

Comparative Study of Extended Totally Extraperitoneal Repair (ETEP) Vs Totally Extraperitoneal Repair (TEP) In Uncomplicated Bilateral Inguinal Hernia

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Received: 01-02-2025 / Revised: 15-03-2025 / Accepted: 21-04-2025

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Conflict of interest: Nil

Abstract

Background and Aim: Extended totally extraperitoneal repair (eTEP) is a new technique that was first introduced by Jorge Daes in 2012 to address difficult inguinal hernias. The principle is to create a larger space than what is done in TEP specially to tackle large groin hernias. However, there is still a paucity of well conducted, peer reviewed comparative studies regarding the advantages, if any, of eTEP. This study is to compare the efficacy of extended total extra peritoneal (e-TEP) and total extra peritoneal (TEP) repair in the treatment of inguinal hernia.

Methods: This is a prospective randomised study of total 40 patients having bilateral inguinal hernia in which 20 patients underwent eTEP repair (group A) while 20 patients underwent TEP repair (group B) who presented to Surgery Department Civil Hospital Ahmedabad between March 2023 to June 2024. Permission of ethics committee was taken.

Results: On comparing both groups mean operating time for eTEP was significantly less than that of TEP group. Conversion rates to open surgery were higher in TEP group. Post-operative seroma formation was higher in eTEP group as compared to TEP group. There was less incidence of pneumoperitoneum in eTEP group due to peritoneal breach. We had one recurrence in TEP group. Surgeon satisfaction score was better for eTEP group.

Conclusion: We don't conclude that eTEP is better than TEP however eTEP has the slight advantage of a large working space and hence proper placement of mesh and better surgeon satisfaction for ease of doing surgery.

Keywords: Bilateral Inguinal Hernia, TEP, e TEP.

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Introduction

Inguinal hernia repair has always been the one of most commonly performed surgeries with numerous innovations over time. The innovators of transabdominal preperitoneal repair (TAPP) were Arregui and colleagues in 1991 [1] and of totally extraperitoneal repair (TEP) were McKernan and Laws [2] 1993.

Innovating from TEP for groin hernia, Jorge Dias, in 2012 popularized the 'Enhanced' or 'Extended' view (eTEP) which offered a more flexible port placement along with a wide space for better handling of the tissues. [3,4] Though eTEP too has an associated learning curve, it is easier to learn and is being adopted increasingly. However, there are no strong recommendations for the management of inguinal hernias by eTEP because of lack of comparative data with TEP. This study aims to compare eTEP and TEP in bilateral hernia in terms of operative time, intraoperative and post-

operative complications and surgeon satisfaction for ease of doing the surgery.

Methodology

Forty patients with bilateral inguinal hernia were randomly assigned of which 20 underwent eTEP (group A) and rest 20 TEP (group B).

Inclusion Criteria

- Age of patient more than 18 years
- Bilateral inguinal hernia
- Consent to participate in study.

Exclusions Included:

- Unilateral hernia
- Congenital hernia
- Complicated hernias (obstructed and strangulated)
- Recurrent hernias

- Patients with infraumbilical laparotomy scars
- Patients with decompensated cardiac or airway diseases, or American Society of Anaesthesiologists (ASA) Classification grade 3 or 4.

All patients were operated under general anaesthesia by the same surgeon and his surgical team. The collected data was compared using the student unpaired t-test and two tailed P-value. A p value of < 0.05 was considered as significant.

Data was collected to compare and contrast eTEP repair with TEP repairs for inguinal hernias. The end points of study were:

1. Operative time
2. Complications
3. Conversion rates to Open method
4. Operative ease in terms of the surgeon's satisfaction score
5. Postoperative pain in terms of the Visual Analogue Scale (VAS)
6. Duration of stay in hospital
7. Duration required to get back to normal activities
8. Recurrence rates with follow-up over 1 year

A proforma was made, which included detailed history, physical examination, basic investigations, and other relevant investigations required. All patients were diagnosed, treated, and followed up in the same hospital. In case of need for conversion patient underwent open hernioplasty as expertise for TAPP of operating surgeon was not there.

Following hospital protocols were followed in all the patients of e-TEP and TEP.

All patients were given general anaesthesia, catheterized and given prophylactic antibiotics preoperatively just before induction.

Technical details of both operative methods included:

Extended Total extra peritoneal repair methodology:

Approx. 12mm skin incision kept 4 cm above the umbilicus on the left side at the level of the midclavicular line.

