

# A Comparative Evaluation of Extended Total Extraperitoneal Repair Versus Standard Total Extraperitoneal Repair and Transabdominal Preperitoneal Repair of Inguinal Hernias

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## ABSTRACT

**Background and Objectives:** Laparoscopic inguinal hernia repair (LIHR) includes transabdominal preperitoneal repair (TAPP), standard totally extraperitoneal repair (TEP), and now extended TEP (eTEP). However, there is still a paucity of well conducted, peer reviewed comparative studies regarding the advantages, if any, of eTEP. This study aimed to compare the data of eTEP repair with that of TEP and TAPP repair.

**Methods:** Two hundred twenty patients were randomly assigned to one of three groups of eTEP (80), TEP (68), and TAPP (72) after matching for age, sex, and clinical extent of hernia. Permission of ethics committee was taken.

**Results:** Comparison with TEP showed, mean operating time for eTEP was significantly longer in the first 20 patients, subsequently there was no difference. Conversion rates of TEP to TAPP was significantly higher. The other peroperative and postoperative parameters did not differ. Similarly, on comparison with TAPP, there was no difference in any of the parameters. eTEP, also had shorter operating time and less incidence of pneumoperitoneum when compared to published TEP and TAPP studies.

**Conclusion:** All the three laparoscopic hernia approaches had similar outcomes. eTEP cannot be advocated as a

substitute for TAPP or TEP. The choice of procedure should be the surgeon's choice. However, eTEP does combine the advantage of both TAPP, in the form of a large working space and of TEP, by being totally extraperitoneal. eTEP is also easier to learn and teach.

**Key Words:** eTEP, TEP, TAPP, Hernias, Inguinal.

## INTRODUCTION

Inguinal hernia repair has always been the one of most commonly performed surgeries with numerous innovations over time. With the present-day emphasis on enhanced recovery after surgery (ERAS) protocols, there is an increasing shift in the choice of operation for inguinal hernia repair, from open repairs to laparoscopic inguinal hernia repairs. The innovators of transabdominal preperitoneal repair (TAPP) were Arregui and colleagues<sup>1</sup> in 1991 and of totally extraperitoneal repair (TEP) were McKernan and Laws<sup>2</sup> in 1993. Although randomized trials have failed to assert any one of these procedures as superior to the others, some hernia surgeons tend to favour TEP over TAPP as the complications related to transabdominal entry are generally avoided. But the learning curve for TEP is still longer than with TAPP, especially because of the limited preperitoneal space, and hence, a greater percentage of laparoscopic hernia surgeons prefer TAPP to TEP.

Extended-TEP (eTEP), which was introduced in 2012 by Daes<sup>3</sup> offsets the limitation of restricted space in TEP, by providing a larger operative preperitoneal (PP) space, which in turn vastly improved the ergonomics without losing the other benefits of TEP. 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 or TAPP.

This study had three aims. First, comparing the three LIHR alternatives in our study groups of inguinal hernia patients. Second to compare our eTEP data with other

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Acknowledgements: none.

Disclosure: none.

Conflict of interests: none.

Funding sources: none.

Informed consent: Dr. Rajeev Sinha declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

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DOI: 10.4293/JSLs.2023.00004

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published eTEP data. Third to compare our eTEP data with standard data from published studies on TEP and TAPP.

## METHODOLOGY

Two hundred twenty patients with inguinal hernia were randomly assigned to one of three groups: eTEP (80), TEP (68), and TAPP (72) after matching them for age, sex, and clinical extent of inguinal hernia (i.e. bubnocele, funicular, or complete (**Table 1**)). The hospital ethics committee approved this study, and all patients gave informed consent to participate.

Exclusions included:

- Congenital hernia patients < 15 years of age
- Complicated hernias (obstructed and strangulated)
- Recurrent hernias
- Patients with infraumbilical laparotomy scars
- Patients with decompensated cardiac or airway diseases, or American Society of Anesthesiologists (ASA) Classification grade 3 or 4.

All patients were operated under (regional) epidural A + sedation 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 and TAPP repairs for inguinal hernias. The end points of study were:

1. Operating time
2. Conversions
3. Complications
4. Postoperative pain based on visual analogue scale (VAS)
5. Length of stay in hospital or time to discharge (TTD).

Technical details common to all three operative methods included:

1. Sac management:
  - a. Funicular and bubnocele, total reposition of sac
  - b. Scrotal, initially total reposition, or in later patients, partial reposition plus transection and ligation of proximal end of sac, while the distal sac was left open.
  - c. Large sacs or large direct defects, transversalis fascial sac inverted and stitched or tacked to under-surface of the anterior abdominal wall.

