Original Article

HEALTH SCIENCES
MEDICINE

DOI: 10.32322/jhsm.1412322
J Health Sci Med. 2024;7(2):174-179

Comparison of TAPP and TEP in laparoscopic inguinal hernia repair

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Cite this article as: Öcal İH, Ülger BV, Öcal M. Comparison of TAPP and TEP in laparoscopic inguinal hernia repair. *J Health Sci Med.* 2024;7(2):174-179.

Received: 02.01.2024 ◆ **Accepted**: 23.02.2024 ◆ **Published**: 25.03.2024

ABSTRACT

Aims: The aim of this study was to compare TAPP and TEP techniques, which are laparoscopic inguinal hernia repair techniques. In this study, it was tried to determine whether one technique has an advantage over the other in terms of surgery, hospitalization and recovery times, recurrence, postoperative bleeding and testicular edema.

Methods: Totally 62 patients who underwent laparoscopic inguinal hernia repair between January 2015 and January 2020 were included in this retrospective study.

Results: Among the patients who underwent TAPP and TEP operations; it was determined that there was no significant difference in terms of operation time, recovery time, hospital stay, recurrence and complications ($p>0.05$).

Conclusion: Based on the results of this study, TEP and TAPP are equally effective and safe as laparoscopic hernia repair surgery. The choice of which approach to perform can be made according to the skill and preference of the surgeon.

Keywords: Inguinal hernia, laparoscopy, TAPP, TEP

INTRODUCTION

One of the frequently performed surgeries is the repair of inguinal hernia for adults throughout the world.[1] Inguinal hernia makes up 75% of all abdominal wall hernias, %97 of which are inguinal and 3% are femoral hernia. 90.2% of inguinal hernias are present amongst men, and 70.2% of femoral hernias occur in women.[2] As an inguinal hernia can easily be detected as a palpable mass on the inguinal region, it is often diagnosed on time. It is generally treated successfully via surgery and doesn't threaten life. Emergency surgery might be required in cases of strangulation due to possible complications like bowel necrosis, diffuse peritonitis, and septic shock.[3] One of the primary concerns associated with inguinal hernia repair is the possibility of relapse, but it has been diminished by the adoption of a uniform surgical technique and the production of artificial mesh.[4] When it comes to laparoscopic inguinal hernia repair, transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair are the two most commonly utilized techniques. In TAPP management, the peritoneal cavity must be penetrated in order to insert the mesh via the incision in the peritoneum. Synthetic mesh is placed in the peritoneal cavity to cover all of the possible hernia spots in the inguinal region. Later, a peritoneal mesh is covered so that the mesh is inserted between the abdominal wall and preperitoneal tissue, where it will fuse with fibrous tissue. In TEP management, contrary to TAPP, the peritoneal cavity is not penetrated, and mesh is utilized outside the periton to provide coverage for the hernia. Despite being considered a more difficult method than TAPP, the chances of complications such as adhesion formation and internal organ damage leading to intestinal obstruction are less likely with this approach.[5]

This study aims to conduct a comparison of the surgery time, postoperative bleeding ratio, time of hospital stay, time of recovery, relapse ratio, and testicular edema related to TEP and TAPP inguinal hernia repair.

METHODS

Between January 2015 and January 2020, a retrospective analysis of laparoscopic inguinal hernia repair was conducted on a total of 62 patients. Using the cohort method, the patients who received TAPP and TEP treatments were categorized into two groups and compared. Surgery time, testicular edema, postoperative

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bleeding, time of hospital stay, time for recovery, and relapse ratios of the two groups were evaluated. Ethics committee approval was provided by the faculty before starting the study Dicle University Medical Faculty Non-interventional Studies Ethics Committee (Date: 26.11.2020, Decision No:11). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. All of the patients were informed about the study, and written consent was provided, declaring they agreed to be a part of the study. Written consent of parents was taken for the patients who were not of full age legally. Individuals aged 15 years or above, both male and female, who were diagnosed with inguinal hernia and agreed to surgery were enrolled in the study. Patients with cases of contradiction for laparoscopic inguinal hernia repair (high-risk for general anesthesia, intraabdominal extensive ascites, intraabdominal active infection, story of open pelvic surgery, large scrotal hernia, coagulation disorder that is refractory to treatment, strangulation), patients who were on immunosuppressive agents for any indication, patients with acute or chronic infections were not included in the study.

