

ORIGINAL RESEARCH OPEN ACCESS

Transabdominal Preperitoneal (TAPP) Compared to Totally Extraperitoneal (TEP) for Primary Inguinal Hernia Repair in a Military Hospital: A Retrospective Cohort Study

Sunil Basukala¹ | Oshan Shrestha²  | Suchit Thapa Chhetri³  | Niranjana Thapa¹  | Samana Oli¹ | Bipin K. Mehta³ | Nabin Pokhrel⁴ | Bishal Tiwari⁵

¹Department of Surgery, Nepalese Army Institute of Health Sciences, Kathmandu, Nepal | ²Department of Anaesthesiology, Manmohan Cardiothoracic Vascular and Transplant Center, Kathmandu, Nepal | ³Nepalese Army Institute of Health Sciences, Kathmandu, Nepal | ⁴Department of Surgery, Universal College of Medical Sciences and Teaching Hospital, Bhairahawa, Nepal | ⁵Lamjung Hospital, Besisahar, Nepal

Correspondence: Suchit Thapa Chhetri (chhetrisuchit123@gmail.com)

Received: 19 April 2024 | **Revised:** 4 September 2024 | **Accepted:** 23 November 2024

Funding: The authors received no specific funding for this work.

Keywords: inguinal hernia | totally extraperitoneal | transabdominal preperitoneal

ABSTRACT

Background: Inguinal hernias are encountered commonly, but there is a lack of uniformity and standardization in repair techniques. There are a variety of repair methods, from open methods to laparoscopic approaches. The available laparoscopic techniques that exist for inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. This study aims to compare the outcomes of these two laparoscopic procedures.

Methods: The study was initiated after receiving ethical clearance. This single-centric retrospective study included the patients that underwent laparoscopic inguinal hernia repair from January 1, 2020, to December 31, 2023. Patient records were reviewed and assessed against the inclusion criteria of the study. Systematic random sampling was applied to select patients from the records. A structured questionnaire was prepared for the purpose of data collection. The data were refined and analyzed using the SPSS software.

Results: A total of 200 patients (100 in each group) who underwent laparoscopic repair of an inguinal hernia were part of this study. The median (IQR) age of patients in the TAPP group was 50 (41.25–64.75) years, and that in the TEP group was 48.5 (39.25–64.75) years. The TAPP procedure took a median (IQR) time of 81 (77–88) min, while the TEP procedure took 69 (66–73) min to finish. The patients in the TAPP group returned to their normal activities after 15 (14–16) days of surgery, and the patients in the TEP group returned after 13 (11–14) days. The pain score at 1 week was found to be better in the TEP group. No difference was observed in complications or recurrence.

Conclusion: TEP repair was found to be superior to TAPP repair in terms of procedural time, return to normal activities, and pain score at 1 week.

1 | Introduction

Inguinal hernia repair stands as one of the most frequently conducted surgical procedures, imposing a substantial financial burden

and morbidity on a global scale [1]. Despite the common occurrence of inguinal hernias, there is a notable absence of uniformity and standardization in hernia repair techniques. There are a variety of

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Author(s). *Health Science Reports* published by Wiley Periodicals LLC.

repair methods available, spanning from open to laparoscopic approaches, leading to continued discussions [2].

While laparoscopic repair is advantageous over open inguinal hernia repair in terms of postoperative discomfort, duration of hospital stay, and return to normal work [3]. The available laparoscopic techniques that exist for inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. TAPP necessitates access to the peritoneal cavity, whereas in TEP, the mesh is utilized to close the hernia outside the peritoneal cavity. TAPP is comparatively easier to learn, whereas TEP is a technically difficult procedure [4]. TAPP offers the advantage of no space constraints, while TEP provides the advantage of avoiding peritoneal violations.