2. Mesh:
  - a. Light weight; monofilament; knitted polypropylene mesh (Prolus lite).
  - b. 45 gm/m<sup>2</sup> (light weight).
  - c. 0.43 mm thick; pore size of 1.3 mm x 1.0 mm
  - d. Size of mesh 12 x 15 cm.
3. Mesh fixation:
  - a. Nonabsorbable tacks (Protack by Covidien) or absorbable tacks (Secure strap by Ethicon or Absorbatack by Covidien).
  - b. Indirect and small direct defects used two-point mesh fixation; medially just superior to upper margin of pubic bone and laterally, upper outer corner of the mesh.
  - c. Large defects and direct defects used multiple point mesh fixation.

Distinct technical details for the three minimally invasive surgical techniques:

eTEP (3 ports):

1. Optional port positions: 2–3 cms lateral to midline and 2–3 cms cranial to transumbilical line.
  - a. 1st port: ipsilateral or contralateral
  - b. 2nd port: iliac fossa contralateral to the side of the hernia
  - c. 3rd port: just below the umbilicus on the side of the 1st port or in the contralateral iliac fossa, near the 2nd port.
2. Retro-rectus tunnelling
3. Large preperitoneal (PP) space creation
4. Safeguarding inferior epigastric artery
5. Dissection identical to TEP
6. Dissection continued in all patients with accidental pneumoperitoneum
7. Peritoneal tear repaired.

TEP:

Standard technique:

1. Port positions: standard three infraumbilical ports in midline.
2. TEP steps are already standardized

TAPP:

1. 3 ports: supraumbilical 10 mm; two 5 mm lateral at edge of rectus sheath at transumbilical line.
2. Dissection already standardized.
3. Peritoneal flaps: sutured intracorporeally with 2-0 vicryl or tacked with nonabsorbable or absorbable tacks.

**Table 1.**  
Demographics

	eTEP (Group A)	TEP (Group B)	P-value (eTEP vs TEP)	Tapp	P-value (eTEP vs TAPP)
Patient/hernias	80/95	68/80		72/86	
U/L–B/L	65 – 15 (30 h)	56 – 12 (24 h)		58 – 14 (28 h)	
Type: Ind/D	65/30	53/27		61/25	
BMI ± SD	26.34 ± 352	26.573 ± 3.131	NS (0.6097)	25.622 ± 3.997	NS (0.1729)
Age (mean ± SD)	49.28 ± 18.342	46.6 ± 16.51	NS (0.3554)	44.36 ± 12.93	NS (0.0605)
Sex M/F	79/1	68/2		70/2	

Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal; U/L, unilateral; B/L, bilateral; Ind, indirect; D, direct; BMI, body mass index; SD, standard deviation; NS, not significant.

## RESULTS

The demographic distribution can be seen in **Table 1**. The comparative operative time for unilateral and bilateral inguinal hernias by eTEP vs TAPP never reached significant proportions. But comparison of the same eTEP data with TEP showed that the operating time for unilateral and bilateral eTEP, in the initial learning phase of eTEP (20 patients) was significantly more than the corresponding time for TEP. However, post-learning phase (after 20 cases), operating times for unilateral and bilateral eTEP were comparable with those of TEP (**Table 2**). Inadvertent pneumoperitoneum, was seen in 20% of patients with eTEP and in 26.4% of patients in the TEP group, a difference which was not significant. None of the eTEP patients required conversion due to pneumoperitoneum, but four patients in the TEP group were converted to TAPP ( $P = 0.027$ ) (**Table 2**). Two patients in the eTEP group required conversion because of difficult and inadequate PP space dissection. Similarly, two other patients from the TEP group required conversion because of poor PP space availability, which brought the total conversion to TAPP from TEP to six patients. This difference in the total conversion rate between eTEP and TEP patients was statistically significant (**Table 2**). Inferior epigastric vessel injury or dissection away from the wall, was seen in one patient in the eTEP group, two patients in the TEP group, and two patients undergoing TAPP. These figures were comparable.

Seroma and hematomas were grouped as one and post-operative seroma/hematoma formation in the inguinoscrotal region was seen in patients of all three groups (**Table 3**). All these patients were successfully managed conservatively. The maximum time to recovery was 8 weeks in one patient.

Pain scores, based on VAS, across all three groups were not significantly different. Chronic thigh pain occurred only in two patients in the TAPP group (**Table 3**). Other complications rates across all three groups were similar.

