

Comparison of Laparoscopic Total Extraperitoneal (TEP) Repair and Transabdominal Peritoneal (TAPP) Repair of Inguinal Hernia

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ABSTRACT

Objective: To assess the outcomes of laparoscopic total extraperitoneal (TEP) repair compared to transabdominal preperitoneal (TAPP) repair of inguinal hernias. These outcomes were evaluated based on hospital stay duration, postoperative pain, and recovery time.

Methodology: The study design employed for this research was a Comparative Observational RCT. A total of 62 patients with inguinal hernia, 25 to 65 years of age of both genders were included. Patients with irreducible hernia, strangulated hernia, obstructed hernia, recurrent hernia, radiation to pelvic tumors and previous history of gut surgery were excluded. Group A included the cases in which TEP repair was done while group B included the cases in which TAPP repair was done. Operative time in both groups was noted. All the patients were followed by the researchers.

Results: In this study, the mean operation time was 64.52 ± 7.58 minutes for TEP repair versus 87.35 ± 3.77 minutes for TAPP repair (p -value = 0.0001). Mean duration of hospital stay for patients in TEP repair group was significantly shorter when compared to TAPP repair group (9.70 ± 2.15 versus 21.90 ± 6.91 hours) which was statistically significant ($p = 0.0001$). Mean post-operative pain was 1.68 ± 1.08 for TEP repair versus 3.32 ± 1.45 for TAPP repair (p -value = 0.0001).

Conclusion: This study concluded that operative time, post-operative pain and hospital stay is less after laparoscopic total extraperitoneal (TEP) repair of inguinal hernia as compared to transabdominal preperitoneal (TAPP) repair.

Keywords: Inguinal hernia, laparoscopic total extraperitoneal, operative time.

Authors' Contribution:

^{1,2}Conception; Literature research; manuscript design and drafting; ^{3,4}Critical analysis and manuscript review; ⁵Data analysis; Manuscript Editing.

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Article info:

Received: October 01, 2023
Accepted: August 20, 2024

Cite this article. Iqbal T, Abubakar MQ, Malok MS, Arbi FM, Jatt A. Comparison of Laparoscopic Total Extraperitoneal (TEP) Repair and Transabdominal Peritoneal (TAPP) Repair of Inguinal Hernia. J Islamabad Med Dental Coll. 2024; 13(4). 596-603.

DOI: <https://doi.org/10.35787/jimdc.v13i4.1045>

Funding Source: Nil

Conflict of interest: Nil

Introduction

Inguinal hernia repair is among the most commonly performed procedures in general surgery. Various techniques are available for treating inguinal hernias, with tension-free repair being the preferred approach due to its lower risk of recurrence. Laparoscopic and open anterior techniques for tension-free repair can be broadly categorized based on the method employed.¹ Alongside traditional surgical methods, minimally invasive approaches

have gained popularity for managing groin hernias. However, the optimal surgical technique remains a topic of debate.¹ The patch repair technique became widely adopted after Lichtenstein introduced it, primarily due to its ability to lower recurrence rates.² Following the rise of laparoscopic surgery, total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) techniques were introduced.³ These methods are increasingly favoured as they cause less postoperative pain, require fewer

analgesics, offer better cosmetic results, enable quicker return to work, and are associated with fewer immediate postoperative wound complications.^{4,5}

In 2024, updated recommendations for managing inguinal hernias in adults highlighted significant differences in recurrence rates. These updates revealed that the Lichtenstein technique had superior outcomes, where a single surgeon accounted for 33% of TEP recurrences.⁶ To address this, the Guidelines Group conducted a meta-analysis that excluded data from this particular surgeon. When this data was removed, no statistically significant difference in long-term recurrence rates was observed between Lichtenstein and endoscopic surgeries ($p = 0.12$).⁶ Analysis of Swedish data also showed no differences in extreme chronic pain outcomes across the groups ($p = 0.34$).⁶ Despite extensive discussions, the European Hernia Society (EHS) ultimately decided to retain the recommendations from 2009 while emphasizing the steep learning curve associated with endoscopic repairs, particularly TEP.⁶ A related study reported mean postoperative pain scores of 4.45 ± 1.7 for TAPP and 3.3 ± 0.98 for TEP, with a p -value of 0.05.⁷ Additionally, the same study found mean operative times of 110.90 ± 12.02 minutes for TAPP and 125.50 ± 7.46 minutes for TEP ($p < 0.0001$).⁷ Another study reported that the mean operative time for TAPP repair was 70 minutes, while TEP repair required only 45.1 minutes ($p = 0.000$).⁸

