

A prospective randomized study of eTEP and TEP repair for inguinal hernia in terms of ease of operability, complication and recurrences



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ABSTRACT

Background: Inguinal hernia is one of the diseases that has haunted humanity from its very beginning to the modern times. Groin hernias are the most common conditions referred to surgeons all over the world and over five lakh hernia repairs are performed annually. The lifetime risk for men is 27.0% and for women is 3.0%. Approximately 75.0% of all abdominal wall hernias occur in the groin. Inguinal hernias are more common on the right than on the left and are seven times more likely in males than in females.

Aims and Objectives: Aim and objective of the study is to compare extended total extra peritoneal (e-TEP) and total extra peritoneal (TEP) repair in terms of complications and recurrence. To evaluate ease of operability of e-TEP and TEP for inguinal hernia repair. **Materials and Methods:** Patients with inguinal hernia who were hospitalized to the Department of General Surgery at GSVM Medical College, Kanpur, and who were over the age of 18 years of both sexes were studied from December 2019 to October 2021 after signing a consent form. The research procedure followed was in accordance with the approved ethical standards of GSVM Medical College, Kanpur, UP, India Ethics Committee (Human). Data were analyzed and evaluated using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are shown as mean \pm standard deviation, whereas results for categorical variables are shown as number (percentage). For comparison of nominal data, Chi-square (χ^2) test was used. The level $P < 0.05$ was considered as the cut-off value of significance. **Results:** Majority of the patients of Group TEP (25 patients) had complications as Conversion to trans abdominal pre-peritoneal (TAPP) 4 (16.0%) and proceed surgery without veress needle decompression 2 (8.0%). In Group eTEP (25 patients) majority of patients had complications as proceed surgery without veress needle decompression 8 (32%) followed by Seroma 2 (8.0%). No recurrences seen in either groups. Mean operative time of eTEP was less as compared to TEP. **Conclusion:** With TEP, complications such as SSI, hematoma, and conversion to TAPP are more common; however with eTEP, proceed surgery without veress needle decompression and seroma. Considering the average operative time of eTEP and TEP, as well as the bigger defect size that eTEP can readily handle. For new surgeons, eTEP is a more straightforward procedure. Moreover, our study findings showed that e-TEP mesh repair of inguinal hernia showed more firm and efficacious results than TEP repair. We suggest that long-term randomized control trials with enhanced sample size and reduced confounding factors are still required to establish the absolute superiority of e-TEP over TEP.

Key words: Extended totally extraperitoneal repair; Inguinal hernia; Laparoscopic Inguinal hernia repair; Totally extraperitoneal repair

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INTRODUCTION

Inguinal hernial repair is one of the most frequently performed operations in general surgery. The standard method for inguinal hernial repair had changed little over 100 years until the introduction of synthetic mesh. This mesh can be placed by either using an open approach or using a minimal access laparoscopic technique. The concept of hernial repair underwent evolution from Bassini's repair to Lichtenstein tension-free repair with the introduction of polyethylene mesh.

After many years of improvement, hernioplasty is now broadly performed. The techniques which are practiced widely presently are mainly

1. Trans abdominal pre-peritoneal (TAPP)
2. Total extra peritoneal (TEP)
3. Intraperitoneal only meshplasty
4. Extended view TEP (e-TEP)

Each technique has its own applications and pitfalls and has a very gradual learning curve; hence, they have remained confined to the expert hands only. The Newer modification of TEP is e-TEP. The e-TEP technique ensures that the extra peritoneal space can be reached from almost anywhere in the anterior abdominal wall. The e-TEP approach can quickly and easily create an extra peritoneal space, enlarge the surgical field, provide a flexible port setup adaptable to many situations, allow unencumbered parietalization of the cord structures (proximal dissection of the sac and peritoneum), ease the management of the distal sac, and improve tolerance of pneumoperitoneum, which is a common complication.

