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Original Research Article

A prospective study comparing intra-operative and postoperative complications in totally extra peritoneal repair vs extended totally extra peritoneal for inguinal hernia

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ABSTRACT

Introduction: Inguinal hernia repair is one of the most common surgical procedures worldwide. Total extra peritoneal repair (TEP) and Extended-TEP (eTEP) are widely used minimally invasive methods. TEP involves creating a space in the preperitoneal plane without entering the abdominal cavity, whereas eTEP extends this approach, allowing for a broader operative field.This study compares the intra-operative and postoperative complications of TEP and eTEP, contributing to the optimisation of inguinal hernia management.
Methods: It is a prospective study. A total of 60 patients who underwent TEP and e-TEP for inguinal hernia, who fulfilled the inclusion criteria. Patients were randomised by simple random sampling technique and were divided into two groups of 30 each (group A-TEP and group B-eTEP). Data of both groups were compared and analysed for statistical significance using Chi square test and Student 't' test**.**
Result: The comparative analysis between TEP and eTEP procedures shows no significant differences in demographic parameters. However, eTEP demonstrates significantly shorter operative time and hospital stay, quicker return to work. Both procedures have similar rates of low intra-operative and postoperative complications, indicating comparable safety profiles.
Conclusion: Our study suggest that both techniques are associated with low complication rates and good patient outcomes, with eTEP showing potential advantages in terms of pain, recovery and wider access. These findings help to take better surgical decision, to make and helped optimize patient care in inguinal hernia management.

Keywords: Inguinal, Hernia, Technique, TEP, eTEP, Management

INTRODUCTION

A hernia is the abnormal protrusion of an organ or tissue through a defect in its surrounding wall, commonly occurring in the abdominal wall, particularly the inguinal region.[1] Approximately 75% of all hernias are groin hernias, with 95% being inguinal and the rest femoral. Inguinal hernias are more common in men and can be either indirect or direct. The primary goals of hernia repair are successful repair, minimal recurrence, fewer intra and postoperative complications, and a quick return to normal activities. Laparoscopic approaches to inguinal hernia repair, first introduced in 1991, with the intra-peritoneal onlay mesh (IPOM) technique that was developed by Toy and Smoot.[2] It has evolved significantly. The main techniques used today includes transabdominal Preperitoneal (TAPP), total xtraperitoneal (TEP), intraperitoneal onlay mesh (IPOM), Extended

view total extraperitoneal (eTEP), stoppa's technique.[3] Each technique has unique applications and challenges and requires specialized expertise.[4,5]

TEP repair

In TEP repair, a working space is created between the peritoneum and the abdominal wall through small incisions. This space is inflated with carbon dioxide gas for adequate mesh placement and hernia repair. TEP repair offers advantages such as reduced postoperative pain, quicker recovery times, and lower risk of intra-abdominal complications compared to open repair techniques.

eTEP repair

The eTEP repair is a modification of the traditional TEP technique designed to address larger and more complex hernias.[6] It involves additional lateral dissection to create a broader working space, allowing for better visualization and coverage of the hernia defect with mesh. This reduces the risk of recurrence and improves outcomes. eTEP repair has shown promising results in terms of reduced postoperative pain, shorter recovery times, and improved cosmesis, especially in patients with large or recurrent hernias.[7] Both TEP and eTEP repairs offer the benefits of minimally invasive surgery, with reduced postoperative pain and quicker recovery times. The choice between these techniques depends on factors such as hernia size and complexity, with eTEP being a valuable option for larger or recurrent hernias.[8]

METHODS

This prospective comparative study was conducted at Department of General Surgery in Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan. Sample size of this study was total 60, with 30 cases each treatment group (Group A-Patients undergoing TEP and Group B-Patients undergoing eTEP). This present study was approved by our institutional ethical committee.

Inclusion criteria

Patients aged 18-65 years of either gender with a primary inguinal hernia. Patient giving consent for laparoscopic hernia repair.

