

Which technique is used in laparoscopic bilateral inguinal hernia surgery?

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ABSTRACT

Introduction: The present study aims to bridge this gap by providing an extensive comparative analysis of totally extraperitoneal (TEP) versus transabdominal preperitoneal (TAPP) techniques to correct bilateral inguinal hernias, focusing on their efficiency, safety levels, and complication rates.

Materials and Methods: We used a retrospective cohort study design that compared TEP with TAPP results among adult patients who underwent bilateral inguinal hernia repair from January 2021 to December 2023 at our institution. Exclusion criteria were recurrent hernias, emergency procedures, or patients who were not suitable for the minimally invasive approach. Surgical results, including complication rates, recovery outcomes, and operative details, were analyzed systematically.

Results: A total of 144 patients, 51 with TAPP and 93 with TEP, were included in the study. There was no statistical difference between the groups in terms of mean age, body mass index, and length of hospital stay. The mean VAS scores in pain assessment the morning after surgery were 3.1 ± 1.5 (TAPP) and 2.9 ± 1.4 (TEP) respectively, and there was no significant difference between the two methods ($p=0.346$). Complications and readmission rates did not show significant differences between the two approaches.

Conclusion: Both TEP and TAPP are effective laparoscopic methods that can be applied in bilateral inguinal hernia surgery. This is because no major complications are observed in either surgical procedure. Patient characteristics and surgical experience are the main determinants of the procedure to be chosen.

Keywords: Bilateral inguinal hernia, Laparoscopic hernia repair, TAPP, TEP

Introduction

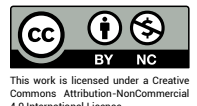
Hernia management has been revolutionised by laparoscopic inguinal hernia repair. This technique has reduced postoperative pain, shorter hospital stays, and faster return to daily activities compared to traditional open repair techniques.^[1] Totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) approaches are the most

widely used approaches among laparoscopic techniques for bilateral inguinal hernia repair. They have several distinct advantages and technical considerations that may be associated with them.^[2] Therefore, despite the widespread adoption of these methods, clinicians still debate whether one is preferred over another based on patient outcomes such as complication rates or overall efficacy.^[3,4]



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Laparoscopy itself allows both TEP and TAPP operations while minimising tissue damage around the hernial sac. However, unlike TEP, which avoids entering the peritoneal cavity, thus reducing the chances of intra-abdominal complications, TAPP makes it possible to reach directly at this site through an incision within the abdominal wall, thus making surgeons more familiar with anatomical orientation in general. Furthermore, some specific types of hernia, especially bilateral hernias, may be easier to manage using this approach than any other method because it provides direct access to their sites from within the abdominal space itself.^[5,6]

Comparative studies have given us insight into what TEP and TAPP procedures result in looking at areas such as operation time, postoperative pain, length of stay in a hospital, and recurrence rates. However, these studies frequently produce contradictory results, where some do not show significant differences between the methods, while others emphasise the strengths or weaknesses of one method compared to another.^[7] This kind of variance in the medical literature reveals the intricacies associated with the evaluation of surgical techniques that can depend on several factors including surgeon experience, patient selection, and methodological variations in different studies.^[4]

In recent years, studies aiming to close the knowledge gap by making detailed comparisons of TEP and TAPP techniques in bilateral inguinal hernia repair have increased. In these studies, the positive and negative aspects of both techniques were tried to be elucidated based on the demographic characteristics of the patients, surgical data, complications, postoperative results, and cost-effectiveness.^[2-4] Our aim is not to compare TAPP and TEP hernia repair techniques in a broad sense, but to evaluate effectiveness and safety, especially in the context of bilateral hernias.

Additionally, our hernia surgery study is very current and reflects the latest trends and outcomes due to ever-changing surgical practices and constant advances in laparoscopic technology. In conclusion, with this study, we aim to improve treatment strategies in laparoscopic bilateral inguinal hernia surgery, improve patient outcomes, and contribute to optimising surgical practice.