Mean hospital stay in our study was  $2.8 \pm 1.2$  days for eTEP,  $2.9 \pm 0.9$  days for TEP, and  $2.9 \pm 0.4$  days for the TAPP group. The difference among them was not significant (**Table 3**). Recurrence during a two year follow-up period was recorded in one patient each from the eTEP and TAPP groups.

## DISCUSSION

### Comparative eTEP Studies

Our findings of significantly longer operative times for both unilateral and bilateral inguinal hernias, in the initial 20 eTEP patients, compared to TEP, can be easily attributed to the initial learning curve for eTEP. This was further substantiated by the observation that post-learning curve, there was no significant difference in operating times among the three procedures (**Table 2; Figure 1**). We had 16 (20%) peritoneal breaches in 80 patients of eTEP group, and in 18 (26.4%) patients undergoing TEP. This incidence was significantly different, as also, the resultant conversion to alternative TAPP was significantly more in the TEP patients ( $P = 0.027$ ) (**Table 2**). None of the eTEP group patients required conversion because of pneumoperitoneum and the procedure was completed in all patients easily and safely. The peritoneal tear was repaired in all patients with 2-0 vickryl. Suturing the peritoneal breach was comparatively easier in the patients in the eTEP group compared to the TEP group patients because of the large PP space and thus better ergonomics. However, two patients in the eTEP group and two more

**Table 2.**  
Peroperative Parameters

	eTEP (Group A) ( 80p)		TEP(Group B) (68p)		TAPP (Group C) (72p)		P-value eTEP vs TAPP		P-value eTEP vs TAPP	
	First 20 pts	Next 60 pts	First 20 pts	Next 60 pts	First 20 pts	Next 60 pts	1st 20 pts	Next 60 pts	1st 20 pts	Next 60 pts
Operating Time mean ± SD	47.27 ± 12.38	41.27 ± 8.23	38.08 ± 10.23	S (0.004)	43.65 ± 12.66	NS (0.325)	NS (0.511)	NS (0.511)	NS (0.325)	NS (0.511)
U/L	15	50	56	22	58	58	NS (0.342)	NS (0.841)	NS (0.342)	NS (0.841)
Number of patients	64.50 ± 14.85	58.74 ± 9.55	49.51 ± 11.87	S (0.043)	58.83 ± 9.69	(n = 14)	NS (0.342)	NS (0.841)	NS (0.342)	NS (0.841)
B/L	(n = 05 p)	(n = 10p)	(n = 12)	S (90.05) S (0.027)	Not relevant	Not relevant	Not relevant	Not relevant	Not relevant	Not relevant
Pneumoperitoneum converted	16 (20%) 0		18 (26.4%) 4							
IEV injury	01 (1.25%)		02 (2.94%)	NS (0.234)	2 (2.78%)					
Conversion	2		6	S (0.046)	0					

Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal; pts, patients; h; hernias; U/L, unilateral; B/L, bilateral; BMI, body mass index; SD, standard deviation; NS, not significant; S, significant; S, significant; S, significant; VAS, visual analog scale; IEV, inferior epigastric vessels.

patients in the TEP required conversion because of difficult and inadequate PP space dissection. Formation of seroma/hematoma was observed in 9 (11.25%), 10 (14.7%), and 7 (9.72%) of our patients in eTEP, TEP, and TAPP respectively. The above difference was not significant (Table 3). All the seromas/hematomas regressed spontaneously, the longest one took eight weeks. Various factors including extensive dissections, mesh placement, and inflammatory response to surgical applications, act together to contribute to seroma formation. The higher incidence of seromas/hematomas in our patients was probably because of extensive, complete dissection of large scrotal sacs, in the initial part of the study.

The VAS at 24 hours, 48 hours, and 7 days among our patients in all of the three groups, showed no significant difference (Table 3; Figure 2). The International Association for the Study of Pain (IASP) defines inguinodynia, also called chronic inguinal pain after herniorrhaphy, as pain lasting greater than three months after herniorrhaphy. The overall incidence of inguinodynia, after inguinal hernia repair, varies between 10% and 12% as variously reported. Although the pain intensity in most cases is mild, it can be severe and disabling, compromising quality of life. None of our patients had chronic inguinodynia after eTEP or TEP, but 2/72 patients (2.78%) had inguinodynia after TAPP. The time to discharge in all three groups was comparable, mostly between 2 – 3 days (Table 3; Figure 3).