Aims and objectives

1. To compare e-TEP and TEP repair in terms of complications and recurrence.
2. To evaluate ease of operability of e-TEP and TEP for inguinal hernia repair.

MATERIALS AND METHODS

The present hospital-based prospective study was conducted on patients with inguinal hernia those were admitted in Department of General Surgery at GSVM Medical College, Kanpur of age more than 18 years both sex, after obtaining the consent form the patient or their relatives were studied during the period of study from December 2019 to October 2021.

Study area

Department of General Surgery at GSVM Medical College, Kanpur.

Study duration

December 2019 to October 2021

Study design

Hospital-based prospective interventional study.

Study sample

Patients who presented with primary or incisional inguinal hernia with defect of size 4–12 cm were studied.

Sample size estimation

During the period of study a total of 50 patients were found eligible as per the inclusion criteria those were admitted to the department.

Inclusion criteria

- Age more than 18 years
- Patient giving consent for laparoscopic hernia repair
- Size of defects between 4 and 12 cm

Exclusion criteria

- Patients with lower abdominal scar
- Patients in which laparoscopic procedure is contraindicated
- Patients with recurrence after eTEP and TEP repair
- Cases of strangulated inguinal hernia.

Ethical clearance

The research procedure followed was in accordance with the approved ethical standards of GSVM Medical College, Kanpur, UP, India Ethics Committee (Human).

Statistical analysis

Data were analyzed and evaluated using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are shown as mean \pm standard deviation, whereas results for categorical variables are shown as number (percentage). For comparison of nominal data, Chi-square (χ^2) test was used. The level $P < 0.05$ was considered as the cutoff value or significance.

RESULTS

In our study, total 50 patients were divided into two groups Group TEP and Group eTEP of 25 patients each as shown in Table 1 and Figure 1

In our study, the mean age of Group TEP and Group eTEP patients was 45.7 ± 7.6 and 44.2 ± 7.4 years, respectively; as shown in Table 2 and Figure 2a.

In Group TEP, there were 24 males and 1 female and in Group eTEP there were 22 males and 3 were females; as shown in Figure 2b.

Groups	Number of patients (n=50)	Percentage
TEP	25	50.0
eTEP	25	50.0

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair

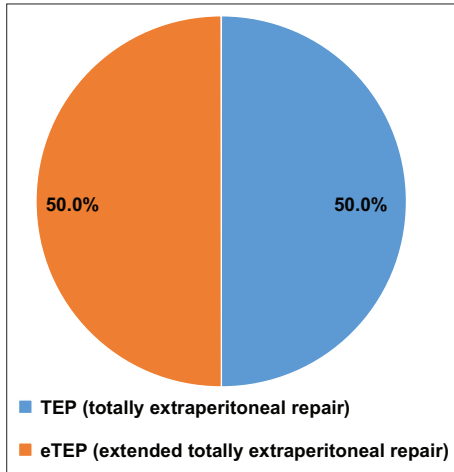


Figure 1: Group classification

Mean body mass index (BMI) calculated in Group TEP and Group eTEP was $27.4 \pm 3.8 \text{ kg/m}^2$, $28.6 \pm 4.2 \text{ kg/m}^2$, respectively; as shown in Figure 2c.

Eight patients had diabetes in Group TEP and 6 patients had diabetes in Group eTEP. 10 patients had hypertension in Group TEP and 6 patients had hypertension in Group eTEP.

Age, gender, BMI, diabetes, and hypertension of the studied patients have shown non-significant correlation in both groups.

In our study, maximum primary hernia patients were found in eTEP Group 15 (60%) than in TEP Group 13 (52%). Maximum incisional hernia patients were found in TEP Group 12 (48%) than in eTEP Group 10 (40%); as shown in Table 3 and Figure 3a.