Exclusion criteria

Patients with recurrent hernias, severe comorbidities, or previous abdominal surgeries. Incarcerated, irreducible or strangulated hernia or any evidence of vascular compromise on imaging.

All consecutive patients 18 to 65 years of age of either gender attending in General Surgery OPD of Mahatma Gandhi Medical College and Hospital with a suspected inguinal hernia with detailed medical history documented, undergo a thorough physical examination and an initial ultrasound. After confirming the hernia to be of inguinal origin, and obtaining an informed consent from the patient, further investigations, including routine blood parameters viz. complete blood counts, renal and hepatic function tests, coagulation profile were evaluated and documented. Patient with medical co-morbidities like diabetes, hypertension, underlying malignancy etc., were evaluated and if declared fit for surgery by the concerned specialist physicians will be included for the laparoscopic hernia repair. After pre-anaesthetic check-up, and preparing patient for Operation, patient were operated under general anaesthesia. Strict intra-op monitoring of the patients was done. Hernia repair was done laparoscopically either e-TEP or TEP.

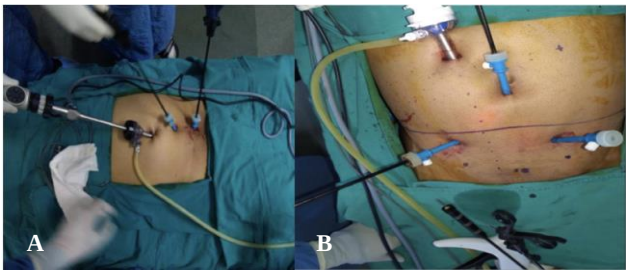

Figure 1: Port placement (A) TEP port placement (B) eTEP port placement.

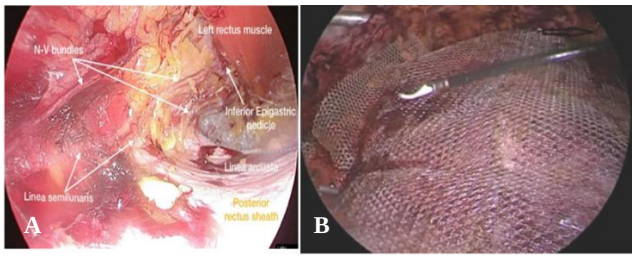

Figure 2: Creation of (A) retrorectus space and (B) placement of mesh.

RESULT

In this study, total 60 patients who underwent by TEP and extended TEP procedures performed at a single centre. The age distribution between the TEP and eTEP groups reveals a similar pattern. Maximum patients in both groups lies in between 31 to 40 years and majority of participants in both groups are male. There is no significant difference in BMI between the two groups. Therefore, the mean BMI is similar between the TEP and eTEP groups. This table presents the distribution of various comorbidities among participants in the TEP and eTEP groups, each comprising 30 individuals. The data show that in the TEP group, the most common comorbidities were diabetes mellitus (13.3%) and Hypertension (10.0%). Other comorbidities included COPD (3.3%), COPD with diabetes mellitus (3.3%), and COPD with hypertension (6.7%). In contrast, the eTEP group had a higher occurrence of COPD (13.3%), while

diabetes mellitus (3.3%) and hypertension (10.0%) had similar incidences to the TEP group. Additionally, COPD with diabetes mellitus (3.3%) and COPD with hypertension (3.3%) were observed. Notably, the majority of participants in both groups had no comorbidities, with 63.3% in the TEP group and 66.7% in the eTEP group. There is no significant difference in comorbidity distribution between the two groups, suggesting that both procedures are comparable in terms of the presence of pre-existing health conditions among participants. Laterality, indicating whether the condition is bilateral or unilateral shows similar distribution in both groups. In the TEP group, 20.0% of cases are bilateral and 80.0% are unilateral, whereas in the eTEP group, 16.7% are bilateral and 83.3% are unilateral. Consequently, laterality distribution is not significantly different between the TEP and eTEP groups.