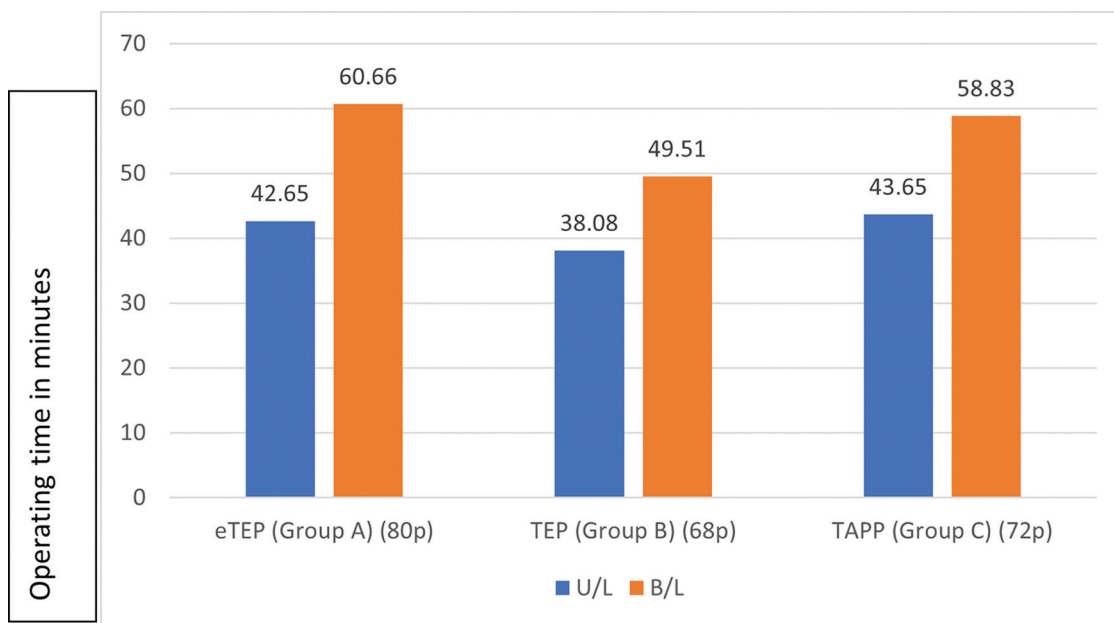
After comparison of all parameters, the significant differences in our comparative study were significantly longer operating times for eTEP in the early learning stages of the procedure and significantly more conversions to TAPP from TEP, both because of pneumoperitoneum and inadequacy of PP space. All the other peroperative or postoperative parameters were no different among the three groups of patients undergoing eTEP, TEP, or TAPP.

Unfortunately, there are only two comparative studies, of eTEP for inguinal hernias, available from our database search<sup>6,7</sup> and one observational study.<sup>8</sup> While the first two<sup>6,7</sup> have compared eTEP with only TEP, and both have a very small number of 25 patients in each group, the third study<sup>8</sup> compares all the three LIHR options like ours, but is an observational study that does not provide a statistical comparison. Contrary to our finding, significantly shorter operating times for eTEP have been reported.<sup>6</sup> Pneumoperitoneum and conversion to TAPP has been reported in both of the studies as significantly more in the TEP group, which agree with our findings. But contrary to

**Table 3.**  
Postoperative Parameters

	eTEP (Group A) (80 p)	TEP (Group B) (68 p)	P-value eTEP vs TEP	TAPP (Group C) (72 p)	P-value eTEP vs TAPP
Seroma/hematoma	09 (11.25%)	10 (14.70%)	NS (0.27)	07 (9.72%)	NS (0.38)
SSI (Port site)	–	–		–	
Mesh infection	–	–		–	
Postoperative pain: VAS score (mean ± SD)					
24 hours	2.92 ± 0.277	3.02 ± 0.557	NS (0.159)	3.06 ± 0.768	NS (0.1295)
48 hours	1.24 ± 0.436	1.180 ± 0.51	NS (0.442)	1.28 ± 0.737	NS (0.6809)
End of 1 <sup>st</sup> week	1.16 ± 0.374	1.22 ± 0.586	NS (0.4526)	1.24 ± 0.539	NS (0.2856)
TTD (days) (mean ±SD)	2.8 ± 1.2	2.9 ± 0.9	NS (0.5728)	2.9 ± 0.4	NS (0.5013)
Recurrence at 2 years	01 (1.25%)	–		01 (1.38%)	