Maximum unilateral hernia patients were found in eTEP Group 22 (88%) than in TEP Group 21 (84%). Maximum bilateral hernia patients were found in TEP Group 4 (16%) than in eTEP Group 3 (12%); as shown in Figure 3b

Maximum right side hernia patients were found in eTEP Group 20 (80%) than in TEP Group 19 (76%). Maximum left side hernia patients were found in TEP Group 6 (24%) than in eTEP Group 5 (20%) as shown in Figure 3c.

Maximum indirect hernia patients were found in TEP Group 20 (80%) than in eTEP Group 18 (72%).

Parameters	TEP (n=25)	eTEP (n=25)	P-value
Mean Age	45.7 \pm 7.6	44.2 \pm 7.4	0.483
Gender			
Male	24 (96.0)	22 (88.0)	0.297
Female	1 (4.0)	3 (12.0)	
Mean BMI (kg/m ²)	27.4 \pm 3.8	28.6 \pm 4.2	0.295
Diabetes	8 (32.0)	6 (24.0)	0.529
Hypertension	10 (40.0)	7 (28.0)	0.370

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair, BMI: Body mass index

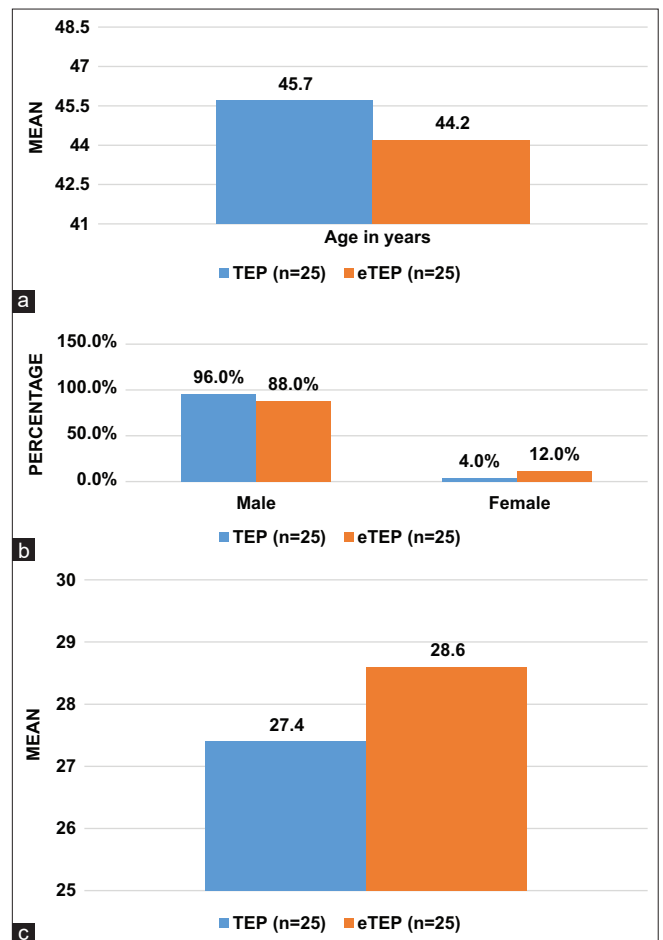


Figure 2: (a) Mean age, (b) Gender distribution, (c) Mean body mass index

Maximum direct hernia patients were found in eTEP Group 7 (28%) than in TEP Group 5 (20%); as shown in Figure 3d.

Mean defect size was higher in eTEP Group (5.1 ± 0.8) as compared to TEP Group (4.7 ± 0.6); as shown in Figure 3e.

Mean size of swelling was higher in eTEP Group (23.4 ± 17.4) as compared to TEP Group (11.6 ± 8.3); as shown in Figure 3f.

Parameters such as type of hernia, laterality, side, direct/indirect, mean defect size, and mean size of swelling among the groups showed statistically non-significant correlation.

In our study, 1 and 2 tackers were used in TEP Group as 15 (60%) and 10 (40%), respectively. 4, 5 and 6 tackers were used in eTEP Group 16 (64%), 7 (28%) and 2 (8%) respectively; as shown in Table 4 and Figure 4.

