

Original Article**Transabdominal Pre-Peritoneal Versus Totally Extraperitoneal Laparoscopic Techniques for Inguinal Hernia Repair in Eastern Nepal**

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Article Received: 14th September, 2023; Accepted: 28th November, 2023; Published: 31st December, 2023DOI: <https://doi.org/10.3126/jonmc.v12i2.61346>**Abstract****Background**

Inguinal hernia is one of the most common surgical problems in the world, with a high risk in men. The treatment modalities have evolved from open to laparoscopic procedures. Laparoscopic procedures are getting attention and widespread utilization among surgeons. The choice between the two procedures is still a debate between the surgeons. This study aims to compare the transabdominal pre-peritoneal approach to the totally extraperitoneal approach in its perioperative outcomes.

Materials and Methods

A prospective analytical study was conducted on 86 adult patients, who underwent laparoscopic inguinal hernia reduction between June 2022 to June 2023 at Nobel Medical College Teaching Hospital in Biratnagar, Nepal. The patients were randomized into two groups of 43 participants each and were analyzed on different variables.


Results

All of the 86 patients included in the study were male. Among them, 30.23% of patients had direct inguinal hernia. There were 12.79% of patients with bilateral hernias. There was a statistically significant difference in the duration of operation among the patients undergoing totally extraperitoneal and transabdominal preperitoneal hernia repair. Total duration of hospital stay was shorter in totally extraperitoneal and postoperative pain was slightly lesser in totally extraperitoneal procedure. The intraoperative and postoperative complications among totally extraperitoneal and transabdominal preperitoneal hernia repair were comparable. There was no conversion to open procedure or recurrence of hernia during the study period. The return to daily life took longer in the transabdominal preperitoneal procedure than in the totally extraperitoneal hernia repair.

Conclusion:

Totally extraperitoneal hernia repair has an advantage over transabdominal preperitoneal hernia repair in terms of shorter operative time, postoperative pain, duration of hospital stays and return to daily life.

Keywords: *Inguinal hernia, Laparoscopic Surgery, Fixation*

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Citation

Adhikari D, Bhattarai A, Parajuli B, Mehta AK, Yadav DK, Poudel S, Transabdominal Pre-peritoneal Versus Totally Extraperitoneal Laparoscopic Techniques for Inguinal Hernia Repair in Eastern Nepal, JoNMC. 12:2 (2023) 60-65. DOI: <https://doi.org/10.3126/jonmc.v12i2.61346>



Introduction

It is estimated that over 20 million inguinal hernia cases are repaired every year [1]. With a lifetime risk as high as 27% for men and 3% for women, inguinal hernia is one of the most resource-consuming conditions worldwide [2]. The highest percentage of inguinal hernia is observed in infants – congenital inguinal hernia [1]. In the adult population, inguinal hernia occurrence is based on the patient and several external risk factors. Patient factors include male gender, old age, patent processus vaginalis, low BMI, connective tissue disorders, and several other factors. The external risk factors include factors that increase intraabdominal pressure such as coughing, and daily heavy lifting, and other factors such as smoking which increases the recurrence of hernias [3]. Surgical repair is the most accepted form of treatment for inguinal hernia. Various types of inguinal hernia repair are performed varying from Shouldice repair, and Lichtenstein mesh repair to recent advances laparoscopic repair such as Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) hernia repair techniques [4, 5].

The laparoscopic techniques have both been compared to open techniques in multiple studies and it is now well-known that laparoscopic techniques are associated with longer operative time, and a longer learning curve for the surgeons however, there are fewer complications, less postoperative pain, and a quicker recovery to normal life [4, 6]. The choice between the two laparoscopic techniques remains a dilemma for surgeons, as both have their advantages and disadvantages. This study aims to compare the outcomes of TEP and TAPP repair in terms of operative time, hospital stay, postoperative pain, short-term complications, conversion to open repair, patient satisfaction, recurrence of hernia and to find the optimal laparoscopic technique among the two for inguinal hernia from the outcomes.

Materials and Methods

This study was conducted at Nobel Medical College Teaching Hospital in Biratnagar, Nepal. This is a prospective analytical study of hospital patients undergoing elective inguinal hernia repair from June 2022 to June 2023. Ethical approval was obtained from IRC Nobel Medical College teaching hospital, Biratnagar. All patients over the age of 18 years, with a diagnosis of inguinal hernia were included in the study. The patients with an irreducible hernia, strangulated

hernia, femoral hernia, incarcerated hernia, recurrent inguinal hernia, history of lower abdominal surgery, coagulopathy, severe cardiovascular or cerebrovascular diseases, severe liver, kidney, and lung disorders, and patients who could not tolerate pneumoperitoneum or general anesthesia were excluded from the study.