Statistical Analysis

Statistical analysis was performed by the SPSS program. As the data distribution was not homogenous, analysis was performed using non-parametrical tests. The Mann-Whitney U test or the Kruskal-Wallis H test was utilized to compare continuous parameters. Categorical parameters were evaluated by the Chi-square test. P values that were lower than 0.05 were regarded as indicative of statistical significance.

RESULTS

27(43.5%) of 62 patients operated for inguinal hernia were operated using the TEP method, and 35 (56.5%) were operated by the TAPP approach. Of the patients with TEP operation, 24(38.7%) had unilateral, 3(4.8%) had bilateral inguinal hernia; 28(45.2%) of TAPP patients had unilateral, and 7(11.3%) had a bilateral inguinal hernia operation. 2(3.2%) of the patients were female and 60(96.8%) were male. Patients who were operated with TEP were all male, while 2(5.7%) of the patients in the TAPP group were women, and 33(94.3%) of them were men (Table 1).

The mean age of the patients was 41±14.29 (17-66) years old in the TEP group, and 43.06±15.97 (19-78) years old in the TAPP group; The mean age did not differ significantly between the two groups (Table 1) (p=0.601).

It was found that 7 (11.3%) of the patients had a relapse, and 55 (88.7%) didn't. While relapse occurred in 2 (7.4%) of the TEP groups patients and 5(14.3%) of those in the TAPP group, the comparison between the groups did not reveal any significant difference concerning the rate of relapse (p=0.396). Evaluating the two groups as subgroups of each; 1 (4.2%) of the patients with unilateral TEP, 1 (33.3%) of those with bilateral TEP, 3 (10.7%) of patients with unilateral TAPP, and 2 (%28.6) of those with bilateral TAPP had a relapse (Table 2).

Postoperative bleeding was observed in 3 of the patients (4.8%), while 59 (95.2%) of them did not have such a condition. 1 (3.7%) of the patients in the TEP group and 2 (5.7%) of those in the TAPP group had bleeding in the postoperative period; The comparison between the two groups did not show any significant difference concerning postoperative bleeding (p=0.715). 1 (4.2%) of the patients with unilateral TEP had postoperative bleeding while 2 (7.1%) of those with unilateral TAPP did. None of the patients going through bilateral inguinal hernia repair surgery had bleeding in the postoperative period (Table 2).

Testicular edema was observed in 3(4.8%) of the patients and not in 59 (95.2%) of them. In the TEP group, 2 (74%) of the patients had testicle edema while 1 (2.9%) of those in the TAPP group did; therefore, the comparison between the two groups did not show any significant difference concerning testicular edema incidence (p=0.480).

Table 1. Distribution of patients in terms of operation method and age

	TEP		TAPP	
	Unilateral TEP (n, %)	Bilateral TEP (n, %)	Unilateral TAPP (n, %)	Bilateral TAPP (n, %)
Surgery type	24 (38.7%)	3 (4.8%)	28 (45.2%)	7 (11.3%)
Age (mean.±sd)	41±14.29 (min: 17-max: 66)		43.06±15.97 (min: 19-max: 78)	

TAPP: transabdominal preperitoneal repair, TEP: totally extraperitoneal repair, SD: standard deviation

Table 2. Rate of incidence of relapse, postoperative bleeding, and testicular edema in patients considering surgery type

	Unilateral TEP (n, %)	Bilateral TEP (n, %)	Unilateral TAPP (n, %)	Bilateral TAPP (n, %)	Total (n, %)
Relapse	1 (4.2%)	1 (33.3%)	3 (10.7%)	2 (28.6%)	7 (11.3%)
Postoperative bleeding	1 (4.2%)	0	2 (7.1%)	0	3 (4.8%)
Testical edema	1 (4.2%)	1 (33.3%)	0	1 (14.3%)	3 (4.8%)
Total (n, %)	24 (100%)	3 (100%)	28 (100%)	7 (100%)	62 (100%)

TAPP: transabdominal preperitoneal repair, TEP: totally extraperitoneal repair

1 (4.2%) of the patients operated with unilateral TEP presented with testicular edema, 1 (33.3%) of those who had bilateral TEP, and 1 (14.3%) with bilateral TAPP had testicular edema. None of the patients operated unilaterally with TAPP had testicular edema (Table 2).