The objective of the present study is to evaluate the outcomes of laparoscopic total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) repairs of inguinal hernias, focusing on hospital stay duration and postoperative pain. Postoperative recovery is a critical aspect of hernia surgery, as it not only affects patients' physical well-being but also contributes to significant morbidity. Based on the study findings, adopting techniques associated with reduced postoperative pain and shorter hospital stays can

significantly improve patient outcomes. These findings could be integrated into routine clinical practice guidelines. Early hospital discharge would help patients save time and money while alleviating the burden on the healthcare system. Moreover, this approach would make beds available for other patients, a particularly critical consideration for this tertiary care facility, which serves a large population. While TEP is preferred in the literature for its advantages, limited data exists on its comparative efficacy in specific demographic or clinical settings, particularly in the context of inguinal hernias repairment. This study aims to address this gap by providing a direct comparison of TEP and TAPP outcomes in terms of operative time, postoperative pain, and hospital stay in a tertiary care setting.

Methodology

This study was a Comparative Observational Randomized Trial, where patients were randomized into two intervention groups: TEP and TAPP repair. Post-intervention outcomes were observed and analyzed. This research was conducted at the Department of General Surgery, Bahawal Victoria Hospital, Bahawalpur, from August 16, 2021, to July 14, 2024. The sample size was calculated to include 62 cases, with 31 participants per group. The calculation accounted for a 5% level of significance, a 90% power of the study, and a mean postoperative pain score of 4.54 ± 1.7 for TAPP compared to 3.3 ± 0.98 for TEP. A non-probability, consecutive sampling method was utilized.

The inclusion criteria comprised male patients aged 25–65 years with unilateral inguinal hernias persisting for at least three months. Eligible patients were classified as ASA Grade I or II. Conversely, patients with complicated hernias, such as irreducible or strangulated hernias, and those with recurrent hernias, prior surgeries, radiation therapy, or comorbidities like diabetes mellitus (DM) and chronic obstructive pulmonary disease (COPD), were excluded.

Patients participating in the study consented to analysis of their data and provided informed consent forms for additional care as required. The Ethical Review Board of the institution (No. 1183/DME/QAMC) approved the study's ethical protocols.

All procedures were performed by a single senior faculty Professor of Surgery with over 20 years of experience in laparoscopic hernia repairs, ensuring consistent surgical technique across cases.

A total of 62 patients meeting the inclusion criteria were admitted to the Department of Surgery at Bahawal Victoria Hospital, Bahawalpur. Informed consent was obtained from each participant. Patients were randomly assigned to groups by selecting one slip from a collection of mixed slips, where half were labeled "A" and the other half "B." Patients in Group A underwent total extraperitoneal (TEP) repair, while those in Group B received transabdominal preperitoneal (TAPP) repair. Operative time was recorded for both groups. Researchers monitored the patients postoperatively, documenting discharge status within 24 hours (yes/no) and pain levels at 24 hours. Additional data, including age, hernia duration, BMI, diabetes mellitus (yes/no), hypertension (yes/no), discharge within 24 hours (yes/no), and pain resolution at two weeks (yes/no), were collected on a specifically designed proforma.

All data were entered and analyzed using SPSS software, version 22.0. Mean values and standard deviations were calculated for variables such as age, hernia duration, BMI, operative time, hospital stay, and postoperative visual analog scale (VAS) pain scores. Categorical variables, including ASA status (1/2) and hypertension (yes/no), were reported as frequencies and percentages. The independent t-test was employed to compare operative time, postoperative VAS scores, and hospital stay between the two groups. A p-value of ≤ 0.05 was considered statistically significant.

Stratification was performed for variables such as age, hernia duration, BMI, ASA status (1/2), and hypertension (yes/no). Post-stratification, an independent t-test was applied to assess the impact of these factors on outcomes. A p-value of ≤ 0.05 was considered significant.

Results

The participants in this study ranged in age from 25 to 65 years, with an average age of 39.62 ± 13.32 years. Group A had a mean age of 38.39 ± 12.99 years, while Group B had a mean age of 40.58 ± 13.89 years. A significant proportion of the participants, 36 patients (58.06%), were aged between 25 and 45 years. The average duration of the disease across all participants was 8.31 ± 2.32 months. Group A reported a mean disease duration of 8.23 ± 2.31 months, compared to 8.39 ± 2.32 months in Group B. The mean BMI of the study population was 27.42 ± 2.85 kg/m², with a mean height of 1.52 ± 12.92 m and an average weight of 74.92 ± 12.85 kg.

