting for 26.67% of the total, while 3 cases, representing 20%, exhibited this condition. Umbilical hernia was identified in 5 cases, constituting 33.33% of the total, and an equal number of cases also displayed this type of hernia, accounting for 33.33%. Epigastric hernia was observed in 6 cases, representing 46% of the total, and 7 cases, corresponding to 46.67%, were discovered to have this condition. The mean and standard deviation (SD) of the defect size of lesion are 3.89 ± 0.85 and 4 ± 0.76, respectively.

Table 2: Clinical History of the Patients

Clinical History		e-TEP(n=15)		IPOM(n=15)	
		Frequency	Percentage	Frequency	Percentage
Co morbidities	High blood pressure	6	40%	4	26.67%
	Hypothyroidism	0	0	1	6.67%
	Diabetes	4	26.67%	7	46.67%
Location of Hernia	Right	6	40.00%	4	26.67%
	Left	9	60.00%	11	73.33%
Condition of disease	Small-ventral hernia	4	26.67%	3	20.00%
	Umbilical hernia	5	33.33%	5	33.33%
	Epigastric hernia	6	40.00%	7	46.67%
Mean defect size (width in cm)		3.89 ± 0.85		4 ± 0.76	

The average operative time in the e-TEP group was 105.32 ± 21.44, while in the IPOM group it was 73.83 ± 6.35. There were no instances of intraoperative problems observed among the patients, and the decision was made not to insert a drain in any of the patients. The patients belonging to the e-TEP group exhibited a statistically significant reduction in pain levels at both the 12-hour and 24-hour time points following the operation, in comparison to the IPOM Plus group. The patients in the IPOM Plus group exhibited a significantly higher cumulative parenteral analgesia demand in the postoperative period. Table 3 displays the comprehensive pain score and the corresponding analgesic need following the surgery.In e-TEP group, mean length of hospital stay post surgerywas 1.11 days as compared to 1.7 days post IPOM Pluswhich was significantly less.

Table 3: Perioperative Details

Variables	e-TEP(n=15)	IPOM(n=15)	P-Value
Mean operative time (min)	**105.32 ± 21.44**	**73.83 ± 6.35**	**S**
Blood loss over 50 ml (N)	**0**	**0**	**NS**
Mean VAS Score at 12 h after surgery 24 h after surgery	 **4.38 ± 0.58** **2.60 ± 0.62**	 **7.55 ± 0.73** **5.84 ± 0.88**	**S**
POD 7	**0.20 ± 0.49**	**1.61 ± 0.62**	**S**
Mean postoperative parenteral analgesia required (equivalent to morphine in mg)	**12.26 ± 2.49**	**31.43 ± 5.62**	**S**
Mean LOS after surgery (days)	**1.11 ± 0.29**	**1.70 ± 0.64**	**S**

There were no instances of surgical site infections, postoperative ileus, or mesh infection observed among any of the patients. Three patients within the e-TEP group had the occurrence of asymptomatic postoperative seroma, and in all cases, a conservative management approach was employed. Table 4 provides a comprehensive overview of the postoperative problems. No readmissions occurred in the IPOM Plus group, however two patients in the e-TEP group were admitted due to recurrence within a 6-month follow-up period. Both of these patients were subsequently treated using the IPOM Plus technique. In both instances, the recurrence was attributed to the dehiscence of the posterior rectus sheath. In both instances, adhesiolysis procedures were performed successfully without any occurrence of intestinal injury.

Table 4: Postoperative complications

Demographic Characteristic	e-TEP(n=15)		IPOM(n=15)	
	Frequency	Percentage	Frequency	Percentage
SSI	**0**	**0**	**0**	**0**
Seroma	**3**	**20.00%**	**0**	**0**
Hematoma	**0**	**0**	**0**	**0**
Postoperative ileus	**0**	**0**	**1**	**6.67%**
UTI	**0**	**0**	**0**	**0**
Bowel or Viscera injury	**0**	**0**	**0**	**0**
Vascular complication	**0**	**0**	**0**	**0**
Mesh infection	**0**	**0**	**0**	**0**
Chronic abdominal pain	**1**	**6.67%**	**1**	**6.67%**
Readmission	**2**	**13.33%**	**0**	**0**
Recurrence	**2**	**13.33%**	**4**	**26.67%**