Time from the first skin incision until the last suture was recorded during the surgeries. It was found that the TEP groups average surgery time was 138.15±49.22 minutes, and the surgery time ranged from 60 minutes, which was the shortest, to 238 minutes, which was the longest. In the TAPP group, the mean surgery time was 136.49±49.24 minutes, the range of surgery time was from 28 minutes, which was the quickest, to 295 minutes, which was the longest. Comparing the TEP and TAPP groups, no statistically significant variation was observed concerning surgery time (p=0.896) (Table 3).

Evaluating the groups regarding time for the hospital stay, it was found that the mean time for hospital stay in the TEP group was 1.85±1.03 days. The hospitalization period varied between one day, which was the least, and five days, which was the most. In the TAPP group, the mean time for hospital stay was 2.03±1.38 days, the shortest time was one day, and the longest stay lasted for eight days. Between TEP and TAPP groups, no statistically significant disparity was detected concerning the length of hospitalization (p=0.580) (Table 3).

Analyzing two groups in terms of recovery parameters, it was seen that the mean time for recovery in the TEP group was 7.67±3.78 days, while the shortest time was 3 days and the longest was 21 days. In the TAPP group, the mean time for recovery was 9.51±4.98 days, the range of time for recovery was from 5 days, which was the quickest, to 18 days, which was the slowest. Between TEP and TAPP groups, no statistically significant disparity was detected concerning the time taken for recovery (p=0.114) (Table 3).

Evaluating 62 patients operated on for inguinal hernia regarding subgroups of the operation type they had, it was found that the mean surgery time in the unilateral TEP group was 135.62±48.46 minutes, the range of surgery time was between 60 minutes, which was the least, and 238 minutes, which was the most. In the bilateral TEP group, the mean surgery time was 158.33±61.71 minutes, and the range of surgery time was between 60 minutes, which was the least, and 238 minutes, which was the most. In the unilateral TAPP group, the mean time of surgery was 129.36±43.90 minutes, the shortest surgery time was 28 minutes, and the longest one was 225 minutes. In the bilateral TAPP group, the mean surgery time was 165±62.28 minutes, while the shortest surgery duration was 112 minutes, and the longest one was 295 minutes. The comparison of surgery time between the groups undergoing unilateral TEP, bilateral TEP, unilateral TAPP, and bilateral TAPP did not reveal any statistically significant difference (p>0.05) (Table 4).

The average time of hospital stay for these four groups was found to be 1.92±1.06 days upon comparison, and varied between 1 day, which was the least, and 5 days, which was the most in the unilateral TEP group. On the other hand, in the bilateral TEP group, the mean time of hospital stay was 1.33±0.58 days, the shortest stay was for 1 day, and the longest one lasted for 2 days. In the unilateral TAPP group, the mean time of hospital stay was 1.85±1.03 days, and the shortest time of stay was 1 day, while the longest stay lasted for 8 days. In the bilateral TAPP group, the mean time of stay was 2±1 days, the shortest one was for 1 day, and the longest stay lasted for 3 days. The comparison between the groups undergoing unilateral and bilateral TEP, and unilateral and bilateral TAPP, did not reveal any statistically significant difference in hospital stay duration (p>0.05) (Table 4).

These four groups were further analyzed for recovery parameters in the hospital. In the unilateral TEP group, the mean time of recovery was 6.92±2.72 days, The shortest recorded recovery time was 1 day, while the longest was 15 days. In the bilateral TEP group, the mean time of recovery was 13.67±6.35 days. The range of time for recovery was from 10 days, which was the quickest, to 21 days, which was the slowest. In the unilateral TAPP group, the mean time of recovery was 9.57±3.10 days, the shortest time was 3 days and the longest one took 30 days. In the bilateral TAPP group, the mean time of recovery was 8.71±4.56 days. The duration of recovery varied between 5 days, which was the quickest, and 15 days, which was the slowest. The comparison between the groups undergoing unilateral and bilateral TEP, and unilateral and bilateral TAPP, did not reveal any statistically significant difference in recovery time (p=0.012) (Table 4).