Materials and Methods

Study Design and Population

This retrospective cohort study compared the effectiveness and outcomes of two laparoscopic techniques for

inguinal hernia repair: total extraperitoneal and transabdominal preperitoneal, focusing specifically on patients with bilateral inguinal hernias. In this context, primary bilateral inguinal hernia patients aged 18 and over who underwent surgery at our center between January 2021 and December 2023 were evaluated. Due to the difference in the anatomy of the inguinal region, female patients were not included in the study to ensure standardization. Patients with recurrent hernias, emergent procedures, or patients who could not be treated with a minimally invasive approach were excluded.

Groups to Analyse and Techniques

In this comparative study, patients undergoing laparoscopic bilateral inguinal hernia repair were systematically divided into two main groups based on a surgical strategy focused on TEP and TAPP. The decision to allocate any patient into either group was made by surgeon preference along with anatomical evaluations of each patient, thus selecting a specific technique for each case. All surgeries were performed by the same team working specifically on hernia.

Totally Extraperitoneal Technique (TEP)

The TEP method involves creating a working area within the preperitoneal region, located just outside the peritoneal cavity.

Transabdominal Preperitoneal (TAPP) Technique

The TAPP method is a procedure that allows access to the bilateral hernia area by entering the peritoneal cavity. In both techniques, polypropylene meshes are placed on both sides after the hernia areas are sufficiently released. When choosing between TEP and TAPP methods, the supervisory physician factors in some factors, including the nature of the patient's previous surgical history involved and the pros/cons inherent in each approach. Therefore, every patient receives appropriate surgery to repair his/her bilateral inguinal hernia, depending on its anatomical arrangement and general health considerations.

Variables Analysed

Preoperative diagnosis of all patients was made by detecting hernia both on physical examination and inguinal region ultrasonography. Demographic/clinical characteristics of the patients, such as age, body mass index

(BMI), American Society of Anesthesiologists (ASA) score, surgery duration, visual analog scale (VAS) on the first postoperative day, and hospitalization duration, were recorded. Rates of seroma, hematoma, unexpected readmission in the first 30 days, and recurrence in the first 6 months were used to provide a more detailed safety profile for each approach.

Data analysis was performed using SPSS version 25.0, with t-test or Mann-Whitney U test applied for continuous variables, and Chi-square or Fisher exact test for categorical variables. A P value of less than 0.05 was considered significant. Multivariable logistic regression was used to adjust for confounders. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki, and due to its retrospective nature, only a standard surgical informed consent form was obtained from individual subjects before surgery. Ethical approval numbered 623 (13/12/2023-623) was received from our hospital's clinical research ethics committee.

Results

Bilateral inguinal hernia surgery was performed on 237 male patients during the study period. Eighteen patients who underwent surgery due to recurrent hernia and seventy-four patients who underwent open surgery were excluded from the study. Data from 145 patients, 51 (35%) with TAPP and 94 (65%) with TEP, were included in the study. Analysis of demographic and surgical characteristics between TAPP and TEP methods showed no statistically significant differences in age, BMI, or ASA scores between patients undergoing bilateral laparoscopic inguinal hernia repair. The mean ages of the patients did not differ significantly between the TAPP (53.78±10.43 years) and TEP (53.24±12.31 years) groups (Table 1).

Surgery time and hospital stay were also comparable. The p-values between these two procedures were 0.822 and 0.115, respectively, and there was no significant difference. Surgery time ranged from 50 minutes to 200 minutes. It was observed that the majority of the patients were discharged the next morning after the surgery (Table 1).

The mean VAS scores in pain assessment the morning after surgery were 3.1±1.5 (TAPP) and 2.9±1.4 (TEP) respectively, and there was no significant difference between the two methods (p=0.346). The rate of unexpected readmission within 30 days after surgery was similar in both groups (2% for TAPP, 2.1% for TEP; p=0.75). The findings in these patients were seroma, hematoma, or subileus attack. Patients who developed hematoma and had subileus attacks were hospitalized and treated without surgery. Patients who developed seroma were followed up at the outpatient clinic and recovered without any need for drainage (Table 2). In addition, the rates of chronic groin pain lasting three months or longer and hernia recurrence in the first 6 months were similar between the groups, with p-values of 0.459 and 0.621, respectively, indicating that there was no significant difference (Table 2).