- Number of tackers among the groups (Group TEP, Group eTEP) showed significant correlation.

In our study, the mean operative time of Group TEP (167.6±32.4) was higher as compared with Group eTEP (127.5±23.4); as shown in Table 5.

Table 3: Distribution of the studied patients on the basis of feature of hernia

Parameters	TEP (n=25)	eTEP (n=25)	P-value
Type of Hernia			
Primary	13 (52.0)	15 (60.0)	0.568
Incisional	12 (48.0)	10 (40.0)	
Laterality			
Unilateral	21 (84.0)	22 (88.0)	0.684
Bilateral	4 (16.0)	3 (12.0)	
Side			
Right	19 (76.0)	20 (80.0)	0.732
Left	6 (24.0)	5 (20.0)	
Direct or Indirect			
Indirect	20 (80.0)	18 (72.0)	0.508
Direct	5 (20.0)	7 (28.0)	
Mean Defect Size (cm)	4.7±0.6	5.1±0.8	0.051
Size of swelling (cm ²)	11.6±8.3	23.4±17.4	0.004

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair

- Mean post-operative parenteral analgesia required in Group TEP (21.4±5.5) was higher as compared with Group eTEP (12.3±2.5).
- Mean Hospital stay after surgery in Group TEP (1.7±0.7) was higher as compared with Group eTEP (1.1±0.3).
- Duration to return back to work after surgery in Group TEP (11.6±3.6) was higher as compared with Group eTEP (9.9±3.4).

Mean operative time, mean post-operative parenteral analgesia required and mean hospital stay after surgery among the groups (Group TEP, Group eTEP) showed significant correlation.

In our study, we observed that mean VAS score at 12 Hour after surgery was high in Group TEP (5.6±0.7) than in Group eTEP (4.5±0.6); as shown in Table 6 and Figure 5.

- Mean VAS score at POD1 in TEP Group was 3.9±0.9 and in eTEP Group it was 2.8±0.6. Mean VAS score at POD3 in TEP Group was 1.1±0.5 and in eTEP Group it was 0.3±0.1.
- Mean VAS score among the groups (Group TEP and eTEP) showed significant correlation.

In our study, there were majority of patients of Group TEP (25 patients) had complications as conversion to TAPP 4 (16.0%) and proceed surgery without veress needle decompression 2 (8.0%); as shown in Table 7.