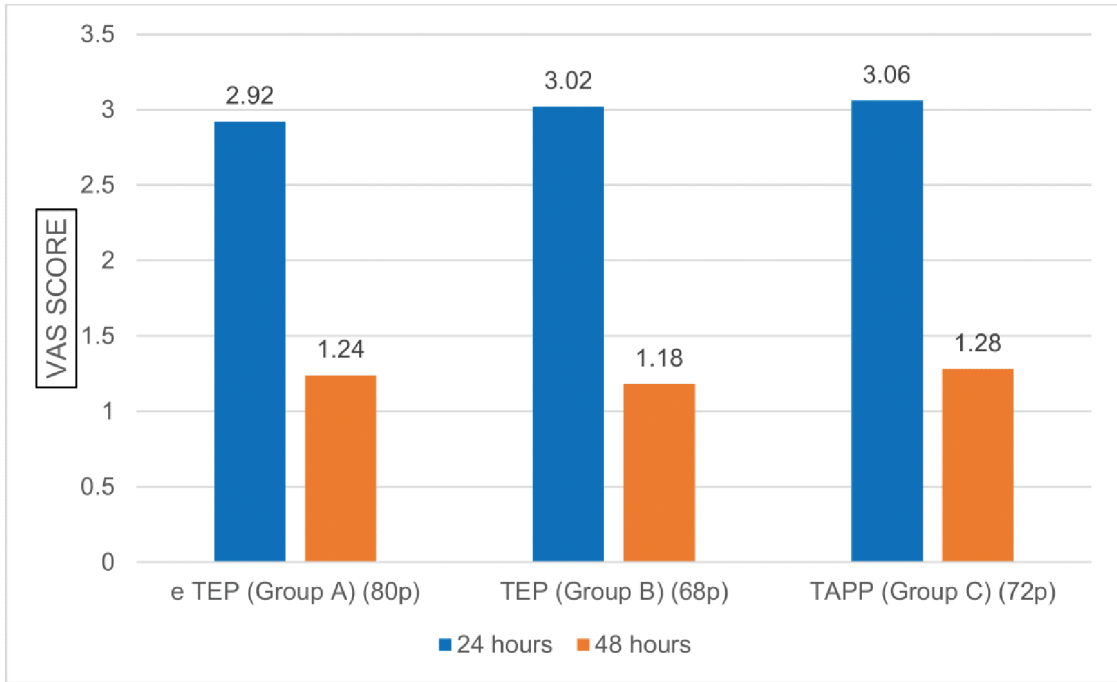
Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal; p, patients; h, hernias; BMI, basal metabolic rate; SD, standard deviation; NS, not significant; S, significant; VAS, visual analog scale; SSI, surgical site infection; TTD, time to discharge.



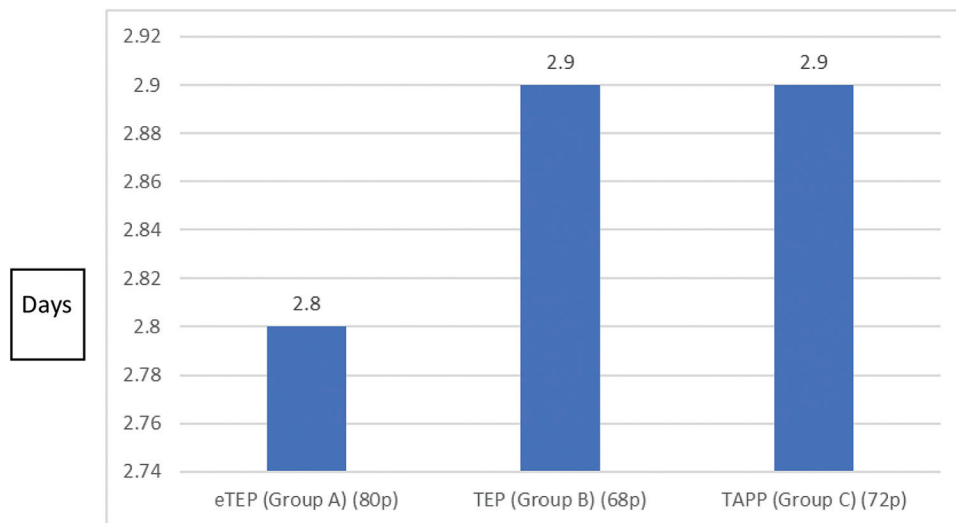
**Figure 1.** Depicting the operating time data for Table 2.

our observation, significant difference was reported in VAS scores with less pain in the eTEP group at all stages,<sup>7</sup> while in the other study pain score was significantly less with eTEP only up to 36 hours postoperatively.<sup>6</sup> Singh et al.<sup>6</sup> have concluded an all-around benefit with eTEP. Talreja et al.,<sup>8</sup> in a one year follow-up study of 100 patients, just infer that for bilateral and recurrent inguinal

hernias, eTEP and TAPP can be used with much ease. Also at odds with our findings, the TTD (time to discharge) was reported as significantly less in eTEP patients.<sup>7</sup> In our follow-up of eTEP patients for recurrence at two years, it was seen in 1/80 patient. One out of 72 patient in the TAPP group also had recurrence at two years. Singh et al.<sup>7</sup> have reported no recurrences at two years.