Despite the formulation of guidelines for laparoscopic hernia repair by the International Endohernia Society [5], there remains debate regarding the choice of TAPP and TEP procedures for inguinal hernia repair. There are studies that provide conflicting results in the comparison of the TAPP and TEP procedures. This retrospective cohort study aims to compare the outcomes of these two laparoscopic procedures in the categories of procedural time, duration of hospital stay, return to normal activity, postoperative pain, intraoperative and postoperative complications, and recurrences.

2 | Methods

This study is compliant with the STROBE guidelines [6].

2.1 | Ethical Consideration

This study was given ethical clearance by the Institutional Review Committee of the Nepalese Army Institute of Health Sciences with a registration number of 965. This study was initiated after receiving ethical clearance from the concerned body.

2.2 | Study Design and Setting

This retrospective cohort study was conducted at a tertiary-level military hospital. This center, located in the capital city of the country, provides service to patients from all parts of the country. Laparoscopic approaches for the repair of the inguinal hernia are routinely taken in this center, and this study was performed to compare the outcomes of the TAPP procedure with the TEP procedure. This single-centric retrospective study included the patients that underwent laparoscopic inguinal hernia repair from January 1, 2020, to December 31, 2023.

2.3 | Study Population

This comparative study included patients over 18 years of age with unilateral inguinal hernia who underwent laparoscopic hernia repair (TAPP or TEP). Patients with complicated hernias (incarcerated, irreducible, or obstructed), who underwent emergency hernia surgery, patients with a history of steroid use, patients with a history of chemotherapy use, and patients with

incomplete records and follow-up not completed for up to 3 months were excluded from the study.

2.4 | Sample Size and Sampling Technique

The minimum sample size required for this study was calculated using the following formula [7],

$$\begin{aligned}n_1 &= (\sigma_1^2 + \sigma_2^2/K)(Z_{1-\alpha/2} + Z_{1-\beta})^2/\Delta^2 n_1 \\&= (0.57^2 + 0.57^2/1)(1.96 + 1.28)^2/0.28^2 n_1 = 87 \\(\text{TAPP group}) n_2 &= K \times n_1 = 87(\text{TEP group}),\end{aligned}$$

where, Δ = difference between two means = $(1.85 - 1.57) = 0.28$ (from a past study with a similar primary endpoint that is, pain score at 1 week) [8], σ_1/σ_2 = variance of mean 1 and mean 2 = 0.57 , n_1 = sample size for group 1 (TAPP), n_2 = sample size for group 2 (TEP), α = probability of type I error (0.05), β = probability of type II error (0.1), power = $(1 - \beta) = 90\%$, Z = Critical Z value for a given α or β , K = ratio of sample size for two groups = 1.

The minimum sample size required in each group was calculated to be 87. As this calculated sample size was the minimum required number of samples, we included 100 in each group for easier data interpretation, making a total of 200 samples in this study.

All the records from January 1, 2020, to December 31, 2023, were reviewed and assessed against the inclusion criteria of the study. The systematic random sampling was applied to select the patients from the records to minimize the selection bias. The eligible patient records were then marked, and every third record was chosen until 100 samples were not reached in each group.

2.5 | Study Tool

A structured questionnaire was prepared for the purpose of data collection from the records. This questionnaire had demographic components (age, sex, body mass index, ASA grading, hernia type, and hernia side), objective outcome components (procedural time, duration of hospital stay, time taken to return to normal activities, and complications), and subjective outcome (visual analog scale [VAS]). This tool collected patient data for up to 3 months of follow-up for both the TAPP and TEP groups. The collected data was refined in Excel.

2.6 | Variables

The categorical variables of this study were sex, ASA grading, hernia type, hernia side, and complications (intraoperative and postoperative). Similarly, the continuous variables of this study were age, body mass index, procedural time (measured in minutes), duration of hospital stay (measured in days), time to return to normal activities (measured in days), and VAS (0–10, where 0 means no pain and 10 denotes maximum pain) measured at the 1st postoperative day, at discharge, at 1 week, at 1 month, and at 3 months.