Table 3. Comparison of TEP and TAPP groups in terms of surgery time, hospital stay period, and recovery time

	Operation type	Number (n)	Mean.±SD	Min-max	P
Surgery Time	TEP	27	138.15±49.22min	60-238 min	p>0.05
	TAPP	35	136.49±49.24 min	28-295 min	
Time of hospital stay	TEP	27	1.85±1.03 days	1-5 days	p>0.05
	TAPP	35	2.03±1.38 days	1-8 days	
Time of recovery	TEP	27	7.67±3.78 days	3-21 days	p>0.05
	TAPP	35	9.51±4.98 days	5-18 days	

TAPP: transabdominal preperitoneal repair,TEP:totally extraperitoneal repair,SD:standard deviation

Table 4. Comparison of surgery time, time of hospital stay, and time of recovery between unilateral and bilateral TEP and TAPP groups

Operation type	Number (n)	Mean.±SD	Min-max	P
Surgery time				0.529
Unilateral TEP	24	135.62±48.46 min	60-238 min	
Bilateral TEP	3	158.33±61.71 min	90-210 min	
Unilateral TAPP	28	129.36±43.90 min	28-225 min	
Bilateral TAPP	7	165.0±62.28 min	112-295 min	
Time of hospital stay				0.746
Unilateral TEP	24	1.92±1.06 days	1-5 days	
Bilateral TEP	3	1.33±0.58 days	1-2 days	
Unilateral TAPP	28	2.04±1.48 days	1-8 days	
Bilateral TAPP	7	2±1 days	1-3 days	
Time of recovery				0.012
Unilateral TEP	24	6.92±2.72 days	3-15 days	
Bilateral TEP	3	13.67±6.35 days	10-21 days	
Unilateral TAPP	28	9.57±3.10 days	3-30 days	
Bilateral TAPP	7	8.71±4.56 days	days	

TAPP: Transabdominal preperitoneal repair, TEP: Totally extraperitoneal repair, SD: Standard deviation

DISCUSSION

Inguinal hernia is a common problem, significantly lowering the quality of life. Inguinal herniorrhaphy is one of the most prevalent general surgical operations worldwide and emergency surgery might be required in cases of obstructed or strangulated inguinal hernia.[5] Although inguinal hernia is encountered commonly and in spite of several studies comparing different techniques of repair, a consensus is not reached on the ideal repairing technique yet. Currently, research has been continuing on the topic, and the opinion that the ideal surgical technique is the one personalized for the patient by the operating surgeon is dominant.[6] In inguinal hernia repair, a technique that is easy and simple to perform, that requires minimal incision and dissection, providing enough vision and minimizing relapse must be preferred. Deciding on the method, patients comfort, cost of the surgery, duration of hospitalization, and time taken to resume work must be considered as well.[5,7] Inguinal hernia can be repaired by laparoscopic and open techniques.[5]

Comparing TAPP and TEP, two laparoscopic techniques used to repair inguinal hernias, is the aim of this study. It was also studied whether one of the techniques is advantageous over the other regarding surgery time, time of hospital stay and recovery, relapse, postoperative bleeding, and testicular edema incidence.

In the world population, approximately 90% of all inguinal hernias are present in males, while around 10% are seen in females.[8] In this study, it was found that 96.8% of patients operated for inguinal hernia are male, which was consistent with the existing literature. Similar to our study, Çelik and Erbil[9] and Köckerling et al.[10] have compared patients operated with TEP and TAPP procedures, and the comparison between the groups did not reveal any statistically significant disparity in age and gender.

Although it was found in this study that TEP surgery takes a longer time, the comparison between the two procedures did not reveal any significant difference in terms of the time of surgery. Supporting our study, Çelik and Erbil[9] found that although operation time was slightly longer for patients operated with the TEP procedure, the difference was not significant. The possible justification for the fact that the TEP procedure takes a long time for surgery is that because there is a limited area for work, so possible anatomical landmarks might be misinterpreted, and wider dissection gets to be performed. On the other hand, In the randomized controlled study carried out by Krishna et al.,[11] they detected that TAPP results in a longer mean time of surgery than TEP. According to those who carried out the study, the reason TAPP application takes longer surgery time is suggested to be due to the time required for suturing the periton that covers the mesh.

Even though the difference is not found significant in this study, the average time of surgery was longer for bilateral TAPP (165±62.28 min) than bilateral TEP (158.33±61.71 min). The possible explanation for this might be that in bilateral hernia repair, dissection is performed as a shift from one side to the other on the plane of work during TEP. At the same time, a separate flap formation might be needed for each side in TAPP. Actually, a new flap formation on the second site of operation during TAPP doesn't take a long time because the medial (retro-pubic) dissection is already completed on the first site of operation.[12] This fact could be the explanation for not detecting a significant difference between bilateral inguinal hernia operation times of TEP and TAPP in this study. On the other hand, the shortest time of recovery after laparoscopic hernia repair was seen with unilateral TEP, while the longest time was seen with bilateral TEP. Another explanation of this result could be variations in the epidemiological profile of the patients.