10 mm trocar introduced into left retrorectus space and CO₂ insufflated up to 13 mmHg.

10 mm 30-degree telescope inserted and left retrorectus space created up to pubis by blunt dissection with scope under vision.

Another 5mm port is inserted once the left arcuate line is visualized along linea semilunaris.

Crossover done to the opposite side at the level of the arcuate line upto the umbilicus

Another 5mm port is inserted below the umbilicus and 5mm port on opposite side just below the right arcuate line.

By sharp and blunt dissection, the space of Bogros and the space of Retzius were created.

All the hernia sites were inspected, and the peritoneum reflected down with a reduction of hernia sac.

Two 15*12cm polypropylene macroporous mesh were introduced through a 10mm port and placed such that both crosses the midline and laterally up to the anterior superior iliac spine, and below up to the reflected peritoneum.

Mesh fixed by using two absorbable tackers 1 cm apart on Cooper's ligament.

After that, all ports were removed. After deflation of preperitoneal space, sheath of the 10mm port closed with portt Vicryl 1 -0 in a simple interrupted manner, and the skin of all ports closed with epimide 2-0 in a simple interrupted manner.

Total extra peritoneal repair (TEP) methodology: 10mm skin incision kept below umbilicus and 2 cm lateral on left side, pre-peritoneal space created with the open method, and 10mm trocar introduced in pre-peritoneal space and CO₂ insufflated.

By help of a 30-degree telescope, pre-peritoneal space was created up to pubic bone by to-and-fro movement under telescopic guidance. Other ports were inserted.

5 mm port at 2 cm above pubic symphysis

5mm port in between the umbilical and suprapubic port at midline.

Rest of dissection and mesh placement was similar to above mentioned eTEP procedure.

Post-operative protocols

Post-operatively IV antibiotics (amoxiclav) were given to all patients for 1 day along with IV analgesia (diclofenac 2ml)12 hrly followed by oral diclofenac twice daily for five days. Then analgesics were given only if patient was having pain. Catheter was removed on same day by evening.

Oral feeding started after 6 hours of surgery.

Patients were discharge on post-operative day 1 by evening if stable.

All patients were carefully monitored with the following parameters:

1. Operative time (placing skin incision to taking last skin stitch)

2. Intraoperative complications (vascular injury, visceral injury, peritoneal breach, surgical emphysema)
3. Conversion rates to open method
4. Post-operative complications like hematoma, Seroma, urinary retention
5. Post-operative pain (at 12 hours post-surgery, post-operative day 3 and post-operative day 7) by using visual analogue scale (VAS) score.
6. Duration of stay in hospital
7. Duration required to get back to normal activities
8. Chronic pain (on 3,6 and 12month follow up)
9. Recurrence rates (on 3,6 and 12month follow up)
10. Operative ease by using Surgeon's satisfaction score

Surgeon satisfaction score modified (1to10)

Ease of visualization of Anatomical land marks			
Parameter	Easily visible	Visible with difficulty	Not Visible
ASIS	2	1	0
Pubic bone	2	1	0
Cooper's ligament	2	1	0
Across the midline	2	1	0
Ease of spreading mesh			
Mesh spreading	Easy	Difficult	Very difficult
	2	1	0

Surgeon satisfaction was modified from surgeons satisfaction score published by Rashid et al⁶ was done in all patients by asking the above parameters to the operating surgeon. Maximum score possible is 10, whereas as minimum score possible is 0. Score obtained by adding the score obtained for individual parameter from each row.

Data Collection: The study was presented to the Institutional Ethics Committee (IEC) for ethical clearance; after getting clearance from the IEC, the study was started.

After taking informed consent, a detailed questionnaire was administered to the selected patients, according to their convenience. Strict confidentiality was employed in carrying out the survey and use of information provided by each respondent.

Various parameters, both intra-op and post-op, were evaluated for a period of 12 months in the postoperative period.

Data analysis: Collected data was entered in the excel data sheet and data analysis done with the help of Epi. Info.7.2 software.

Statistical method: Data was cleaned, validated, and analyzed by Epi. Info 7 software.

Descriptive Statistics: For continuous variable range, mean and standard deviation were calculated, and for categorical variables, proportion and percentage were obtained.

Bi-Variate analysis: To know the association between dependent and independent variables, a chi-square t-test was applied accordingly.

