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COMPARATIVE STUDY BETWEEN LAPAROSCOPIC TOTALLY EXTRA PERITONEAL (TEP) MESH REPAIR AND LAPAROSCOPIC TRANS ABDOMINAL PREPERITONEAL (TAPP) MESH REPAIR

General Surgery

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ABSTRACT

AIM: To compare the following parameters between the two commonly performed methods of laparoscopic repair , namely TEP vs TAPP in terms of intra operative parameters and postoperative parameters.

MATERIALS AND METHODS: The comparative study was done on patients who presented to Department of Surgery, Maharani Laxmi Bai Medical College, Jhansi, either in emergency or the OPD and subsequently underwent TEP vs TAPP from August to September 2020. All patients admitted at Maharani Laxmi Bai Medical College who met the inclusion and exclusion criteria were taken up for the study, on the basis of purposive sampling.

RESULTS: A total of 100 cases were studied and there were 50 patients in each group (Group A TAPP procedure and Group B underwent TEP procedure).

CONCLUSION: Advantages and disadvantages of both the technique varies, in that, TEP may require specialized equipments and there is an increased risk of bleeding when dissecting the pre-peritoneal space TAPP technique has the advantage of increased work space to maneuver the laparoscopic instruments but presents an increased risk of injury to abdominal organs.

KEYWORDS

Laparoscopic hernia repair, TEP, TAPP, inguinal hernia

INTRODUCTION

Laparoscopic groin hernia repair can be done by transabdominal pre-peritoneal (TAPP) approach and also by total extra peritoneal (TEP) approach. The choice of approach to the laparoscopic repair of inguinal hernia is controversial because of scarcity of data comparing the two approaches and some questions remain unanswered about their relative merits and risks. TAPP requires access to the peritoneal cavity with placement of a mesh through a peritoneal incision. The mesh is placed in the pre-peritoneal space covering all potential hernia sites in the inguinal region. The peritoneum is then closed above the mesh. TEP is different in that the peritoneal cavity is not entered and mesh is used to seal the hernial defect from outside the peritoneum. TEP is also thought to reduce post-operative pain. Indirect comparisons between TAPP and TEP have raised questions about whether the two procedures do perform differently for some outcomes such as recurrence.

While any conclusions drawn on such indirect comparisons should be treated with caution, they do raise questions that can only be satisfactorily addressed by well designed studies and systematic reviews of such studies that directly compare TAPP with TEP[1].

AIMS AND OBJECTIVES

The objective of the study was to compare the following parameters between the two commonly performed methods of laparoscopic repair , namely TEP vs TAPP in terms of intra operative parameters and postoperative parameters.

Intraoperative Parameters

- Operating time.
- Difficulty in procedure.

Postoperative Parameters

- Pain
- Short term pain
- Long term pain (after discharge)

MATERIALS AND METHODS

The comparative study was done on patients who presented to Department of Surgery, Maharani Laxmi Bai Medical College, Jhansi, either in emergency or the OPD and subsequently underwent TEP vs TAPP from August to September 2020. All patients admitted at Maharani Laxmi Bai Medical College who met the inclusion and exclusion criteria were taken up for the study, on the basis of purposive sampling.

Sample size of 100 patients

Group A (50) Patients of TEP repair.
Group B (50) Patients of TAPP repair

After getting informed consent for either of the procedures, the patients were investigated and randomly assigned to either of the 2 groups after matching for age, sex and size of hernia (bubonocele, funicular/scrotal).

Pre operative evaluation included ECG, pulmonary function tests and ultrasound of abdomen and pelvis.

TEP and TAPP were performed under spinal/epidural anesthesia or general anesthesia. The steps were the standard steps as described in standard textbooks.

Post operative management was done as per the protocol. Follow up was done for a period of eighteen months following surgery as follows. One week after surgery, once a month for three months and every six months for 18 months after surgery .

At the end of the study comparison was made between TEP and TAPP method as described under aims and objectives.

INCLUSION CRITERIA:

1. Patients diagnosed as having inguinal hernia aged 18 years and above who gave a valid informed written consent.
2. Patients with unilateral or bilateral inguinal hernia.
3. Patients with recurrent inguinal hernia.