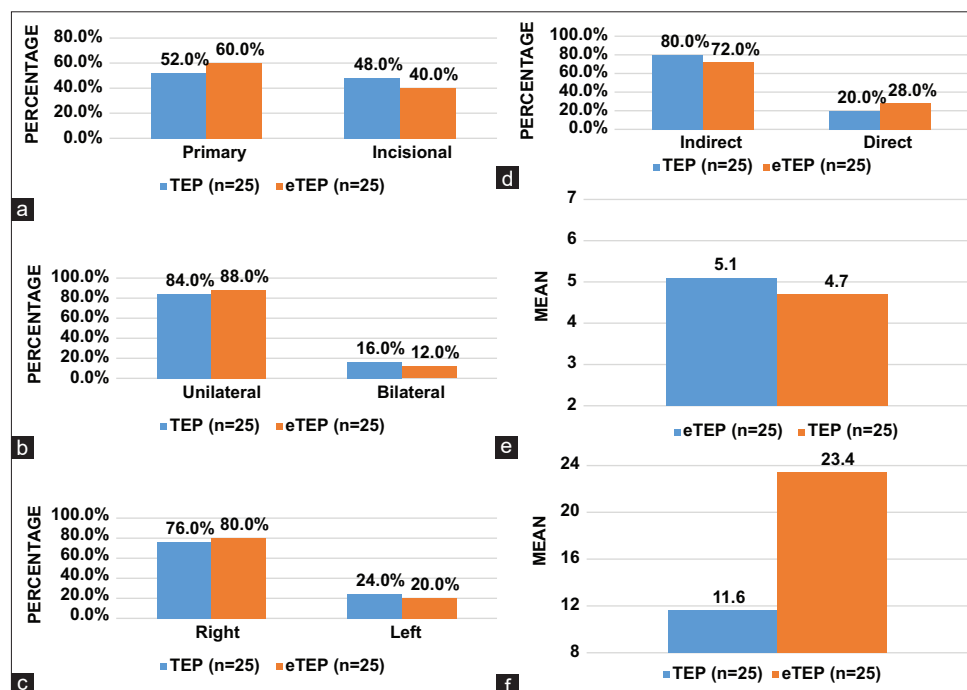


Figure 3: (a) Type of Hernia, (b) Laterality of Hernia (c) Side of Hernia, (d) Direct Indirect Hernia, (e) Mean Defect Size, (f) Size of swelling

In Group eTEP (25 patients) majority of patients had complications as proceed surgery without veress needle decompression 8 (32%) followed by Seroma 2 (8.0%).

Complications like conversion to TAPP and proceed surgery without veress needle decompression among the groups showed statistically significant correlation (P<0.05).

DISCUSSION

Worldwide, inguinal hernia repair is one of the most common surgeries, being performed in more than 20 million people annually.¹ A minority of patients is asymptomatic; however, even a watch-and-wait approach in this group results in surgery in approximately 70% within

5 years.² Surgical treatment is successful in the majority of cases.¹ The expected rate of recurrence following inguinal hernia repair is still 11% today.³ Only 57% of all inguinal hernia recurrences occurred within 10 years after the previous hernia operation. Some of the remaining 43% of all recurrences happened only much later, even after more than 50 years.

Throughout the years there have been many advancements in the operation including the genesis of laparoscopic techniques. With a multitude of surgical methods, it can often become difficult in deciding the best method of repair. An array of factors contributes to deciding which operative technique is best utilized for a patient presenting with an inguinal hernia. We will explore these variables as well as the surgical techniques themselves. Open inguinal hernia repairs can be categorized into two main categories: tissue repair and mesh repair. There are several named techniques that can be utilized for performing a tissue repair such as the Bassini, McVay, Marcy, and Shouldice repairs.⁴

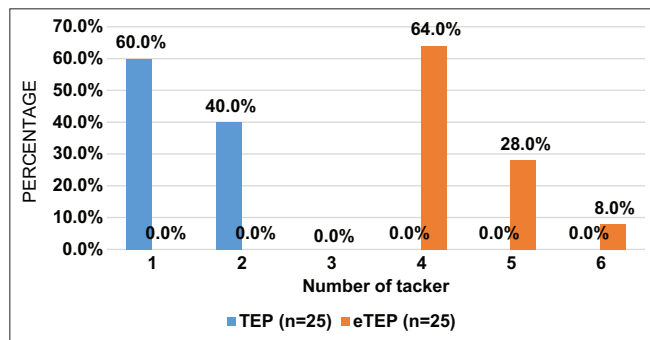


Figure 4: Number of tackers used

Table 4: Distribution of the studied patients on the basis of number of tackers used

Number of Tacker	TEP (n=25)	eTEP (n=25)	P-value
1	15 (60.0)	0	<0.001
2	10 (40.0)	0	
3	0	0	
4	0	16 (64.0)	
5	0	7 (28.0)	
6	0	2 (8.0)	

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair

Table 5: Peri-operative parameters of the studied patients

Parameters	TEP (n=25)	eTEP (n=25)	P-value
Mean operative time (min)	167.6±32.4	127.5±23.4	<0.001
Blood loss over 50 ml	0	0	>0.05
Mean post-operative parenteral analgesia required (mg)	21.4±5.5	12.3±2.5	<0.001
Mean Hospital stay after surgery (days)	1.7±0.7	1.1±0.3	<0.001
Duration to return back to work after surgery (days)	11.6±3.6	9.9±3.4	0.093