Table 2. Postoperative complications and outcomes

	TAPP n=51	TEP n=94	p
VAS (Mean±SD)	3.1±1.5	2.9±1.4	0.346
Readmission 30 Days, n (%)	1 (2)	2 (2.1)	0.785
Chronic Inguinal Pain, n (%)	2 (3.9)	3 (3.1)	0.459
Hernia Recurrence, n (%)	2 (3.9)	2 (2.1)	0.621

TAPP: Transabdominal preperitoneal; TEP: Totally extraperitoneal; VAS: Visual analog scale; SD: Standard deviation.

Table 1. Comparison of demographic data and perioperative results of surgical techniques

	TAPP n=51 (35%)		TEP n=94 (65%)		p
	Mean (Min-Max)	±SD	Mean (Min-Max)	±SD	
Age	53.78 (31-73)	10.43	53.24 (22-80)	12.31	0.778
BMI	26.62 (19-36)	3.37	26.66 (17-34)	3.05	0.947
Surgery Duration (minute)	101.2 (60-195)	32.17	98.41 (50-200)	32.17	0.822
Hospital Stay (day)	1.25 (1-3)	0.52	1.19 (1-3)	0.44	0.115

TAPP: Transabdominal preperitoneal; TEP: Totally extraperitoneal; BMI: Body mass index; Min: minimum; Max: maximum; SD: Standard deviation.

Although a balloon trocar was used in the TEP method, mesh fixation was generally not required. In the TAPP method, tacks were generally used to fix the mesh. In addition, locking sutures were used to close the peritoneal flaps. Other surgical equipment was similar for both techniques. Therefore, no cost analysis was performed between the two techniques in terms of materials used.

Discussion

Our research highlights the effectiveness of both TEP and TAPP in the treatment of bilateral laparoscopic inguinal hernias. This understanding led us to a deeper appreciation of the need for personalized surgical intervention to align with the competence of the surgeon and the unique characteristics of each particular case.

Although findings in previous studies have contributed some useful facts on this topic, it is known that there is a paucity of literature comparing TAPP and TEP techniques, especially for bilateral hernias. There is not yet a common ground as to which method will yield better overall results. For this reason, studies have specifically addressed the management and economic aspects of complications related to hernia repair.^[8,9] Although it is known that there is a longer operating time and learning curve for laparoscopic methods in hernia surgery, studies have shown additional advantages such as less postoperative pain, early return to normal activities, and a comparable recurrence rate compared to open Lichtenstein repair.^[10]

A study comparing the Lichtenstein and TAPP procedures for bilateral inguinal hernia reported that TAPP effectively reduced postoperative pain, hospital stay, and postoperative complications.^[11] Sharma et al.^[12] prospectively compared TEP and TAPP methods in bilateral inguinal hernias. In this study, they found the average surgery time and postoperative pain score to be high in the TEP group. They also emphasized that the difference between the two groups in terms of cost could be ignored. In our study, we saw that the costs were balanced due to the different materials used in both techniques. Additionally, in our study, we did not detect a statistically significant difference between the two groups in terms of surgery times and postoperative pain scores. Similarly, Jaiswal et al.^[8] reported in their study that pain at the 24th hour after surgery was higher in TAPP patients than in TEP patients, but the difference was not statistically significant.