**Figure 2.** Depicting the comparative VAS scores of eTEP, TEP and TAPP from Table 3.



**Figure 3.** Time to discharge (TTD), in days, representing comparative data from Table 2. The difference was non significant.

### Comparison with Other Reports of Isolated eTEP Repairs

In comparison with other published eTEP reports, our unilateral eTEP operating time ( $41.27 \pm 8.23$ ) was in agreement with that of Daes et al.<sup>3</sup> (38 min). Highly variable operating times for eTEP, have been reported, but all of them are substantially longer than the time

reported by us and Daes et al.<sup>3</sup> These reported operating times vary from 80 min<sup>10</sup> to as long as 180 min<sup>4,5,6,7,9</sup> (**Table 4**). We had 2 (2.5%) conversions from eTEP to TAPP repair. Daes<sup>12</sup> reported 6 (2.1%) conversions to TAPP and Reza<sup>9</sup> in his report, one patient's eTEP was converted to open hernia repair. Other studies did not report any need for conversion because of pneumoperitoneum.<sup>5-7</sup>

**Table 4.**  
eTEP Comparative Studies

Author/Year	Nos	Operating Time (Mins)	Complications	Conversion	Recurrence	Hospital Stay (Days)
Daes, et al. 2012 <sup>3</sup>	36	38	Pneumo = often Seroma = 2 Port Skin slough = 1	0		Same as classical TEP
Cordova, et al. 2018 <sup>4</sup>	20	145	FU: 1–16 mnths Total 4 Seroma = 2	NM	0	1.3
Andrade, et al. 2018 <sup>5</sup>	44	127.4	FU: 6 months 9% pts Uncomplicated seromas = 2 Penile ecchymosis = 1, Retained hematoma requiring drainage = 1	NM	NM	1.2
Sudarshan, et al. 2021 <sup>6</sup>	25	180	Pneumo = 9 Seroma = 2	0		Return to work-9.9 days
Singh, et al. 2022 <sup>7</sup>	25	167.6 ± 32.4	Pneumo = 2	4 (16.0%)	0	1.1 ± 0.3
Reza, et al. 2019 <sup>9</sup>	25	95	Perop: (8%) Peritoneal tear = 2, BW injury = 1 Post op: (12%) SSI = 1 Seroma = 1 Scrotal swelling = 1	1 (4%) To open		2.56
Deshpande and Talwar 2019 <sup>10</sup>	18	80	FU: 3 months NIL			2
Daes, et al. 2014 <sup>11</sup>	94	NM	Seroma = 1 (8 <sup>th</sup> postop day)			NM
Daes, et al. 2016 <sup>12</sup>	276	NM	6 = 2.1% Bladder injury = 1 Self limiting seromas = 5	To TAPP = 6 (2.1%)	2 (0.7%)	NM

Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal, Pts, patients, B/L, bilateral; U/L, unilateral, BW, bladder wall; SSI, surgical site infection; GA, general anesthesia; FU, follow-up; NM, not mentioned.

But two comparative studies reported significantly more incidences of pneumoperitoneum and subsequent conversions to TAPP.<sup>6,7</sup> Postoperative seromas/hematomas were common to all eTEP studies, and reported with variable frequency<sup>3,4,5,6,7,8,9,10</sup> (Table 4). Our seroma rate of 11.25% in the eTEP group would appear to be higher than all the other reported series, but we have already assigned a probable and plausible reason for complete dissection of a large scrotal hernial sac. None of the series reported any intervention in the seromas/hematomas, as all

of them regressed spontaneously, except Daes, who reported draining the seroma in one patient.<sup>11</sup>

#### Comparison with Standard TEP and TAPP Data

Database searches showed that ours is the only study to date comparing the three LIHR procedures, although comparison of eTEP with TEP is available in two studies with very small patient groups.<sup>6,7</sup> So we compared our data for eTEP with earlier studies of TEP and TAPP.