EXCLUSION CRITERIA:

1. Patients with strangulated/obstructed inguinal hernia.
2. Patients with failed laparoscopic repair of inguinal hernia.
3. COPD and cardiac decompensation.
4. Patients deemed unfit for general and regional anaesthesia.ASA >3.

Postoperative assessments were- assessment of pain, any postoperative complications, hospitalization and discharge time.

Post operative pain:

Accurate pain assessment is a prerequisite for successful pain management as well as for study. The American Pain Society emphasizes the importance of obtaining the patients self report of pain as the gold standard of pain assessment. There are various pain scores to measure post operative pain.

The pain scores used in our study were —
1. Visual analogue scale (VAS)
2. Faces pain scale (FPS)

Visual analogue scale (vas)
Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end, as illustrated in Figure. The patients marked on the line, a point that they feel represented their perception of their state of pain. The VAS score is determined by measuring in millimeters from the left hand end of the line to the point that the patients marks.

No Pain 1 ——————— Very severe pain

Statistical analysis:
Descriptive statistical analysis was carried out to present the data in the current study. Results on continuous measurements were presented with Mean and standard deviation and results on categorical measurements were presented in number and percentages.

Significance was assessed at 5% level of significance. Student t test (two tailed, independent) was used to find the significance of study parameters on continuous scale between two groups. Chi-square/ fisher's exact test were used to find the significance of study parameters on categorical scale between the two groups.

The statistical software SPSS version 17.0 was used for the analysis of the data and Microsoft word and Excel were used to generate graphs and tables.

RESULTS

Table 1: Age distribution in study groups

Age (in years)	Group A (TAPP) (N=50)		Group B (TEP) (N=50)	
	Number of patients	Percentage	Number of patients	Percentage
18-30	17	34.00%	13	26.00%
31-40	5	10.00%	13	26.00%
41-50	6	12.00%	7	14.00%
51-60	8	16.00%	7	14.00%
>60	14	28.00%	10	20.00%

Table 2: Mean age distribution in study groups

Group A (TAPP)	Group B (TEP)	p value
Mean±SD	Mean±SD	
45.56±19.223	43.24±16.712	0.5211 **(NS)**

Table 3: Presenting complaint in study groups

Presenting complain	Group A (TAPP) (N=50)		Group B (TEP) (N=50)	
	Number of patients	Percentage	Number of patients	Percentage
Pain (50)	17	34.00%	06	12.00%
Buldge (50)	50	100%	23	100%
Fullness (50)	00	0.00%	00	0.00%

Table 4: Preoperative diagnosis in study groups

Preoperative diagnosis	Group A (TAPP)		Group B (TEP)	
	Number of patients	Percentage	Number of patients	Percentage
Bubonocele	31	62.00%	32	64.00%
Funicular	13	26.00%	12	24.00%
Scrotal	09	18.00%	07	14.00%

Table 5: Mean VAS Pain scale in study groups

Mean VAS pain scale	Group A (TAPP) (N=50)	Group B (TEP) (N=50)	p value
	Mean±SD	Mean±SD	
12 hours	36.6±7.982	34.6±6.746	0.1791 **(NS)**
24 hours	29±8.391	28.80±7.183	0.8979 **(NS)**
36 hours	21.6±7.384	17.40±6.642	0.0035 **(S)**
48 hours	13.6±4.849	11.40±3.505	0.0108 **(S)**

Table 6: Intraoperative complication in study groups

Intraoperative complication	Group A (TAPP) (N=50)		Group B (TEP) (N=50)	
	Number of patients	Percentage	Number of patients	Percentage
Bleeding	02	04.00%	03	6.00%
SAC adhesion	01	02.00%	00	0.00%

Table 7: Mean duration of hospital stay (in days) in study groups

Group A (TAPP)	Group B (TEP)	p value
Mean±SD	Mean±SD	
2.91±0.668	2.72±0.834	0.2116 **(NS)**