The side of hernia distribution reveals that 16.7% of the TEP group and 23.3% of the eTEP group have left-sided hernia, while 63.3% of the TEP group and 60.0% of the eTEP group have right-sided hernia and 20% of the TEP group and 16.7% of the eTEP group have bilateral side hernia. Thus, the side of hernia distribution is similar between the TEP and eTEP groups. The distribution of direct and indirect hernia shows that 30.0% of the TEP group and 20.0% of the eTEP group have direct hernia, while 70.0% of the TEP group and 80.0% of the eTEP group have indirect hernia. Therefore, the distribution of direct and indirect hernia is not significantly different between the TEP and eTEP groups. The mean defect size is significantly different between the TEP and eTEP groups, with mean values of 5.070±1.1806 cm and 7.737±2.5668 cm respectively. The p value of 0.001 indicates a statistically significant difference, suggesting that the defect size is larger in the eTEP group compared to the TEP group. Thus, the defect size is significantly larger in the eTEP group.

Table 1: Age group and gender wise distribution among both the groups.

Age (in years)	TEP				eTEP			
	No.	%	Gender		No.	%	Gender	
			Male	Female			Male	Female
≤ 20	1	3.33	1	0	2	6.67	2	0
21-30	3	10.00	2	1	2	6.67	2	0
31-40	13	43.33	12	1	17	56.67	16	1
41-50	11	36.67	9	2	7	23.33	6	1
>50	2	6.67	2	0	2	6.67	2	0
Total	30	100.0	26	4	30	100.0	28	2

Table 2: Comorbidity distribution among both the groups.

Comorbidity	TEP		eTEP	
	No.	%	No.	%
COPD	1	3.3	4	13.3
Diabetes mellitus	4	13.3	1	3.3
Hypertension	3	10.0	3	10.0
COPD with Diabetes mellitus	1	3.3	1	3.3
COPD with hypertension	2	6.7	1	3.3
No comorbidity	19	63.3	20	66.7
Total	30	100.0	30	100.0

Table 3: Laterality and side of hernia distribution among both the groups.

TEP				eTEP			
Laterality	**No.**			**Laterality**	**No.**		
Bilateral	6			Bilateral	5		
Unilateral	24	Left	5	Unilateral	25	Left	7
		Right	19			Right	18
Total	30			Total	30		

Table 4: Type of hernia among both the groups.

Type of hernia	TEP		eTEP	
	No.	%	No.	%
Direct	9	30.0	6	20.0
Indirect	21	70.0	24	80.0
Total	30	100.0	30	100.0

Table 5: Mean defect size (cm) and swelling among both the groups.

Group	N	Mean defect size	Std. deviation	P value	Mean size of swelling	Std. deviation	P value
TEP	30	5.070	1.1806	0.001 (S)	10.720	2.2791	0.001 (S)
eTEP	30	7.737	2.5668		4.7237	4.7237	

Table 6: Mean Operative time (min) among both the groups.

Group	N	Mean	Std. deviation	P value
TEP	30	164.467	11.8022	0.001 (S)
eTEP	30	132.500	16.8252	

Table 7: Mean Hospital Stay (days) among both the groups.

Group	N	Mean	Std. Deviation	P value
TEP	30	3.033	1.4499	0.005 (S)
eTEP	30	2.133	0.8604	

Table 8: Mean Duration to return back to work after surgery (days) among both the groups.

Group	N	Mean	Std. deviation	P value
TEP	30	10.567	2.7125	0.009 (S)
eTEP	30	8.000	1.7019	

Table 9: Mean VAS score at different time intervals among both the groups.