Table I: Comparison of operation time, hospital stay and post-operative pain.			
Outcome	Group A (n=41)	Group B (n=41)	p-value
	Mean \pm SD	Mean \pm SD	
Operation time (minutes)	64.52 \pm 7.58	87.35 \pm 3.77	0.0001
Hospital stay (hours)	9.70 \pm 2.15	21.90 \pm 6.91	0.0001
Hospital stay (days)	1.68 \pm 1.08	3.32 \pm 1.45	0.0001

The average operative time for the total extraperitoneal (TEP) repair group was 64.52 ± 7.58 minutes, compared to 87.35 ± 3.77 minutes for the transabdominal preperitoneal (TAPP) repair group, which was statistically significant (p-value = 0.0001).

Co-morbid conditions		Group A (n=31)		Group B (n=31)		P-value
		Operative time (minutes)		Operative time (minutes)		
		Mean	SD	Mean	SD	
Age (years)	25-45	65.16	7.39	87.24	6.12	0.0001
	46-65	63.50	8.05	87.50	5.53	0.0001
Duration (months)	≤6	64.43	3.91	85.20	6.38	0.0001
	>6	64.54	8.40	87.77	5.68	0.0001
BMI (kg/m ²)	≤27	60.31	8.11	87.06	5.20	0.0001
	>27	67.56	5.59	87.67	6.48	0.0001
Hypertension	Yes	66.33	5.50	87.67	6.36	0.0001
	No	63.37	8.57	87.16	5.53	0.0001
ASA	1	60.31	8.11	87.06	5.20	0.0001
	2	67.56	5.59	87.67	6.48	0.0001

Co-morbid conditions		Group A (n=31)		Group B (n=31)		P-value
		Hospital stay (days)		Hospital stay (days)		
		Mean	SD	Mean	SD	
Age (years)	25-45	9.26	2.08	21.0	7.65	0.0001
	46-65	10.42	2.15	23.0	5.97	0.0001
Duration (months)	≤6	9.71	2.06	25.0	6.67	0.0001
	>6	9.71	2.22	21.31	6.92	0.0001
BMI (kg/m ²)	≤27	9.92	2.60	23.38	6.38	0.0001
	>27	9.56	1.82	20.33	7.33	0.0001
Hypertension	Yes	10.08	1.98	23.17	6.73	0.0001
	No	9.47	2.27	21.11	7.08	0.0001
ASA	1	9.92	2.60	23.38	6.38	0.0001
	2	9.56	1.82	20.33	7.33	0.0001

Table IV Stratification of post-operative pain with respect to age, duration of disease, BMI, hypertension and ASA status.						
Co-morbid conditions		Group A (n=31)		Group B (n=31)		P-value
		post-operative pain		post-operative pain		
		Mean	SD	Mean	SD	
Age (years)	25-45	1.72	1.20	3.59	1.58	0.0001
	46-65	1.58	0.90	3.00	1.24	0.0001
Duration (months)	≤6	1.71	1.38	2.20	0.45	0.0001
	>6	1.67	1.01	3.54	1.48	0.0001
BMI (kg/m ²)	≤27	2.15	0.99	3.69	1.35	0.0001
	>27	1.33	1.03	2.93	1.49	0.0001
Hypertension	Yes	1.58	1.17	3.33	1.56	0.0001
	No	1.74	1.05	3.32	1.42	0.0001
ASA	1	2.15	0.99	3.69	1.35	0.0001
	2	1.33	1.03	2.93	1.49	0.0001

Similarly, the mean hospital stay duration was significantly shorter for the TEP repair group at 9.70 ± 2.15 hours, compared to 21.90 ± 6.91 hours for the TAPP repair group (p -value = 0.0001). Postoperative pain scores were also significantly lower in the TEP group, with a mean score of 1.68 ± 1.08 , compared to 3.32 ± 1.45 in the TAPP group (p -value = 0.0001), as detailed in Table 1.

Stratified analyses of operative time based on variables such as age, disease duration, BMI, hypertension, and ASA status are presented in Table 2. The stratification of hospital stay by these variables is shown in Table 3, while Table 4 provides stratification of postoperative pain across the same parameters.