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair

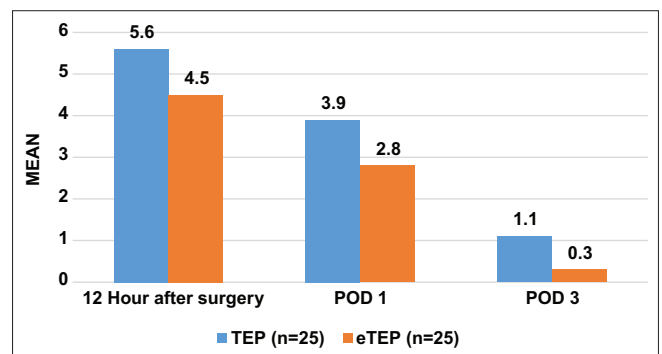


Figure 5: Post-operative pain

Table 6: Post-operative pain

Mean VAS Score	TEP (n=25)	eTEP (n=25)	P-value
12 Hour after surgery	5.6±0.7	4.5±0.6	<0.001
POD 1	3.9±0.9	2.8±0.6	<0.001
POD 3	1.1±0.5	0.3±0.1	<0.001

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair

Table 7: Complications

Complications	TEP (n=25)	eTEP (n=25)	P-value
SSI	0 (0.0)	0 (0.0)	1.00
Seroma	0 (0.0)	2 (8.0)	0.148
Hematoma	0 (0.0)	0 (0.0)	1.00
Conversion to TAPP	4 (16.0)	0 (0.0)	0.037
Proceed surgery without veress needle decompression	2 (8.0)	8 (32.0)	0.033
Recurrence	0 (0.0)	0 (0.0)	1.00

TEP: Totally extraperitoneal repair, eTEP: Extended totally extraperitoneal repair, TAPP: Trans Abdominal Pre-Peritoneal

eTEP is a novel technique that was first introduced by Daes in 2012 to address difficult inguinal hernias.⁵ The principle is to create a larger space than what is done in TEP to tackle large groin hernias. When the defect is too wide to be closed without tension, a component separation procedure is added. In general, the posterior component separation technique in the form of transversus abdominis release (TAR) as described by Dr. Novitsky *et al.*,⁶ is preferred with the eTEP technique since the plane of dissection is the same. This is called eTEP TAR. It is believed that mesh placement in retromuscular space translates into vascularization of the mesh from both sides, less recurrence, fewer issues of fixation, less pain and fewer chances of bowel adhesions in addition to being economical due to the deployment of a cheaper mesh as composite mesh with anti-adhesion barrier is not needed.⁷ However, the technique has a steep learning curve.

Present study aims to compare eTEP and TEP repair in terms of complications and recurrence and evaluate ease of operability of eTEP and TEP for inguinal hernia repair. Study enrolled 50 patients, were divided into two groups Group TEP and Group eTEP of 25 patients each. Demographic profile was comparable for both the groups; mean age was Group eTEP patients was 45.7 and 44.2 years, respectively. Male dominance was observed in both the groups.

Baig and Priya⁸ reported mean age as 54.67 years and female dominance in contrast our study. Köckerling *et al.*,⁹ concluded that No significant difference in mean age and BMI was found between the recurrent operations in TEP. Further, we documented the features of hernia and observed primary hernia more in eTEP group (60%) and Incisional in TEP group (48%). Penchev *et al.*,¹⁰ did a study and reported that there were no differences between age, sex, BMI.

Peri-operative parameters were also logged, mean operative time of Group TEP (167.6 mins) was higher as compared with Group eTEP(127.5). In a study, they recorded mean operating time was 176.48 min which ranged from 138 to 310 min in eTEP.⁹ Karim *et al.*,¹¹ reported mean operative time for TAPP was 64.27 min, Kumar *et al.*,¹² reported operative time was significantly higher for e-TEP. Hospital stay after surgery in Group TEP (1.7±0.7) was higher as compared with Group eTEP (1.1±0.3) and difference among group was significant, which was in contrast to Rekhi *et al.*,¹³ reported hospital stay and time to return to usual activity no statistical difference present between TEP and TAPP while pain score was in TEP more than TAPP.