Postoperative period	Group	N	Mean	Std deviation	P value
12 hours postop	TEP	30	5.133	1.1666	0.000 (S)
	eTEP	30	2.200	0.7611	
1 month postop	TEP	30	1.000	0.9469	0.570 (NS)
	eTEP	30	0.867	0.8604	
3 months postop	TEP	30	0.300	0.4661	0.292 (NS)
	eTEP	30	0.433	0.5040	

Table 10: Postoperative Complications among both the groups.

Postoperative complications	TEP		eTEP		P value
	No.	%	No.	%	
Surgical Site Infection	1	3.3	2	6.7	0.554 (NS)
Edema	1	3.3	0	0.0	0.313 (NS)
Hematoma	1	3.3	0	0.0	0.313 (NS)
Urinary retention	4	13.3	1	3.3	0.161 (NS)
Recurrence	0	0.0	0	0.0	-
Parasthesia	2	6.7	2	6.7	1.000 (NS)

The size of swelling is significantly larger in the eTEP group (22.120±4.7237 cm) compared to the TEP group (10.720±2.2791 cm). The p value of 0.001 indicates this difference is statistically significant. Therefore, the eTEP group exhibits a significantly larger size of swelling compared to the TEP group.The mean operative time is

significantly shorter in the eTEP group (132.500±16.8252 minutes) compared to the TEP group (164.467±11.8022 minutes), with a p value of 0.001. This indicates that the eTEP procedure takes significantly less time than the TEP procedure.

The findings reveal that there were no cases of cord injury reported in either group. Female patients doest not have cord so, incidence of cord injury in that group is mentioned as 0. Specifically, 0% of participants in both the TEP and eTEP groups experienced cord injuries. Thereby suggesting that both procedures have an equal risk profile concerning cord injury. Vascular injuries occurred in 2 cases of the TEP group and 1 case of the eTEP group. Thus, the incidence of vascular injuries is similar between the TEP and eTEP groups. Blood loss over 50 ml occurred in 1 case of the TEP group and not a single case of the eTEP group. No significant difference in blood loss between the groups. Therefore, the incidence of significant blood loss is not significantly different between the TEP and eTEP groups. The mean hospital stay is significantly shorter for the eTEP group (2.133±0.8604 days) compared to the TEP group (3.033±1.4499 days), with a p value of 0.005.

This indicates that the eTEP group has a significantly shorter hospital stay. Thus, patients in the eTEP group tend to have shorter hospital stays compared to those in the TEP group. The duration to return to work after surgery is significantly shorter in the eTEP group (8.000±1.7019 days) compared to the TEP group (10.567±2.7125 days). This suggests that patients in the eTEP group return to work sooner than those in the TEP group. Thus, the eTEP group has a significantly shorter duration to return to work. The VAS scores at 12 hours post-op show a significant difference, with the TEP group having a mean score of 5.133±1.1666 and the eTEP group having a mean score of 2.200±0.7611 (p=0.000), indicating significantly less pain in the eTEP group. However, at month and 3 months post-op, the VAS scores show no significant difference (p=0.570 and p=0.292, respectively). Therefore, the eTEP group experiences significantly less pain at 12 hours post-op compared to the TEP group, but there is no significant difference in pain levels at 1- and 3-months post-op. Postoperative complications such as surgical site infection, edema, hematoma, urinary retention, and paresthesia show no significant differences between the TEP and eTEP groups, with p values all being non-significant (NS). Additionally, there were no recurrences reported in either group. Thus, the incidence of postoperative complications is similar between the TEP and eTEP groups.

DISCUSSION

Hernia repair remains a critical area of surgical practice, with ongoing advancements aimed at optimizing patient outcomes.2 Among the various techniques available, Totally Extraperitoneal (TEP) and Extended-view Totally Extraperitoneal (eTEP) are two prominent laparoscopic methods used for inguinal hernia repair. This study aims to compare the outcomes and applicability of these techniques across several patient demographics and clinical factors, such as age distribution, gender distribution, BMI, laterality, side of hernia, type of hernia, defect size, swelling size, operative time, injury to cord, vascular injury incidence, blood loss, and hospital stay. Understanding the nuances between TEP and eTEP is essential for surgeons to make informed decisions tailored to individual patient needs. By examining recent studies and comparing their findings, this discussion highlights the strengths and limitations of each technique. The goal is to provide a comprehensive analysis that can guide clinical practice, ensuring the most effective and safe approach is chosen for hernia repair.