Discussion

The transabdominal preperitoneal (TAPP) approach has emerged as an alternative to open mesh surgery for inguinal hernia repairs.⁹ This method offers several advantages over open procedures, including reduced trauma, fewer early complications, and quicker postoperative recovery.⁹ The standard TAPP procedure involves initially accessing the abdominal cavity, followed by incising the peritoneum overlying the posterior wall of the inguinal canal to reach the avascular preperitoneal plane. A large mesh is placed across the hernia openings after adequate dissection, and the mesh is secured with staples.⁹ Despite the increasing popularity and favorable outcomes of standard TAPP repairs, complications

related to mesh fixation can occur, some of which are severe.¹⁰

This study aims to compare the outcomes of tackless laparoscopic total extraperitoneal (TEP) repair and transabdominal preperitoneal (TAPP) repair of inguinal hernias, focusing on operative time, postoperative pain, and hospital stay duration. In this study, the mean operative time was 64.52 ± 7.58 minutes for TEP repair compared to 87.35 ± 3.77 minutes for TAPP repair (p -value = 0.0001). The mean hospital stay was significantly shorter in the TEP group (9.70 ± 2.15 hours) compared to the TAPP group (21.90 ± 6.91 hours; $p = 0.0001$). Postoperative pain scores were also significantly lower for TEP (1.68 ± 1.08) than for TAPP (3.32 ± 1.45 ; $p = 0.0001$). Additionally, another study found postoperative pain scores of 4.45 ± 1.7 for TAPP and 3.3 ± 0.98 for TEP ($p < 0.05$),⁷ while the same study reported mean operative times of 110.90 ± 12.02 minutes for TAPP and 125.50 ± 7.46 minutes for TEP ($p < 0.0001$).⁷ A different study reported shorter operative times for TEP (45.1 ± 3.54 minutes) compared to TAPP (70 ± 6.01 minutes; $p = 0.000$).⁸ In a research conducted by Cohen RV et al., the operative time for TAPP was shorter, though not statistically significant.¹¹ Surgeons reported more technical challenges with the TEP technique (70% encountered issues; four conversions to TAPP). The mean hospital stay (30 hours) and time to return to work (TAPP: 7 days; TEP: 5.5 days) were comparable.¹¹ Complications due to pneumoperitoneum or its systemic effects were not observed (TAPP: 20.5%; TEP: 13.5%; not significant).¹¹ Trocar site hernias occurred in two cases with TAPP, while one severe case of cellulitis was reported with TEP, both of which were treated non-surgically.¹¹ Recurrence rates were statistically comparable (TAPP: 1.85%; TEP: 0%), though follow-up durations varied.¹² Despite similar benefits, TAPP is considered simpler due to its shorter learning curve and clearer anatomical visualization, making it a viable laparoscopic option for groin hernias.¹²

Longer follow-up periods are needed to establish recurrence rates conclusively.¹²

Another randomized trial by Nawaz et al. in Pakistan noted minor pain in 40 of 60 patients in the TEP group and 25 of 60 in the TAPP group during one-year follow-up.¹³ In this study, the difference in pain between the two techniques was not significant on the first day but became significant on the second day ($p < 0.0001$), with TAPP causing more pain than TEP.¹³ The mean operative time was significantly shorter for TAPP (86.72 minutes) compared to TEP (99.72 minutes; $p < 0.0001$).¹³ However, TAPP patients had a longer hospital stay (5.2 days) compared to TEP (2.6 days; $p < 0.0001$).¹³ The mean time to resume normal activities was also significantly shorter for TEP (6.2 days) compared to TAPP (10.8 days; $p < 0.0001$).¹³ Postoperative complications included seroma formation (TAPP: 8 cases; TEP: 1 case; $p < 0.0001$) and port site infections (TAPP: 20%; TEP: 2.5%; $p < 0.0001$).¹³

Hung et al., in China, found no significant differences in pain levels between TAPP and TEP groups.¹⁴ Similarly, Alverdyan et al. observed no notable differences in pain levels.¹⁵ Another meta-analysis reported a significantly shorter mean operative time for TEP (45.1 ± 3.54 minutes) compared to TAPP (70 ± 6.01 minutes; $p < 0.0001$).¹⁶

A study by Hurel et al. found that TEP was associated with more intraoperative and postoperative complications, longer operative times, and higher conversion rates.¹⁷ For unilateral inguinal hernia repair, TAPP was deemed superior based on population data.¹⁷ However, in another study by Rodha et al., TEP showed significant advantages in reducing postoperative pain within three months, leading to higher patient satisfaction.¹⁸ Both techniques resulted in similar intraoperative complications, postoperative issues, and costs, with TEP performing better in certain parameters.¹⁸

Conclusion

This study concluded that laparoscopic total extraperitoneal (TEP) repair of inguinal hernia is

associated with shorter operative time, reduced postoperative pain, and a shorter hospital stay compared to transabdominal preperitoneal (TAPP) repair. Therefore, we recommend that TEP repair be routinely adopted for inguinal hernia repair due to its efficiency, lower postoperative pain, and shorter recovery period, which collectively benefit patients by saving time, reducing costs, and minimizing postoperative complications.

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