**Table 5.**  
eTEP vs TEP: Comparative Data in Literature

	eTEP Sinha 2022	eTEP Daes et al. <sup>12</sup>	TEP Krishna et al. <sup>13</sup>	TEP Barta et al. <sup>14</sup>	TEP Patel et al. <sup>15</sup>	TEP Tai et al. <sup>16</sup>
Pts/Hernias	80/95 (2 years)	276/307	841/14 years	469	488	54/98
Operating time (min)		38				70.9 ± 23.8
U/L	42.65	–	54.8	55	65.71 ± 19.20	–
B/L	60.66	–	77.9	90	78.98 ± 21.27	–
Total complications	13.75%	2.1%		10.23%	36	7.4%
Pneumo	16 (20%)	Common	NM	NM	NM	1
IEA injury/bleed	1	0	0	(1.07%)	0	0
Seroma/hematoma	11.25% (9)	1.8% (5)	9.5% (80)	1.28% (6)	1.02% (5)	3.7% (2)
Intervention	0	0	0	In all 6 pts	0	0
Visceral injury	0	Bladder-1	0	0	0	0
Recurrence	1	0.7% (2)	0.36% (3)	0.42% (2)	0.61% (3)	0
Conversion to TAPP	2 (2.5%)	6 (2.1%)	81 (6.5%)	5 (1.07%)	2 (0.41)	0
Chronic pain	0	0	1.4%	0	5 (1.02%)	
VAS score	24 <sup>th</sup>	NM		NM	NM	
24 h	2.92 ± 0.277		1.77 ± 1.10			3.4 ± 1.7
48 h	1.24 ± 0.436		3rd month 0.39 ± 0.84.			NM
1 week	1.16 ± 0.374		12th month 0.06 ± 0.20			1.57 ± 2.31
Hospital stay (days)	2.8 ± 1.2	NM	5% stayed 48 hours or more	1	NM	1.7

Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal; Pts, patients; B/L, bilateral; U/L, unilateral, BW, bladder wall; SSI, surgical site infection; GA, general anesthesia; FU, follow-up; IEA, inferior epigastric artery; VAS, visual analog scale; NM, not mentioned.

Our mean operative time for both unilateral eTEP of 42.65 min and 60.66 min for bilateral eTEP was well below the corresponding time periods in other TEP studies<sup>13-16</sup> (Table 5), and TAPP studies<sup>13,14,19</sup> (Table 6). This validates the contention that eTEP does not require a longer operating time.

Among the other perioperative parameters, the commonly occurring accidental pneumoperitoneum following a parietal peritoneal breach and its effect on the completion of the procedure, needs mentioning. We had 16 (20%) breaches in 80 patients of eTEP group, and 18 (26.4%) patients undergoing TEP. Both the incidence of pneumoperitoneum and subsequent conversion to TAPP were significantly more in the TEP patients ( $P = 0.05$  and  $P = 0.027$  respectively) (Table 2). None of the eTEP group patients required conversion because of pneumoperitoneum and the procedure could be completed in all, easily and safely. Incidence of pneumoperitoneum

was reported as 276 in 841 (32.8%) patients undergoing TEP inguinal hernia repair, and with a conversion rate of 4.1% to TAPP and 2.4% to open repair.<sup>13</sup> Barta et al.<sup>14</sup> reported a conversion of TEP to TAPP in five of 469 patients (1.07%). Tai et al.<sup>16</sup> had a peritoneal breach in two of 85 (2.35%) TEP patients.

Formation of seroma/hematoma was observed in nine (11.25%) of our patients in the eTEP group and in 10 of 68 patients (14.70%) in the TEP group. Postoperative seromas have been similarly reported in 80 out of 841 patients of TPE (9.5%)<sup>13</sup> and seven of 85 (8.23%).<sup>16</sup> Very low incidence of postoperative seromas/hematomas, of around 1% or even less have also been reported after TEP.<sup>14,15,17</sup> Comparing our eTEP seroma incidence of 11.25% against TAPP reports, incidence has varied from as low as three of 361 pts (0.83%)<sup>17</sup>, two of 190 (1.05%)<sup>15</sup> to as frequent as 80 of 841 (9.5%)<sup>13</sup> and one of eight patients (12.5%)<sup>14</sup>. Junsheng Li et al.<sup>18</sup> reported only one patient among 195