Results

Table 1: Age distribution of study participants [N=40]

Age Group (in year)	e-TEP (n=20)		TEP (n=20)	
	N	%	N	%
18-30	1	5	1	5
31-45	7	35	7	35
46-60	8	40	9	45
60-75	4	20	3	15
Mean \pm SD	47.2 \pm 9.4		48.0 \pm 10.3	

Table 2: Type of inguinal hernia [N=40]

Type	e-TEP (n=20)		TEP (n=20)	
	N	%	N	%
Bilateral Indirect	8	40	9	45
Bilateral Direct	12	60	11	55

Table 3: Mean duration of operative time according to type of hernia [N=40]

Type of hernia	Duration of operative time (Mean \pm SD) (in min)		P value
	e-TEP (n=20)	TEP (n=20)	
Bilateral Indirect	85.0 \pm 18.8	100 \pm 18.2	0.019
Bilateral Direct	70 \pm 14.8	80 \pm 8.6	<0.001

Table 4: Mean duration of hospital stay [N=40]

Duration (in day)	Mean \pm SD		P value
	E-TEP(n=20)	TEP(n=20)	
Hospital Stay	1.3 \pm 0.2	1.4 \pm 0.3	0.7

Table 5: Intra-operative, Post-operative complication [N=40]

Complication	e-TEP (n=20)		TEP(n=20)	
	N	%	N	%
Intra-operative				
Vascular Injury	0	0%	0	0%
Visceral Injury	0	0%	0	0%
Conversion to open surgery	0	0%	1	5%
Peritoneal breach required Veress needle insertion	4	20%	7	35%
Surgical Emphysema	2	10%	3	15%
Post-operative				
Hematoma	0	0%	1	5%
Wound infection	0	0%	0	0%
Asymptomatic Seroma	3	15%	2	10%
Chronic pain	0	0%	1	5%
Urinary retention	0	0%	0	0%
Recurrence	0	0%	1	5%

Table 6: Mean duration of return to normal activity after operation [N=40]

Duration (in day)	Mean \pm SD		P value
	E-TEP(n=20)	TEP(n=20)	
Return to normal activity (Joining of duties)	7.5 \pm 1.1	9.2 \pm 1.3	0.04

Table 7: Post-operative pain [N=40]

Post-operative duration	Mean VAS score (N=10)		P value
	E TEP	TEP	
POD 1 (after 24 hrs)	3	3	1.0
POD 1 month	2	3	<0.44
POD 6 month	0	1	<0.36

Discussion

The average age of all patients was 47.2 in eTEP group and 48.0 in TEP group. In our study in 'e-TEP' group, 60% participants found to have bilateral direct hernia and 40% have bilateral indirect type of hernia. In TEP group 55% participants found to have direct hernia and 45% have indirect type of hernia. The present study found that the mean duration of operative time was statistically lower among the participants of the 'e-TEP' group compared to participants of the 'TEP' group (85 min vs. 100 min) for bilateral indirect, (70 min vs. 80 min) for bilateral direct hernia (p 0.05).

A study done by Sinh S et al. [5] noted the mean duration of operative time was statistically significantly lower among the participants of the 'e-TEP' group compared to participants of the 'TEP' group (127.5 min vs. 167.6 min), which is similar to the present study. In another study done by Rashid A et al [6] noted the mean operative time of 68.16 versus 65.12 minutes in groups 'TEP' & 'e-TEP', respectively, which is comparable to the present study. Less operative

time may be attributed to better ergonomics and larger space for dissection in eTEP compared TEP.

Present study found that mean duration for 'hospital stay' was statistically not significant however slightly higher among the participants of the 'TEP' group compared to participants of the 'e-TEP' group (1.4 days Vs 1.3 days) (p<0.05). These observations are comparable with the similar study done by. Sinh S et al, Joshi et al [7] Rekhi HS et al [8] reported hospital stay and time to return to usual activity no statistical difference present between TEP and eTEP.

In our study, there were no vascular or visceral injuries in either group. In 1 (5%) patients, conversion to open surgery is required in the TEP group due to rent in peritoneum. Loss of vision due to inadequate space and failure to identify the structures led to the conversion to open surgery. TAPP was not tried as the operating surgeon was not well verse with TAPP. Peritoneal breach was more common in TEP group vs eTEP group (35%Vs20%) respectively. Surgical emphysema developed in 1 (5%) patient of the 'eTEP' group and 2 (10%) patients of the 'TEP' group.