DISCUSSION

Surgeons have consistently faced difficulties when performing repairs on primary and incisional small-ventral hernias. In the contemporary period, there exists a wide array of alternatives for the treatment of small-ventral hernias, ranging from traditional open surgeries to less invasive treatments [9]. This extensive range of approaches presents a challenge in the decision-making process for managing small-ventral hernias. Surgeons continue to actively seek an optimal or universally accepted approach that effectively reduces postoperative complications and enhances quality of life. Based on the most recent evidence, it has been observed that laparoscopic techniques offer several advantages over open techniques, including a reduced length of hospital stay post-surgery, an earlier return to work, and a lower incidence of surgical wound problems [10]. Over the past decade, there has been considerable advancement in the field of less invasive treatments for small-ventral hernia repair, namely in techniques and mesh locations, ranging from IPOM to e-TEP [11]. The e-TEP technique provides the advantage of a minimally invasive operation combined with the use of mesh in the sublay/retrorectus location, hence preventing difficulties associated with intra-abdominal mesh placement [12]. An additional benefit of utilizing e-TEP in the context of large small-ventral hernias is the potential to combine it with the posterior component separation procedure known as transversus abdominis release, particularly in cases where closure of

the hernia is challenging or not feasible. This combination is facilitated by the shared plane of dissection [13]. Based on the existing evidence, it is widely accepted that the utilization of mesh in the sublay position yields enhanced postoperative connective tissue formation, reduced recurrence rates, and lower costs in comparison to the usage of composite mesh with an anti-adhesion barrier in the intraperitoneal position [14].

In the age range of 20-29, 3 individuals (20%) participated in e-TEP, while 2 individuals (13.33%) participated in IPOM. This was followed by 4 individuals (26.67%) and 5 individuals (33.33%) in the age group of 30-39. The highest involvement in both techniques was observed in the age group of 40-49, with 5 individuals (33.33%) and 7 individuals (46.67%) respectively. Lastly, 3 individuals (20%) and 1 individual (6.67%) were over the age of 49. Within the cohort of participants, it was observed that 9 individuals, constituting 60% of the total, received e-TEP treatment. In contrast, 11 participants, accounting for 73.33% of the sample, underwent IPOM treatment. The remaining individuals were female, with 6 individuals (40% of the total) receiving e-TEP treatment and 4 individuals (26.67% of the sample) undergoing IPOM treatment. The average age, represented as Mean ± SD, was 43.25 ± 7.38 for the e-TEP group and 44.72 ± 7.65 for the IPOM group. The mean ± standard deviation (SD) of the body mass index (BMI) was 25.3 ± 3.9 for the enhanced open methodtechnique and 27.3 ± 2 for the intraperitoneal onlay mesh (IPOM) technique**.**Dr. Jignesh Joshi and Dr. Firdaus Dekhaiya conducted a study in which they examined a total of 60 instances. Specifically, they studied 30 patients that underwent the e-TEP therapy technique and 30 cases that underwent the IPOM treatment approach [15].

The prevalence of high blood pressure was observed in 40% of cases in the e-TEP group and 40% of cases in the IPOM group. Additionally, stroke occurred in 22.22% of cases in the IPOM group and 25% of cases in the e-TEP group. Hypothyroidism was present in 6.67% of cases in the IPOM group, while diabetes was found in 26.67% of cases in the IPOM group and 46.67% of cases in the e-TEP group. The hernia was found to be located on the right side in 6 cases, accounting for 40% of the total, and in 4 cases, accounting for 46.67% of the total. On the left side, the hernia was seen in 9 cases, representing 60% of the total, and in 11 cases, accounting for 73.33% of the total. Upon evaluating the disease status, it was observed that small-ventral hernia was present in 4 cases, accounting for 26.67% of the total, while 3 cases, representing 20%, exhibited this condition. Umbilical hernia was identified in 5 cases, constituting 33.33% of the total, and an equal number of cases also displayed this type of hernia, accounting for 33.33%. Epigastric hernia was observed in 6 cases, representing 46% of the total, and 7 cases, corresponding to 46.67%, were discovered to have this condition. The mean and standard deviation (SD) of the defect size of lesion are 3.89 ± 0.85 and 4 ± 0.76, respectivelywhich is similar with the study of D. Penchev, G. Kotashev and V. Mutafchiyski[16].

In our study there were no instances of surgical site infections, postoperative ileus, or mesh infection observed among any of the patients. Three patients within the e-TEP group had the occurrence of asymptomatic postoperative seroma, and in all cases, a conservative management approach was employed. Table 4 provides a comprehensive overview of the postoperative problems. No readmissions occurred in the IPOM Plus group, however two patients in the e-TEP group were admitted due to recurrence within a 6-month follow-up period. Both of these patients were subsequently treated using the IPOM Plus technique. In both instances, the recurrence was attributed to the dehiscence of the posterior rectus sheath. In both instances, adhesiolysis procedures were performed successfully without any occurrence of intestinal injury.Belyansky et al. reported 79 cases under e-TEP and only three postoperative complications—two of them seroma and one dehiscence at port site without SSI. The recurrence rate in this study is 1.3% [17].

CONCLUSION

The e-TEP treatment is a dynamic technique that can be likened to IPOM Plus in relation to factors like as postoperative discomfort, painkiller usage, mesh expenses, and duration of hospitalization.To corroborate our findings and prove the potential benefit of the surgery, however, further randomized control and multicenter studies with extended follow-up are required.

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