Ortenzi et al.^[9] found that TAPP and TEP had similar overall complication risks, incidence of postoperative acute

and chronic pain, and recurrence rates. In the long term, chronic pain is reported as the most common complication in both groups. In our study, the presence of pain at the 3rd month follow-up was found to be 4.5% and 3.5% in the TAPP and TEP groups, respectively. Because TAPP and TEP have comparable results, the choice of technique depends on the surgeon's skills, training, and experience. Postoperative pain is expected to be less observed in TEP in laparoscopic hernia repair, as it preserves peritoneal integrity. For this reason, the TEP technique can be preferred over TAPP. Additionally, there are studies showing that patients treated with TEP experience early recovery and faster return to routine work.^[13] A meta-analysis that randomized 1519 hernia patients to TEP and TAPP repair groups concluded that TEP and TAPP had distinct advantages over each other.^[14] Although both repair techniques were found to be equally effective in a prospective randomized study including 100 patients, it was reported that TEP had a better patient satisfaction score than TAPP.^[15] Although studies have found the rate of seroma to be higher in the postoperative period, especially in the TEP group compared to TAPP, it has been reported that it resolves without requiring intervention.^[8,15] In our study, we had two patients with seroma, and they were in the TEP group. However, this rate may actually be higher. Since we did not use a routine imaging examination during follow-up, only seromas detected by USG in symptomatic patients were recorded.

Various studies have been conducted by researchers to determine the results of laparoscopic TAPP and TEP techniques in inguinal hernia repairs, but very few have focused on bilateral inguinal hernia repairs using these methods.^[1,12,16] This study seeks to bridge this gap by providing a comparative analysis of the adequacy, safety, and complication rates associated with using either technique in the treatment of bilateral hernias. In contrast to much broader findings that do not discriminate between unilateral or bilateral repairs, our results show that both TAPP and TEP are equally effective in resolving a double-sided groin hernia, with lower risk potential adjustments of TAPP. These results may have been influenced by various factors, including inherent technical distinctions between TAPP and TEP, surgical expertise and preference of the operating surgeon, as well as specific anatomical and health characteristics of patients undergoing bilateral hernia repair. Even though it is more invasive than the latter technique, direct visual operation access might be among the reasons for the lesser complications associated with TAPP, especially during the treatment of a double-sided hernia.

Although the research adds valuable information to compare laparoscopic TAPP and TEP techniques to repair bilateral hernias located in the groin area, it has some limitations. One major limitation is that this study is retrospective in design, which is useful for collecting a large amount of data over a long period but may cause data collection and patient selection biases. Furthermore, the use of medical records and operative reports alone may omit some clinical subtleties and postoperative complications, probably affecting the accuracy of the comparison between these two surgical methods. Additionally, the fact that this study only focused on one hospital setting could limit its generalizability to other surgical settings where variations in surgeons' skills, patient characteristics, and procedural protocols could affect the outcomes of TAPP or TEP hernia repair.

Our study provides important information about the comparable results of TAPP and TEP techniques in bilateral hernia repair. Therefore, while our study adds to the growing corpus of evidence supporting both TAPP and TEP techniques as safe and effective means of treatment for patients with inguinal hernias, more multicenter randomized trials involving different patient groups are needed to confirm our findings, as well as increase their relevance in wider surgical settings and types of patients.

Conclusion

Our study showed that TEP and TAPP are effective laparoscopically in the treatment of bilateral inguinal hernia. Both techniques can be safely preferred in bilateral inguinal hernia surgeries. However, it would be more beneficial to choose the method with more experience according to patient characteristics in the selection of surgical technique.

Disclosures

Ethics Committee Approval: Ethical approval numbered 623 (13/12/2023-623) was received from our hospital's clinical research ethics committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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References