Table 8: Post-op Complication in study groups

VAS pain scale	Group A (TAPP) (N=50)		Group B (TEP) (N=50)	
	Number of patients	Percentage	Number of patients	Percentage
Seroma	02	04.00%	03	6.00%
Chronic Pain	02	04.00%	01	2.00%
Recurrence	00	0.00%	00	0.00%
Wound infection	00	0.00%	00	0.00%

Table 9: Mean operating time (in minutes) in study groups

Group A (TAPP)	Group B (TEP)	p value
Mean±SD	Mean±SD	
34.70±14.332	38.50±11.475	0.1465 **(NS)**

Table 10: Mean time taken to return to work in study groups

Group A (TAPP)	Group B (TEP)	p value
Mean±SD	Mean±SD	
6.43±1.409	7.40±2.424	0.0162 **(S)**

DISCUSSION

The most important approaches to laparoscopic inguinal hernia repair are the TAAP and TEP techniques which vary in their approach to the inguinal defect. Of great importance when comparing these two techniques is the difficulty or ease to accomplish them. Comparison is highly subjective and difficult to carry out due to the fact that such a parameter cannot be clearly defined and depends on multiple variables such as ease of access to the operative field, preperitoneal space creation, type of hernia, frequency and severity of iatrogenic injury to surrounding structures and difficulties encountered during mesh placement.

The corner-stone, to which the success rate of a laparoscopic hernia repair depends, is the creation of an adequate work space for a safe dissection and fast management of intraoperative accidents. How one achieves this is one of the important factors when comparing these two techniques. The use of a special balloon to dissect the preperitoneal space increases the cost of the TEP technique but it decreases the operative time and risk of bleeding. The balloon is not mandatory for this technique as one can use a telescope to dissect but this increases the difficulty of the procedure. One needs to obtain a proper space to work in order to correctly identify the anatomical landmarks.

A total of 100 cases were studied and there were 50 patients in each group (Group A TAPP procedure and Group B underwent TEP procedure). The mean duration of follow up was 5 months, hernia diagnosis was confirmed by clinical examination and the procedures were carried out in the surgical unit of Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh.

The age group of patients in our study varied from minimum 18 to a maximum of 76 year in TAPP and 19 to a maximum of 76 year in TEP with mean age of 45.56±19.223 in TAPP and 43.24±16.712 as the mean age in TEP. There were no significant difference in the mean age of the two groups in our study. All the 100 people in the study were male patients.

All the 100 patients presented with complaints of bulge in the inguinal region. Out of the 100 cases 23 cases had pain as the presenting complaints, of which 17 underwent TAPP and 6 underwent TEP procedure.

Among the two groups the clinical presentation did not vary much, out of the 50 patients who underwent TAPP surgery (Group A) 31 (62%) were bubonocele, 13 (26%) patient had funicular hernia and the rest 9 (18%) were scrotal hernias. In this group 5 patients had bilateral inguinal hernia. In Group B who underwent TEP surgery 32 (64%) had

bubnocele, 12 (24%) had funicular and 7 (14%) had scrotal hernia. This group included 1 patient who had bilateral hernia.

Intraop complications:

Vascular injuries are of utmost importance in laparoscopy due to the restricted space to stop the bleeding. Inferior epigastric artery injury is reported more commonly in the TEP technique than TAPP with an incidence of 0.3% (13,14). The inferior epigastric artery serves as a landmark to differentiate direct from indirect hernia and for the dissection of the hernia sack. In laparoscopy the chances to encounter this complication are greater than in open hernia repair. One can injure the inferior epigastric artery in TEP when the sack is being prepared or the tacks are applied to the artery wall. In the TAPP technique, the risk to injure the inferior epigastric artery is the greatest when the peritoneal flap is created.

The primary blood supply to the deep anterior abdominal wall is from the inferior epigastric artery, a branch or the external iliac artery. Laparoscopically, the most commonly injured vessels include the inferior epigastric and external iliac vessels.

During mesh fixation, the vessels may be difficult to visualize and gets injured through placement of tack or staple less likely an inadvertent instrument injury during dissection can occur, leading to oozing or frank extravasation of blood.