The sample size was calculated using the formula, $n = (z)^2 p (1 - p) / d^2$. Given, that the confidence level (z) at 95% is 1.96 prevalence of recurrence is 10% [11]. The margin of error (d)=9%. Substituting these values into a formula gives the value of 42.72. So, the desired minimum sample size is 43 in each group.

All patients who met the inclusion criteria were included in the study. To ensure fairness and minimize bias, patients were randomly assigned to either the TEP or TAPP group using a simple randomization method. This involved dividing the patients into two groups of 43 each as they presented to our outpatient clinic and assigning them to a group based on the outcome of a coin toss.

The outcomes were measured in terms of operative time, duration of hospital stay, postoperative pain, short-term complications, conversion to open repair, patient satisfaction in return to normal daily life, and recurrence of the hernia.

Statistical analysis was done using SPSS software version 26®. Results on continuous measurements were presented with mean and standard deviation and results on categorical measurements were presented in numbers and percentages. Appropriate statistical tests were used for statistical analysis. A probability value of $p < 0.05$ was declared statistically significant.

Regarding the surgical technique of TAPP, following the establishment of pneumoperitoneum, three standard ports were utilized: a 10 mm supraumbilical port, a 10 mm ipsilateral port at the mid-clavicular line (2.5 cm above the umbilicus), and a contralateral 5 mm port (2.5 cm below the umbilicus at the mid-clavicular line). Peritoneal dissection commenced at the level of the anterior superior iliac spine, proceeding medially approximately 1-1.5 cm above the hernial opening. The dissection continued medially along the medial umbilical ligament, extending 1-2 cm beyond the symphysis pubis to the contralateral side, and cranially 3-4 cm above the transversalis arch or any direct hernia defect. Lateral dissection extended to the anterior superior iliac spine, caudally 4-5 cm below the iliopubic tract at the level of the psoas muscle, and 2-3 cm below Co-



per's ligament at the superior arch of the pubic bone. In cases of inguinal hernia, the contents were reduced, and a peritoneal flap was raised. Anatomical landmarks (inferior epigastric vessels, rectus muscle, transversalis fascia, pubic bone) were identified. The vas deferens was observed turning medially, and the triangle of doom was clearly visualized. A flat polypropylene mesh (12×15 cm) was inserted into the resulting preperitoneal space without an opening or slit for the spermatic cord. The mesh was secured at two points: medially at the symphysis pubis and laterally above the iliopubic tract. The peritoneal flap was closed using 2.0 Vicryl.

Regarding the surgical technique of TEP, three midline ports were established for the procedure. An infra umbilical port of 10 mm was created, through which a 30° telescope was utilized for blunt dissection to generate the pre-peritoneal space, initially proceeding along the midline down to the pubic symphysis. Two additional 5 mm ports were fashioned, one just above the symphysis pubis and another midway between the former two. A direct or indirect hernia, if present, was reduced. The entire posterior floor underwent dissection. A polypropylene mesh measuring 12 cm x 15 cm was introduced through the 10 mm port site and positioned over the myopectineal orifice. CO2 gas was gradually released under visual guidance, and any defects at the port sites were closed.

Results

A total of 86 patients were included in the study and were randomized into 2 groups of 43 each that either underwent TEP or TAPP repair.

All the patients were male, with ages ranging from 26 to 68 years of age. The two groups were comparable in respect to the age of the patient, laterality of hernia, and type of inguinal hernia. The mean age of the patients was 45.65±11.81 years, with the mean age of patients undergoing TEP and TAPP being 46.02±11.81 years and 45.27 ±11.94 years respectively. (Table 1)

There were 12 (27.9%) patients and 14 (32.55%) patients with direct inguinal hernia, while 31 (72.1%) patients and 29 (67.45%) patients had indirect inguinal hernia in TEP and TAPP groups respectively. In the TEP group, there were 4 (9.3%) patients with bilateral hernia while in the TAPP group, there were 7(16.27%) patients with bilateral hernia. (Table 1)

There was a significant difference in the operative time between TEP and TAPP. The operative

time of TEP was significantly shorter at 54.72±12.43 minutes than of the TAPP group at 65.23±12.83 minutes ($p<0.05$). (Table 2)

The patients undergoing TEP stayed in the hospital for a mean duration of 3.11±1.17 days, while that of the TAPP group stayed in the hospital for a mean duration of 4.04 ±1.63 days. The difference between the two group was statistically significant ($p<0.05$). (Table 2)