2.7 | Analytical Strategy

The normality of the data were tested by the Kolmogorov–Smirnov test. All the categorical variables of the study were presented using frequency and proportion (since the total sample size in both TAPP and TEP groups was 100, frequency corresponds to proportion). The continuous variables were presented using a mean with standard deviation (SD) for normal data and a median with an interquartile range (IQR) for skewed data. Inferential statistics were used to compare the outcomes of the two groups (TAPP and TEP). The chi-square test for association was used for the categorical outcomes, whereas the *t*-test or Mann–Whitney *U* test was chosen as per the distribution of the data for comparison of continuous variables. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 24.0 software.

TABLE 1 | Demographic details.

Variables	TAPP (N = 100)	TEP (N = 100)
Age (median [IQR])	50 (41.25–64.75) years	48.5 (39.25–64.75) years
Body mass index (kg/m ²)	26.8 (24.62–27.7)	27.1 (24.4–28.1)
Sex		
Male	95	93
Female	5	7
ASA		
1	59	67
2	34	27
3	7	6
Hernia type		
Indirect	69	72
Direct	31	28
Hernia side		
Right	57	64
Left	43	36

Abbreviations: IQR, interquartile range; TAPP, transabdominal preperitoneal; TEP, totally extraperitoneal.

3 | Results

A total of 200 patients (100 in each group) who underwent laparoscopic repair of inguinal hernia were part of this study with majority of them being males in both groups. The median (IQR) age of patients in TAPP group was 50 (41.25–64.75) years and that in TEP group was 48.5 (39.25–64.75) years. The median (IQR) body mass index was 26.8 (24.62–27.7) and 27.1 (24.4–28.1) in the TAPP and TEP group respectively. Indirect inguinal hernia was the commonest hernia type in both groups with right-sided hernia being the most frequent. The details of demographic details are given in Table 1.

The Kolmogorov–Smirnov test showed that all the continuous variables of the study were skewed and median (IQR) is used to present them while Mann–Whitney *U* test is used to compare the continuous outcomes between two groups. The chi-square test is used to compare the categorical outcomes.

This study found that the time taken to complete the TAPP procedure was 81 (77–88) min and time taken to complete the TEP procedure was 69 (66–73) min. This difference was found to be statistically significant inferring that the TEP procedure takes lesser time to finish. There was no statistically significant difference observed in the duration of hospital stay outcome between the TAPP and TEP. The patients who underwent TAPP recovered and returned to their normal activities in 15 (14–16) days of surgery while the patients who underwent TEP returned to normal activities in 13 (11–14) days. On comparing this outcome using the Mann–Whitney *U* test, it was found that the patients of TEP group recovered and returned to normal activities faster compared to the patients of TAPP group ($p < 0.01$).

A subjective assessment of pain felt by the patients after the surgery was done by using VAS. The VAS at the first postoperative was found to be 7 (6–8) in both groups which improved to 4 (3–5) and 4 (3–4) among TAPP and TEP groups respectively. The patients reported VAS score of 2 (2–3) in the TAPP group and 1 (1–2) in the TEP group at 1 week and this difference was found to be statistically significant ($p < 0.01$). The VAS score was found to be improving in both groups with no significant difference thereafter and at the 3 months both groups had VAS of 0 (0–1). The details of the primary outcomes are given in Table 2.

TABLE 2 | Comparison of primary outcomes of TAPP and TEP.