A vascular injury may go unnoticed as trocar can tamponade bleeding.

However, once the trocar is removed, a significant amount of blood can be lost. An indication of a significant vessel injury may include dripping of the blood along the length or the trocar.

Smaller vessels within the operative field usually respond to direct compression. The surgeon should be wary of the temponading effect of pneumoperitoneum. If the pressure of the insufflated effect of carbon dioxide is greater than the pressure within the vessels, bleeding will not be manifested until pneumoperitoneum is released. Such a situation if often seen with rectus sheath hematomas, where injury to the inferior epigastic vein results in a delayed presentation, patient will present with significant diffuse pain and possible hypotension. Less severe vascular complication include trocar site and rectus sheath hematomas. Similar to open repair extensive dissection or injury to small vessels within the groin will lead to operative site hematomas and that may extend in to the scrotum.

Haematoma may present as a localized collection or diffuse bruising over the operative site. Injury to the corona mortis or iliac vessels may present as a progressively expanding haematoma. Expansion of blood within the peritoneum or preperitoneal space is not tamponaded and may lead to a significant blood loss that is not readily apparent on physical examination. The management of wound haematomas is expectant, yet they may rarely need to be opened for decompression.

Initial management of vascular injury required local compression, definitive treatment may require conversion to open surgery especially if a major vascular injury has occurred. Otherwise the injury may be treated by laparoscopic clipping and division, depending on the skills of the surgeon. Inferior epigastic vessels may also be ligated with use of a percuteneous suture.

Bleeding was encountered in 2 (4%) out of 50 patients who underwent TAPP procedure and 3 (6%) out of 50 patients who underwent TEP procedure.

Bleeding occurred both in TEP and TAPP In the case of TEP, the extraperitoneal space is markedly narrower than the abdominal space and impairs visibility when using current for TEP dissection. Hence in TEP to avoid the use of current and perform dissection without current, using pulling and counterpulling technique, while tearing the connective tissue that bridges between the anatomic structures. That inevitably results in a higher rate of bleeding. Therefore, current may be used for dissection to reduce the bleeding rate.. But extreme care must be exercised when using current at the level of the peritoneum because this can cause adhesions to the intestines as well as thermal damage.

E. L. Felix et al (1995)[3], R Van Hee et al[4] (2020) and M. Lepere et al (2000)[5] reported no vascular injuries.

N Khoury et al (1995)[2] reported higher rate of vascular injuries in TEP than TAPP.

Adrian Tulin et al (2019)[13] reported 1 cases of out of 13 TEP cases to have troublesome bleeding, which was encountered when dissecting the Retzius space in the TEP technique. They also reported other sources of bleeding were the "corona mortis"vascular anastomosis and inferior epigastric artery. The bleeding vessel was clipped in their study.

Study	Percentage of vascular injury in TAPP	Percentage of vascular injury in TEP
E. L. Felix et al (1995)[3]	0%	0%
M. Lepere et al (2000)[5]	0%	0%
R Van Hee et al (2020)[14]	0%	0%
N Khoury et al (1995)[2]	0%	3%
B J Leibl et al (2005)[6]	0.5%	0%
Our study	0%	0%

Accidental pneumoperitoneum:

During the course of TEP procedure an inadvertent rent may result in the peritoneum leading to loss of working space. Usually the intra abdominal and preperitoneal pressure will equilibrate with no loss of exposure, however if the preperitoneal space becomes limited from billowing of the peritoneum, the peritoneum may be closed using an endoloop. Alternatively the operation can be converted to a TAPP or an open procedure. The tears in the peritoneum should be repaired before conclusion of the operation to prevent mesh erosion or bowel obstruction.

It has been suggested by Zhang et al[19] that the incidence of peritoneal tears may be decreased by a medial approach to dissection of the preperitoneal space when compared to the lateral approach in TEP procedure.

The true incidence of pneumoperitoneum has not known but has been reported to be between 8% to 70% in various studies.

In our study, 3 cases of accidental pneumoperitoneum were encountered in the 50 cases of TEP procedure.