**Table 6.**  
eTEP vs TAPP: Comparative Data in the Literature

	eTEP Sinha 2022	TAPP Krishna et al. <sup>19</sup>	TAPP Barta et al. <sup>14</sup>	TAPP
Pts/Hernias	80/95	154	8	190
Operating time (mins)				
U/L	42.65	62.6 ± 19.2	70	50.94 ± 12.87
B/L	60.66	93.2 ± 25.2	100	81.11 ± 14.43
Total complications	13.75%		2 (25%)	13 (6.84)
IEA injury/bleed	1	0	0	0
Seroma/hematoma	9 (11.25%)	25 (16.2%)	1 (12.5%)	2 (1.05)
Visceral injury	0	0	0	1 (0.53)
Recurrence	1	1 (0.3%)	0	6 (3.16)
Chronic pain	0	2 (1.29%)	0	4 (2.11)
VAS score				
24 hours	2.92 ± 0.277	1.93 ± 0.64	NM	NM
48 hours	1.24 ± 0.436	NM		
1 week	1.16 ± 0.374	1.75 ± 0.72		
Hospital stay (days)	2.8 ± 1.2	1.05 ± 0.21	1	NM

Abbreviations: eTEP, extended totally extraperitoneal; TEP, standard totally extraperitoneal; TAPP, transabdominal preperitoneal; Pts, patients; B/L, bilateral; U/L, unilateral; BW, bladder wall; SSI, surgical site infection; GA, general anesthesia; FU, follow-up; IEA, inferior epigastric artery; VAS, visual analog scale.

elective inguinal hernias repaired at their center to have had seroma formation. Seromas/Hematomas were managed conservatively across all studies except in Barta et al.<sup>14</sup> where intervention was reported in all patients. In our patients too, all the seromas/hematomas regressed spontaneously, the longest one took eight weeks. Other complications mentioned were occasional (**Table 5** and **6**).

The incidence of pain at 24 hours, 48 hours, and 7 days among our patients in all the three groups, showed no significant difference (**Table 3**). Our reported VAS scores for pain after eTEP were 2.92 ± 0.277 at 24 hours, 1.24 ± 0.436 at 48 hours, and 1.16 ± 0.374 at one week was higher compared to a much lower VAS score of 1.77 ± 1.10 at 24 hours reported by Krishna et al.<sup>13</sup> They further reported VAS scores of 0.39 ± 0.84 at three months and 0.06 ± 0.20 at 12 months after TEP. Tai et al.<sup>16</sup> reported higher VAS scores than ours of 3.4 ± 1.7 at 24 hours and 1.57 ± 2.31 at one week for TEP. Krishna et al.<sup>19</sup> also reported VAS scores of 1.93 ± 0.64 at 24 hours and 1.75 ± 0.72 at one week after TAPP repair. Use of pregabalin as premedication in many our patients, based on an earlier study,<sup>20</sup> may be responsible for attenuating the postoperative pain.

The mean hospital stay in all three groups was similar at 2 – 3 days. Our mean hospital stay for eTEP group was 2.8 ± 1.2 days. Studies on eTEP report almost the same mean hospital stay time. Cordova et al.<sup>4</sup> and Andrade et al.<sup>5</sup> reported 1.3 days and 1.2 days, Deshpande et al.<sup>10</sup> reported 2 days, and Reza et al.<sup>9</sup> reported 2.56 days. There was a single comparative study reporting significantly less hospital stay time after eTEP compared to TEP.<sup>7</sup> Hospital stay in other TEP and TAPP studies, has been variously quoted as one day by Barta et al.<sup>14</sup> for both TEP and TAPP, 1.7 ± 0.8 days by Tai et al.<sup>16</sup> for TEP, and a reported 5% of 841 patients staying for longer than 48 hours by Krishna et al.<sup>13</sup> for TEP. For TAPP, Krishna et al.<sup>19</sup> reported a hospital stay of 1.05 ± 0.21 days.

## CONCLUSION

Our comparative study of the three LIHR options does not offer any significant peroperative or postoperative advantage of eTEP over TEP or TAPP. Also, on comparison of our eTEP data with data of other TEP and TAPP studies there are no disadvantages. There are distinct technical advantages of

eTEP, which often may not lend to easy objective assessment. Namely, the relatively easy creation of a large preperitoneal space which results in more ergonomic instrument manipulation. eTEP can be completed without hindrance, even after a peritoneal breach induced pneumoperitoneum, and repairing the peritoneal breach is easy. A large direct defect can be obliterated by tacking or stitching a large, inverted sac to the under surface of the abdominal wall more easily than in TEP. Because of the large preperitoneal space both learning and teaching this procedure is much easier than TEP. eTEP thus offers the advantages of both TEP and TAPP, namely it is totally preperitoneal like TEP and offers a large working space as in TAPP. But in the absence of any significant advantage with eTEP, it cannot be offered as a replacement or as the preferred method of LIHR. Its value remains as another method of LIHR. The final choice should be the surgeon's, based on their expertise and comfort level with either of the LIHR methods.

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