In the meta-analysis by Wei et al.[13] experienced surgeons (ones who had performed TEP in approximately 30-100 cases) it was discovered that there was no statistically significant difference between TAPP and TEP in relation to clinical outcomes. Additionally, when subgroup analysis is applied, it was revealed that the surgeons' level of experience does not affect the incidence of complication but only affects the operation time. This finding was clarified in their meta-analysis, suggesting that although surgeons of different levels of experience had done the evaluation, all of them were experienced enough to perform the surgery securely.[13] Similarly,

the fact that rates of complication in both TEP and TAPP groups were low in this study could be because the operating surgeons were experienced and qualified enough.

In the study carried out by Vãrcuæ et al.[14] they detected the time of hospital stay for patients operated using both TEP and TAPP techniques as approximately 2 days, supporting our article. The results of this study indicated that there was no difference between the TAPP and TEP groups in terms of hospital stay duration. Similarly, in a study by Rao et al.[15] TAPP and TEP groups were not found to be significantly different regarding hospital stay and return to daily activities.

In laparoscopic inguinal hernia repair, prominent outcome parameters are complications related with surgical wound and incidence of relapse.[12] In this study, consistent with Özkaya's research, no significant difference was detected between TAPP and TEP groups in terms of relapse.[16] In favor of our article, existing meta-analysis do not show difference between TAPP and TEP in terms of relapse, either. For any hernia surgery, recurrence is accepted as the most critical endpoint.[5,17,18] For a long time, the absence of a recurrence was the only factor considered to evaluate the success of hernia repair. Compared with unilateral hernia repair, bilateral repair surgeries were found to have a higher recurrence rate in this study. The incidence of two or more recurrences after inguinal hernia repair was significantly higher in those with a defect size larger than 3cm.19 Similarly, the larger defect in bilateral inguinal hernia repair may have increased the recurrence rate.

After the laparoscopic repair of an inguinal hernia, scrotal edema or hematoma are common complications.[5,17] In this study, the rate of incidence of edema was 7.4% inTEP group and 2.9% in the TAPP group. Similarly, in the study carried out by Jaiswal and his friends, it was reported that scrotal edema was encountered by 8.9% of patients in the TAPP group and 8.9% of those in TEP group.[17] On the other hand, the incidence of scrotal edema in TAPP group was reported to be 34% and in TEP group as 9.4%.[11] However, scrotal edema incidence was found to be as high as 33.3% amongst patients treated with bilateral TEP. In the study by Hidalgo et al.[20] advanced age, large hernia defect, complete inguinal hernia and presence of dital indirect sac are reported as risk factors related with scrotal edema formation. The justification for difference of the results of the mentioned studies in terms of rates of scrotal edema formation could be because the epidemiological and clinical factors are not similar.

In this study, it has been found that there is no significant difference between TEP and TAPP surgical procedures, considering postoperative bleeding. Consistent with our study, Jaiswal et al.[17] have reported that although postoperative hematoma incidence is higher in TAPP group than that in TEP group, this difference is not statistically significant.

Similar to this study, Wei et al.[13] have confirmed through the meta-analysis comparing TAPP and TEP for laparoscopic hernia repair, that no significant disparity was detected between TAPP and TEPP in terms of recovery time, operation time, hospital stay duration, and total complications.

CONCLUSION

This studys results indicate that TEP and TAPP are equally efficient and safe as laparoscopic hernia surgery procedures. It was anticipated that because it is not required during TEP to penetrate into the abdominal cavity, it would lower incidence of complications and enhance the clinical results, but the results did not support this idea.

During inguinal herniorapphy, both laparoscopic techniques can be favored. The decision of which approach to use, is dependent on the surgeon and their surgical skills.

Further comprehensive studies can be planned, including the surgeons learning curves and levels of experience, evaluating the postoperative pain scores and cost-efficiency analysis of TEP and TAPP surgical procedures.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Dicle University Medical Faculty Non-interventional Studies Ethics Committee (Date: 26.11.2020, Decision No:11).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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