Study	Percentage of pneumoperitoneum in TEP
Adrian Tulin et al (2019)[13]	15.38%
Tariq Nawaz Malik et al (2015)[9]	8.33%
Our study	6%

R V Cohen et al (1998)[4] 4%, E. L. Felix et al (1995)[3]1.8% and R Van Hee et al (1998)[14] 7% showed conversion of TEP to TAPP due to peritoneal tears.

N Khoury et al (1995)[2] showed no conversion of TEP or TAPP procedure due to peritoneal tears

Study	Percentage of TEP converted to TAPP
R V Cohen et al (1998)[4]	4%
E. L. Felix et al (1995)[3]	1.8%
R Van Hee et al (2020)[14]	7%
N Khoury et al (1995)[2]	0%
Our study	0%

Visceral injuries:

The risk of visceral injury in inguinal hernia repair was limited to hernia emergencies and sliding hernias when inguinal hernia were approached with an open anterior approach. The advent of laparoscopic inguinal hernia repair, coupled with steep learning curve, initially increase the rate of visceral injury significantly. Increased experience and training have decreased the rates. Furthermore by using the TEP approach, the intra abdominal environment is avoided and subsequently, visceral injury is reduced. Viscera at risk include small and large bowel as well as bladder. Previous lower abdominal surgeries may predispose to adhesion and thereby increase the risk of visceral injuries. A past surgical history is a relative contraindication to laparoscopic inguinal hernia repair. Bowel injury also result during the course of trocar placement.

If a bowel injury is suspected the entire bowel should in inspected possibly necessitating a conversion to open if repair is required.

Bladder injuries must be repaired in several layers with prolonged

catheterization. Preoperative prophylactic catheterization or patient directed bladder emptying may be performed for laparoscopic cases. Which decompresses the bladder therefore places it away from contiguous structures such as coopers ligament and spermatic cord. Incomplete voiding secondary to benign prostatic hypertrophy may however necessitate catheterization.

N Khoury et al (1995)[2] and R Van Hee et al (2020)[14] reported no visceral injuries.

R V Cohen et al (1998)[4] (0.9% vs 0%) and E. L. Felix et al (1995)[3] (0.4% vs 0%) reported higher visceral injuries in TAPP then TEP.

No visceral injury (bladder, bowel) were encountered in our study.

Study	Percentage of visceral injury in TAPP	Percentage of visceral injury in TEP
N Khoury et al (1995)[2]	0%	0%
R Van Hee et al (2020)[14]	0%	0%
R V Cohen et al (1998)[4]	0.9%	0%
E. L. Felix et al (1995)[3]	0.4%	0%
Our study	0%	0%

The classical TEP technique is an laparoscopic technique ideal for inguinal hernia repair, but the technique has several drawbacks such as limited space for dissection and mesh placement, restricted port placement, a low tolerance of accidental pneumoperitoneum, and difficulty in teaching and learning the technique. These disadvantages may explain the low implementation of the technique outside the circle of experts.

Now there is an extended-view modification of the TEP procedure, the eTEP technique, which overcomes several of these drawbacks. The eTEP technique is based on the premise that the extraperitoneal space can be reached from almost anywhere in the anterior abdominal wall. The eTEP approach can quickly and easily create an extraperitoneal space, enlarge the surgical field, provide a flexible port setup adaptable to many situations, allow easy parietalization of the cord structures (proximal dissection of the sac and peritoneum), ease the management of the distal sac in cases of large inguinoscrotal hernias, and improve tolerance of pneumoperitoneum, which is a common complication. The eTEP can expand the traditional indications of the extraperitoneal approach to patients with difficult body habitus, a short umbilicus-pubis distance, and previous pelvic surgery, and as experience is gained, the indications for traditional TEP can expand to more complex cases.

Post operative data:

Seroma:

A seroma is a loculated fluid collection more commonly seen following prosthetic repairs, although seroma may result following repair of large hernias. Seroma may be acute or chronic, acute seroma usually develop during the first week postoperatively. When the seroma persist for a longer period, a chronic seroma may develop due to fibrous encapsulation. The reason for this is largely unknown. Interruption of lymphatic flow and shear forces between the tissue layer where suggested as the contributing factors for the development of a chronic seroma. A chronic seroma usually requires a complete surgical excision.