One (5%) patient of the TEP group developed hematoma right inguinal region. This patient was on anticoagulants for cardiac risk which were stopped 5 days prior to surgery. Intra operative diffuse oozing of blood was noted. However it was managed by compression of operative site by compressive dressing.

Seroma developed in 3 (15%) patients of the eTEP group and 2 (10 %) patients of the TEP group. One patient in the TEP group developed chronic pain up to a follow-up of 6 months. One patient in the TEP group developed a recurrence 3 months after surgery.

Although a study done by Singh S et al. found the incidence of postoperative complications was higher in the e-TEP group (40%) compared to the TEP group (24%), however in our present study, postoperative complications were higher in the TEP group (30%) compared to the e-TEP group (10%). Reza SM et al [9] reported the eTEP procedure as cost-effective, has minimum complications, and is easier to learn. Hallen M [10] et al reported pain was higher in the TEP; 3 recurrences were found in the TEP group.

The present study found that the mean duration for return to normal activity after operation was statistically significantly higher among the participants of the 'TEP' group compared to participants of the 'e-TEP' group (9.2 days vs. 7.5 days) ($p < 0.05$). These findings are comparable with the similar study done by Rashid A et al.

The present study found that the 'mean' surgeon satisfaction score was statistically significantly higher among the participants of the 'e-TEP' group compared to participants of the 'TEP' group (9.1

vs. 6.3) ($p < 0.05$). These findings are comparable with the similar study done by Rashid A et al. In a study done by Kurtulus et al [11] states that e-TEP approach employs a conundrum of surgical strategies and manoeuvres with the primary aim of improving the extraperitoneal workspace. These strategies include flexible placement of surgical trocars, increased distance of the ports to the hernial defect with resultant favourable working angle, and creation of a large extraperitoneal working space avoiding cluttering and sword-fighting of instruments. The above are reasons for higher surgeon's satisfaction score in the e-TEP group which amply reflect in our study.

The present study found that the higher VAS score was noted as equal among the participants of the 'e-TEP' group compared to the 'TEP' group of at postoperative of day 1, but it was noted slightly higher among the participants of the 'TEP' group (3& 1) compared to the 'e-TEP' group (2&0) after 1 month and after 6 months, respectively ($p > 0.05$). Although VAS score was slightly higher in TEP group however it was not statistically significant.

These observations are comparable with similar study done by Abdullah Hilmi Yilmaz et al [12]. One patient of TEP group developed chronic pain up to follow up of 6 month. One patient of bilateral direct hernia of TEP group developed recurrence of left side at 3 months after surgery. This was a medial recurrence on left side which was managed by open hernioplasty.

The previous operative notes showed the hernia was very large which may have been the cause of medial recurrence due to improper placement of mesh.

Table 8:

Comparative data of our study with other studies								
Parameter	Present study		Singh S et al		Rashid A et al		Abdullah-Hilmi-Yilmaz	
	e-TEP (N=20)	TEP (N=20)	e-TEP	TEP	e-TEP	TEP	e-TEP	TEP
Mean operative time (min)	75	90	127.5	167.6	65.12	68.16	57.6	58.5
Post-operative complication								
• Seroma	2	3	-	-	1	3	2	1
• Wound infection	0	0			1	1		
• Surgical emphysema	1	2			1	1	0	2
• Urinary retention	0	0			1	0	-	-
Mean Duration of hospital stay (day)	1.3	1.4	1.1	1.7	1.09	1.12	1	1
Mean duration of return to normal activity (day) or	7.5	9.2	9.9	11.3	8.29	9.17	-	-

joining of duty								
Mean Surgeon Satisfaction score	9.1	6.3	-	-	8.72 ± 0.74	7.36 ± 0.82	-	-
VAS SCORE- POD 1	3	3	-	-	-	-	4	3
POD 1month	2	3					2	2
POD 6month	0	1					1	1

Conclusion

eTEP has certain advantages like relatively easy creation of a large preperitoneal space which results in more ergonomic instrument manipulation. A large space created offers better placement of mesh, less chance of complications and more surgeon satisfaction in ease of doing surgery. However increased seroma formation due large space and unnecessary dissection more than required for placement of mesh is a disadvantage of eTEP. Hence eTEP may have a slight advantage over TEP however it cannot be considered a replacement to TEP. Doing eTEP or TEP may depend on surgeon's expertise for favourable results. More studies and a larger sample size may be required to substantiate the results.

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