1. Jan Z, Ali S, Ahmed N, Sarwar MA. Comparison of common postoperative complications between lichtenstein open repair and laparoscopic Transabdominal Pre-Peritoneal (TAPP) repair for unilateral inguinal hernia. *Cureus* 2021;13(9):e17863.
2. Hidalgo NJ, Guillaumes S, Bachero I, Butori E, Espert JJ, Ginestà C, et al. Bilateral inguinal hernia repair by laparoscopic totally extraperitoneal (TEP) vs. laparoscopic transabdominal preperitoneal (TAPP). *BMC Surg* 2023;23(1):270.
3. Yildiz A. Laparoscopic transabdominal preperitoneal and totally extraperitoneal in inguinal hernia surgery: Comparison of intraoperative and postoperative early complications of two techniques. *J Minim Invasive Surg* 2022;25(1):18–23.
4. Bansal VK, Misra MC, Babu D, Victor J, Kumar S, Sagar R, et al. A prospective, randomized comparison of long-term outcomes: Chronic groin pain and quality of life following totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) laparoscopic inguinal hernia repair. *Surg Endosc* 2013;27(7):2373–82.
5. Harvitkar RU, Gattupalli GB, Al-Hano H, Al-Kharouf KF, Joshi A. Laparoscopic groin hernia repair using the totally extraperitoneal approach: A retrospective study and our experience. *Cureus* 2023;15(6):e41151.
6. Pulikkal Reghunandan R, Ali Usman A, Basheer S, Kutichi L, Els Jojo J, Abdul Rasheed MF. Laparoscopic versus open inguinal hernia repair: A comparative study. *Cureus* 2023;15(11):e48619.
7. Verheij M, Abdalla AE, Chandran P. Comparative review of outcomes of Totally Extraperitoneal (TEP) and Transabdominal Preperitoneal (TAPP) primary inguinal hernia repair. *Cureus* 2023;15(12):e49790.
8. Jaiswal RK, Pandey NK, Tolat A, Kalwaniya DS, Gupta AK, Naga Rohith V, et al. A prospective comparative study of laparoscopic Totally Extraperitoneal (TEP) and Laparoscopic Transabdominal Preperitoneal (TAPP) inguinal hernial repair. *Cureus* 2023;15(7):e42209.
9. Ortenzi M, Williams S, Solanki N, Guerrieri M, Haji A. Laparoscopic repair of inguinal hernia: Retrospective comparison of TEP and TAPP procedures in a tertiary referral center. *Minerva Chir* 2020;75(5):279–85.
10. Shah MY, Raut P, Wilkinson TRV, Agrawal V. Surgical outcomes of laparoscopic total extraperitoneal (TEP) inguinal hernia repair compared with Lichtenstein tension-free open mesh inguinal hernia repair: A prospective randomized study. *Medicine (Baltimore)* 2022;101(26):e29746.
11. Lelpe B, Duran H, Diaz E, Fabra I, Caruso R, Malavé L, et al. A prospective randomized study comparing laparoscopic transabdominal preperitoneal (TAPP) versus Lichtenstein repair for bilateral inguinal hernias. *Am J Surg* 2018;216(1):78–83.
12. Sharma D, Yadav K, Hazrah P, Borgharia S, Lal R, Thomas S. Prospective randomized trial comparing laparoscopic transabdominal preperitoneal (TAPP) and laparoscopic totally ex-

- tra peritoneal (TEP) approach for bilateral inguinal hernias. *Int J Surg* 2015;22:110–7.
13. Dokania MK, Ankur A, Agarwal N, Jain A, Anshu A, Singh RAK. Comparison of perioperative complication rates of total extraperitoneal and transabdominal preperitoneal repairs in primary inguinal hernia. *J West Afr Coll Surg* 2024;14(1):69–75.
 14. Chen LS, Chen WC, Kang YN, Wu CC, Tsai LW, Liu MZ. Effects of transabdominal preperitoneal and totally extraperitoneal inguinal hernia repair: An update systematic review and meta-analysis of randomized controlled trials. *Surg Endosc* 2019;33(2):418–28.
 15. Krishna A, Misra MC, Bansal VK, Kumar S, Rajeshwari S, Chabra A. Laparoscopic inguinal hernia repair: Transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) approach: A prospective randomized controlled trial. *Surg Endosc* 2012;26(3):639–49.
 16. Kim SG, Son J, Lee SR, Jung KU. Laparoscopic repair of inguinal hernias: Risk factors for urinary retention and chronic pain after totally extraperitoneal repair and transabdominal preperitoneal repair. *J Minim Invasive Surg* 2021;24(4):215–22.