It is perceived that the body attempts to encapsulate the foreign body though a normal reaction. In the case of large hernia sac the potential space that remains in the defect may fill with the physiological fluid postoperatively. Seroma will usually developed within the 1st week and may cause concern for the patient, who may perceive it as an early recurrence. Physical examination of the seroma will demonstrate a compressible buldge in the groin or scrotum. Seroma may be painful but are more likely uncomfortable. Aspiration the seroma should be avoided unless it persists over a prolonged period because infection may be secondarily introduced. Warm compression may aid in resolution.

Lau et al (2003)[16] found that significant clinical factors were associated with seroma formation including old age, large hernia defects, an extension of the hernia into the scrotum and the presence of a residual distal indirect sac.

E. L. Felix et al (1995)[3], N Khoury et al (1995)[2] and R Van Hee et al (2020)[14] have reported no seroma formation.

Weiser HF et al (2000)[17] showed 0.2% seroma in TAPP vs 0% seroma in TEP.

In our study seroma in the inguinal region was encountered in 5 patients post operatively of which 2 (4%) patients had undergone TAPP and 3 (6%) patients had undergone TEP procedure.

Study	Percentage of seromaformation in TAPP	Percentage of seroma formation in TEP
K McCormack et al (2005)[1]	3.5%	0%
Weiser HF (2000)[17]	2%	0%
E. L. Felix et al (1995)[3]	0%	0%
R Van Hee et al (2020)[14]	0%	0%
Our study	4%	6%

Sac adhesions have not be mentioned in most of the studies we found sac adhesion in 1 (2%) out of all 100 cases who had underwent TEP or TAPP procedure and we speculate that this could be a cause of seroma formation because of the dissection required to separate the sac adhesions.

Pain:

Postoperative pain is an extremely important consideration in that many hernias present preoperatively without pain as a symptom. Post operative pain can be sub classified as short term or chronic. Chronic post hernioplasty pain last beyond 3 months and result secondary to nerve entrapment or mesh adherence.

Nerve injury during laparoscopic hernia repair may cause considerable and often persistent post operative pain. The anatomical danger zone of pain is referred to as the triangle of pain or the electrical hazard zone. The medial border is constant and is formed by the internal spermatic vessels. The lateral and inferior border are nebulous as the entire space lateral to the internal spermatic vessels where critical nerves pass is included. The triangle contains the lateral femoral cutaneous nerve, the femoral branch of genitofemoral nerve and the femoral nerve. Avoidance of electro surgical energy, dissection, or application of staples within the triangle is crucial to avoid nerve injury or entrapment. The genitofemoral nerve and lateral femoral cutaneous nerve is especially at risk during laparoscopic hernia repair.

Regardless of the etiology or the specific nerve injured, patient will usually present with common symptom such as sharp localized pain, paresthesia or numbness over the cutaneous distribution of the affected nerve.

Injury of the lateral femoral cutaneous nerve will lead to meralgia paresthetica, a "pain and needle" sensation over the lateral aspect of the thigh, it also may be associated with specific paresthesia known as formication, a sensation of insects crawling on or under the skin

The pain scores were recorded at 12 hours, 24 hours, 36 hours and 48 hours. Post operatively using the visual analogue scale for pain assessment.

During 12 and 24 hours there were no significant difference in the pain scale or both the procedures. But during the 2nd post operative day at 36 hours and 48 hours there was a significant reduction in the pain scale of the TEP group as compared to the TAPP group of patients. Chronic pain was present in a total of 3 patients of which 2 (4%) from TAPP and 1 (2%) from TEP procedure.

Sudarshan P.B. et al (2017)[10] showed no significant difference on the pain scale in both procedures. Tariq Nawaz Malik et al (2015)[9] study showed a slight higher pain scale in case of TAPP compared to TEP.