Age and gender distribution

The age and gender distributions between the TEP and eTEP groups were similar, with the majority of participants in the 31-50 age range and predominantly male. These findings are consistent with studies by Belyansky et al and Prakhar et al, indicating that both techniques are suitable for a wide age range of patients and are equally applicable to male patients, who constitute the majority of hernia cases.[10]

Body mass index (BMI)

The mean BMI was similar between the TEP and eTEP groups, indicating that BMI does not significantly impact the choice between these procedures. This is corroborated by Belyansky et al, Taşdelen et al, who reported the versatility of the eTEP technique in managing patients with higher BMI values. This adaptability is crucial in managing obese patients, who are at higher risk for hernias.[8,9]

Laterality and side of hernia

The distribution of unilateral and bilateral hernias, as well as the side of the hernia (left or right), showed no significant differences between the TEP and eTEP groups. This suggests that both techniques are equally effective for treating unilateral and bilateral hernias, regardless of the anatomical side affected. These findings are consistent with studies by McCormack et al and Miserez et al.[11,12]

Type of hernia and defect size

There was no significant difference in the distribution of direct and indirect hernias between the TEP and eTEP groups. However, the mean defect size was significantly larger in the eTEP group, suggesting that eTEP may be more suitable for larger hernias due to its ability to accommodate larger defect sizes. This is supported by Belyansky et al and Prakhar et al.[9,10]

Operative time, injury incidence, and blood loss

The operative time was significantly shorter for the eTEP group, indicating greater efficiency in surgical procedures. Operative, time was even shorter in direct hernia as compare to indirect hernia for both the procedures. There was no incidence of injury to cord structures in either group, and the incidence of vascular injuries was low and not significantly different. Blood loss over 50 ml was also comparable between the groups. These findings are consistent with studies by Lomanto et al and Bracale et al indicating that both TEP and eTEP have comparable safety profiles.[13,14]

Hospital stays and recovery

The mean hospital stay was significantly shorter for the eTEP group, suggesting that eTEP can improve patient throughput and reduce healthcare costs. Additionally, the duration to return to work after surgery was significantly shorter in the eTEP group, supported by Belyansky and Sudarshan et al.[9,15]

Pain and postoperative complications

Pain levels at 12 hours post-op were significantly lower in the eTEP group, although long-term pain outcomes were similar between the two groups. Postoperative complications such as infection, edema, hematoma, urinary retention, and paresthesia showed no significant differences between the TEP and eTEP groups. No recurrences were reported in either group, consistent with findings by Lomanto et al, Bracale et al.[13,14]

CONCLUSION

The comparative analysis between TEP and eTEP procedures reveals notable findings. While demographic parameters such as age, gender, BMI, laterality, and side of hernia show no significant differences, clinical differences are evident. The eTEP procedure offers several advantages over TEP, including a significantly shorter operative time, shorter hospital stay, and quicker return to work. Patients in the eTEP group also experience significantly less pain at 12 hours post-op. However, the eTEP group presents with larger defect sizes and swelling compared to the TEP group. Both procedures have similar rates of vascular injury, blood loss, and postoperative complications, indicating comparable safety profiles. In terms of recovery and pain management, the eTEP procedure offers significant benefits, making it a potentially preferable option in clinical practice. Both TEP and eTEP are effective and safe techniques for inguinal hernia repair. eTEP shows advantages in terms of handling larger hernias, shorter operative times, and faster recovery. However, the choice between TEP and eTEP should be based on specific patient factors and surgical expertise to ensure the best outcomes.

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