Short-term complications included vascular injury, visceral injury, seroma formation, hematoma formation, and SSI. Vascular injury occurred in 2(4.65%) patients undergoing TEP surgery, while there was 1(2.32%) incident of vascular injury in the TAPP group. Visceral injuries occurred in 2 (4.65%) patients undergoing the TAPP procedure, while no visceral injury was seen during the TEP procedure. Postoperative seroma formation was seen in 4 (9.3%) cases of TAPP while there was only 3 (6.97%) case of seroma formation in the TEP group. Hematoma formation was seen in 1(2.32%) case of the TAPP group, while there was no incidence of hematoma in the TEP group. There was 1 (2.32%) case of surgical site infection (SSI) in the TAPP group, while SSI was not reported in the TEP group. The postoperative complications were not statistically significant ($p>0.05$). (Table 2)

Return to daily work was significantly better in the TEP group compared to the TAPP group, with the mean days to return to daily work being 11.76±2.74 days and 14.67 ± 3.3 days respectively. The outcome was statistically significant ($p<0.05$). (Table 2)

There was no need to convert to open procedure during either TEP or TAPP. No recurrences were observed during the course of the study. (Table 2) The postoperative pain was measured using the Visual Analogue Scale in the postoperative period at 6 hours, 24 hours, and 48 hours. (Table 3)

Table 1: Patient Demographic

Variables	TEP (N=43)	TAPP (N=43)
Age	46.02 ± 11.81 years	45.27 ± 11.94 years
Type of inguinal hernia		
Direct	12 (27.9%)	14 (32.55%)
Indirect	31 (72.1%)	29 (67.45%)
Unilateral	39 (90.7%)	36 (83.73%)
Bilateral	4 (9.3%)	7 (16.27%)

TEP: Totally Extra Peritoneal. TAPP: Transabdominal Preperitoneal



Table 2: Operative outcomes

Variables	TEP (N=43)	TAPP (N=43)
Operative Time	54.72 ± 12.43 minutes	65.23 ± 12.83 minutes
Short-term complications		
Vascular injury	2 (4.65%)	1 (2.32%)
Visceral injury	0	2 (4.65%)
Seroma formation	3 (6.97%)	4 (9.3%)
Hematoma formation	0	1(2.32%)
SSI	0	1 (2.32%)
Conversion to open procedure	0	0
Recurrence	0	0
Duration of hospital stay	3.11 ± 1.17 days	4.04 ± 1.63 days
Days to return to normal work	11.76 ± 2.74 days	14.67 ± 3.3 days

TEP: Totally Extra Peritoneal. TAPP: Transabdominal Preperitoneal

Table 3: Postoperative pain using VAS as median (IQR)

Time Period	TEP (N=43)	TAPP (N=43)
6 hours	5 (5-6)	7(6-7)
24 hours	4(4-5)	5(4-5)
48 hours	2(1-2)	3(3-4)

TEP: Totally Extra Peritoneal. TAPP: Transabdominal Preperitoneal

Discussion

The treatment of inguinal hernia is undoubtedly surgical [7]. There are over 100 choices of surgery among the different open and laparoscopic procedures classified as tissue repair, open mesh repair, and laparo-endoscopic mesh repair [7]. The new International Guidelines of the Hernia-Surge Group recommends mesh repair either open or laparo-endoscopic method as the first choice for inguinal hernia surgery repair [8]. Laparoscopic hernia repair by the closure of the neck of the sac was first described by R Ger in 1982 [9]. The first use of prosthetic mesh in laparoscopic hernia repair was done in 1991 [10]. Since then, multiple trials have shown that laparoscopic hernia repair comes with the advantage of faster return to daily life, less postoperative pain, and reduced wound infection [11, 12]. The consensus of surgeons has been shifting from open procedures to minimally invasive ones such as TEP and TAPP [12]. The choice between the two has however always put surgeons in the dark.

Laparoscopic hernia repair initially started with TAPP repair, whereby the surgeon enters the peritoneal cavity and places a mesh through a peritoneal incision over the hernial site. TEP developed later in which the surgeon does not invade the peritoneal space but rather places a mesh over the hernia from outside of the perito-

neum [11–13]. The TEP technique is considered to be technically more difficult with a longer learning curve than the TAPP technique but it lessens the risk of intra-abdominal damage, adhesion formation, and obstruction, all of which are linked to the TAPP technique [11, 12, 14].

There were a total of 86 (100%) patients who underwent either TEP or TAPP through a randomized distribution. All 86 (100%) patients were male. This specifies the gender-specific distribution of inguinal hernia in the general population. The increased diameter at the internal ring of the inguinal canal in men and the increased width of rectus abdominis in females, are suspected to be the reasons for this disparity between the incidence of inguinal hernia between the two sexes [15].