Study	Acute postoperative pain [TAPP vs TEP]	
	12 hrs	24hrs
Komal B. Gurung et al (2018)[12]	Not studied	2.25 vs 1.92 p=0.015
Virinder Kumar Bansal et al (2020)[15]	Not studied	1.93 vs 1.77 p=0.001
Rambhia et al (2017)[18]	2.19 vs 2.44 P=0.078	2.28 vs 1.78 p=0.036
Asuri Krishna et al (2011)[7]	Not studied	1.83 vs 1.09 p= 0.007
Our study	36.6 vs 34.6 p=0.1791	29 vs 28.80 p=0.8979

Study	Chronic postoperative pain [TAPP vs TEP]
Komal B. Gurung et al (2018)[12]	**1.30 vs 1.12 p=0.25**
Asuri Krishna et al (2011)[7]	1.28 vs 1.09 p=0.001
Virinder Kumar Bansal et al (2020)[15]	1.46 vs 1.27 p=0.002
Our study	4% vs 2%

Operating time:

The mean operating time in minutes in TAPP was 34.70±14.332 minutes and in TEP it was 38.50±11.475minutes in our study.

There was no significant difference in the operating time between both the TAPP and TEP procedures.

However it may take >30 procedure to become an expert in the laparoscopic surgery. Our findings were comparable with the study by Dr. Siva Shankar Rao et al which also showed no significant difference in the operating time. Adrian Tulin et al (2019)[13], K MC Cormack et al(2005)[1] and F. Kockerling et al(2015)[8] also showed no significant difference in the operating time.

Study	Mean operative time in TAPP (In minutes)	Mean operative time in TEP (In minutes)
K McCormack et al (2005)[1]	46±9.2	52.3±13.9
F Köckerling et al (2015)[8]	48.53±21.5	52.6±23.5
Tariq Nawaz Malik et al (2015)[9]	70±6.01	45.1±3.54
Our study	34.70±14.332	38.50±11.475

Length of hospital stay:

The mean duration of hospital stay in the TAPP group was 2.91±0.668 days and in the TEP group was 2.72±0.834 days. suggesting no significant difference in the length of hospital stay in the two group of patients in our study. Patients were discharged from hospital at an average of 3 days in both groups of patients.

Adrian Tulin et al (2019)[13], Tariq Nawaz Malik et al (2015)[9] and F. Kockerling (2015)[8] also showed no significant difference in the length of hospital stay.

	Mean length of hospital stay in TAPP (in days)	Mean length of hospital stay in TEP (in days)
K McCormack et al (2005)[1]	3.75±1.4	4.4±0.9
F Köckerling et al (2015)[8]	1.93±2.2	1.8±2.19
Adrian Tulin et al (2019)[13]	2.4±1.2	1.8±0.8
Sudarshan P. B. (2017)[10]	4.5	3.5
Our study	2.91±0.668	2.72±0.834

Time to return work:

In our study, the mean time taken to work was significantly less in the TAPP group, with a mean of 6.43±1.40days, as compared to TEP group of patients had a mean of 7.40±2.42days to return to work.

Tariq Nawaz Malik et al (2015)[9] showed no significant difference in time taken return to work.

Study	Mean time taken return to work in TAPP (in days)	Mean time taken return to work in TEP (in days)
K McCormack et al (2005)[1]	4.9±0.7	4.6±0.6
Our study	6.43±1.40	7.40±2.42

CONCLUSION

- Both TEP and TAPP are feasible options to treat inguinal hernia; despite the long learning Curve needed.
- There appears to be no significant difference between TEP and TAPP in terms of operating time, length or stay in hospital, time take to return to work.
- Both the technique can be carried out with a very low rate or predominantly harmless complication, in an acceptable duration of operation.
- Now a days the incidence of serious visceral and vascular complication are very rare. The complications rate can further be reduced through continuing training, accretion of knowledge and also improvement or the surgical techniques.
- Advantages and disadvantages of both the technique varies, in that, TEP may require specialized equipments and there is an increased risk of bleeding when dissecting the pre-peritoneal space TAPP technique has the advantage of increased work space to maneuver the laparoscopic instruments but presents an increased risk of injury to abdominal organs.

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