Joshi *et al.*,¹⁴ reported post-operative hospital stay was shorter in e-TEP group. VAS score among the groups (Group TEP and eTEP) showed significant correlation. VAS score at 12 h after surgery was high in Group TEP than in eTEP. Penchev *et al.*,¹¹ reported pain score from the intra-operative (the day of surgery) to the seventh post-operative day is lower in the eTEP group. Vinay and Balasubrahmanya¹⁵ reported low pain scores, similar scores were documented by Sharma *et al.*,¹⁶ pain scores were less in Group TAPP.

In our study, there were majority of patients of Group TEP (25 patients) had complications as Conversion to TAPP 4. Complications like conversion to TAPP and proceed surgery without veress needle decompression among the groups showed statistically significant correlation. Rekhi *et al.*,¹⁵ concluded that higher incidence of post-operative complications is associated with TAPP in comparison to TEP. In contrast Reza *et al.*,¹⁷ reported eTEP procedure is cost effective, has minimum complication with easier learning. Hallen *et al.*,¹⁸ reported pain was higher in the TEP,³ recurrences were found in the TEP group. Vinay and Balasubrahmanya¹⁸ concluded TEP mesh repair and TAPP mesh repair of inguinal hernia are both safe and efficacious.

Limitations of the study

Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations in the present study are mentioned below,

1. The patients taken up for the study were predominantly from northern India, in and around Kanpur district. Therefore, the results of the present study may not be representative of the whole of the country or the world at large.
2. The number of patients included in the present study were less in comparison to other studies.
3. Because the trial was short, it was difficult to remark on recurrences.

CONCLUSION

1. The mean age of Group TEP and Group eTEP patients was 45.7±7.6 and 44.2±7.4years, respectively.
2. In Group TEP, there were 24 males and 1 female and in Group eTEP there were 22 males and 3 were females.
3. Eight patients had diabetes in Group TEP and 6 patients had diabetes in Group eTEP. 10 patients had hypertension in Group TEP and 6 patients had hypertension in Group eTEP.

4. Maximum primary hernia patients were found in eTEP Group 15 (60%) than in TEP Group 13 (52%). Maximum incisional hernia patients were found in TEP Group 12 (48%) than in eTEP Group 10 (40%).
5. Mean defect size was higher in eTEP Group (5.1 ± 0.8) as compared to TEP Group (4.7 ± 0.6).
6. Number of tackers among the groups (Group TEP, Group eTEP) showed significant correlation.
7. Mean operative time of Group TEP (167.6 ± 32.4) was higher as compared with Group eTEP (127.5 ± 23.4).
8. Mean Hospital stay after surgery in Group TEP (1.7 ± 0.7) was higher as compared with Group eTEP (1.1 ± 0.3).
9. VAS score at 12 Hour after surgery was high in Group TEP (5.6 ± 0.7) than in Group eTEP (4.5 ± 0.6).
10. Majority of patients of Group TEP (25 patients) had complications as conversion to TAPP 4 (16.0%) and proceed surgery without veress needle decompression 2 (8.0%). In Group eTEP (25 patients) majority of patients had complications as proceed surgery without veress needle decompression 8 (32%) followed by Seroma 2 (8.0%).
11. Considering mean operative time of eTEP and TEP and the larger defect size easily tackled via eTEP. eTEP is easier to perform for novel surgeons.

Our study findings showed that e-TEP mesh repair of inguinal hernia showed more firm and efficacious results than TEP. We suggest that long-term randomized control trials with enhanced sample size and reduced confounding factors are still required to establish the absolute superiority of e-TEP over TEP.

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