Increasing age as a risk factor for increased risk of inguinal hernia has been described by Ruhl et al [16]. The mean age of the participants was 45.65 ± 11.81 years. The young age of the patients can be relative to the selection criteria, where uncomplicated hernias and patients with limited comorbidities were chosen.

In our study, we found that there was a significant difference in the operative time of TEP (54.72 ± 12.43 minutes) and TAPP (65.23 ± 12.83 minutes) ($p < 0.05$). Similar results were obtained in studies by Köckerling et al., Rabet al., and Cao et al [5, 17, 18]. Numerous studies have found TEP and TAPP to have no significant difference in their operative times [13, 19, 20]. Tulin A et al. in their single-center study have also found TAPP to have a shorter operative time than TEP [21]. The quicker surgical time may be attributed to the fact that the peritoneum is not breached and the visualization of TEP is better than that of TAPP.

In our study, the duration of hospital stay was longer in the patients who underwent TAPP compared to the patients who underwent TEP. This is similar to the findings of M Gass et al [22]. The studies by Köckerling et al. and Cao et al. have however found that the postoperative hospital stays between TEP and TAPP are similar and no statistical significance exists between the two [17, 18]. The shorter hospital stay in our study could be attributed to the fact that there were fewer local complications in the TEP group, and there was an overall better response to TEP than TEPP.

The return to daily activities was earlier in the TEP group (11.76 ± 2.74 days) than in the TAPP group (14.67 ± 3.3 days) ($p < 0.05$). This finding is similar to the finding by Rab et al [5]. This result can be attributed to the fact that peritoneum breach is not required in the TEP group, causing



fewer internal injuries.

Vascular injury was observed in 2 (4.65%) cases of TEP while only 1 (2.32%) case of TAPP. Visceral injury was however observed in 2 (4.65%) of TAPP while no visceral injury was observed in the TEP group during our study period. All repairs whether undergoing TEP or TAPP were successfully repaired. There was no statistical significance in the occurrence of visceral or vascular injury among TEP and TAPP techniques ($p>0.05$). This is similar to the findings of Rab et al. and Wake et al [5,13]. The occurrence of vascular and visceral injuries in our study depended upon the level of abdominal breach, where peritoneal breach caused more vascular and visceral injuries in the TAPP group compared to the TEP group.

Seroma is one of the most common complications following laparoscopic hernia repair surgery [5]. In an analysis study by Köckerling, seroma formation was seen in around 0.5 to 12.2% of TEP surgeries, and between 3 to 8% of TAPP surgeries. In our study, we observed that 3 (6.97%) of patients undergoing TEP and 4 (9.3%) of patients undergoing TAPP, developed seroma in the postoperative phase. It is similar to the data collected by Köckerling [23]. The occurrence of seroma was not statistically significant ($p>0.05$), and was dependent upon the patient's own response to the wound.

We observed 1 (2.32%) case of hematoma in the TAPP group. This was not statistically significant ($p>0.05$) which is also in accordance with other multiple studies [5,24]. Hematoma in the TAPP group was due to a surgical error in the choice of the mesh, which was smaller than the defect in one case.

We observed no deep-seated infection of the mesh during any procedure but 1 (2.32%) case of TAPP group observed port site SSI, which subsided on debridement, dressing, and IV antibiotics. This occurrence was statistically insignificant ($p>0.05$).

Patients who underwent TAPP had more pain in the postoperative period at 6 hours (6-7) than those who underwent TEP (5-6). This trend continued until 48 hours post-operation. A similar trend was observed by Rab et al [5]. The postoperative pain is however lesser in the laparoscopic hernia reduction than in open surgical procedures, evidenced by multiple studies [6,25]. The increased pain during the TAPP procedure in our study could be explained by the breach of the protective peritoneal layer, with minor damage and major damage to the viscera during the surgery. Conversion of laparoscopic hernia repair to open

surgery has been reported worldwide. A conversion rate of 0.24% and 0.23% was reported by Schultz et al. in 2000 and Tamme et al. in 2003 respectively [26,27]. In our study, there were no cases that needed conversion to open surgery.

Recurrence and reoperation are generally found to be between 0.3 and 2% [19,26]. During the study period, no patient reported with recurrence of hernia, and reoperation was not done in any case. A longer follow-up should be done in order to find the recurrence risk of such procedures.

Conclusion

TEP appears to be a viable alternative to TAPP for inguinal hernia repair in male patients. It offers several advantages, including faster operation time, shorter hospital stay, less pain, and a quicker return to daily life.

Acknowledgement: None

Conflict of interest: None

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