Variables	TAPP (N = 100)	TEP (N = 100)	<i>p</i> -value
Procedural time (median [IQR])	81 (77–88) min	69 (66–73) min	$< 0.01^a$
Hospital stay (median [IQR])	3 (2–3) days	3 (2–3) days	0.45 ^a
Return to normal activity (median [IQR])	15 (14–16) days	13 (11–14) days	$< 0.01^a$
Visual analog scale (median [IQR])			
At 1st postoperative day	7 (6–8)	7 (6–8)	0.60 ^a
At discharge	4 (3–5)	4 (3–4)	0.56 ^a
At 1 week	2 (2–3)	1 (1–2)	$< 0.01^a$
At 1 month	1 (0–1)	1 (0–1)	0.25 ^a
At 3 months	0 (0–1)	0 (0–1)	0.27 ^a

Abbreviations: IQR, interquartile range; TAPP, transabdominal preperitoneal; TEP, totally extraperitoneal.

^aMann–Whitney *U* test.

TABLE 3 | Comparison of complications and recurrence.

Variables	TAPP (N = 100)	TEP (N = 100)	p-value
Intraoperative complications			
Visceral injury	0	0	NA
Vascular injury	0	0	NA
Postoperative complications			
Seroma	11	13	0.66 ^a
Hematoma	4	3	0.70 ^a
Surgical site infection	3	2	0.65 ^a
Scrotal edema	4	7	0.35 ^a
Urinary retention	2	1	0.56 ^a
Recurrence	3	7	0.19 ^a

Abbreviations: IQR, interquartile range; TAPP, transabdominal preperitoneal; TEP, totally extraperitoneal.

^aChi-square test.

Comparative study of complications between TAPP and TEP showed no statistically significant difference in the complication rate. None of the patients in either group sustained visceral or vascular injury during the intraoperative period. The most frequent complications among each group was seroma formation followed by scrotal edema and hematoma formation. Three patients in the TAPP group and seven patients in the TEP group developed recurrence during the 3-month follow-up period but this difference was not statistically significant. The details of the complication and recurrence outcomes are given in Table 3.

4 | Discussion

TAPP and TEP are two of the important approaches used in inguinal hernia repair. While these two techniques share similarities, they yield distinct and significant outcomes. Our study revealed that the TEP procedure requires less time to complete compared to the TAPP procedure. This finding aligns with similar observations reported in other studies [4, 9]. The extended operative duration associated with TAPP may be due to the time required for suturing the peritoneum to secure the mesh in place [4]. Performing a TEP repair for bilateral hernias, where dissection transitions from one side to the other within the same working plane, could result in a shorter operating duration compared to TAPP [10]. However, some studies have shown longer operating times for the TEP procedure [10, 11]. The longer duration of the TEP procedure may be due to constraints in the available space and variations in the recognition of typical anatomical landmarks observed from within the peritoneal cavity [10]. The volume of procedures conducted at a hospital and the proficiency, experience, skills, and expertise of the surgeon are pivotal factors influencing operative time [12].

No statistically significant difference was observed in the duration of hospital stay outcomes between TAPP and TEP,

which is consistent with the findings reported by other studies [2]. Lepere et al. [13] and Zanghi et al. [14], in their observational studies, reported a shorter duration of hospital stay for patients undergoing the TEP procedure. Bracale et al. in their meta-analysis, similarly found that patients who underwent the TAP procedure experienced a shorter duration of hospital stay [15]. Hospital stay is influenced by various factors, such as the socioeconomic status of the patient, trends in medical practice, local customs, and the financial structure of healthcare providers [16]. Our study also revealed that patients in the TEP group recovered and returned to normal activities faster compared to those in the TAPP group, consistent with findings reported in other studies [13, 14]. However, Sharma et al. found that patients in the TAPP group returned to work earlier than those in the TEP group, although this difference was not statistically significant [10]. Schrenk et al. [17], Bansal et al. [18], and Cohen et al. [19], in their studies, reported no differences in the time taken for patients to return to normal activities between the TAPP and TEP groups. A significant advantage of laparoscopic repair of an inguinal hernia is the notable reduction in postoperative pain [8]. The difference in reported pain levels between the TAPP and TEP groups at 1 week was statistically significant in our study. Bansal et al. identified that TEP exhibits a notable advantage over TAPP due to a substantial reduction in postoperative pain persisting for up to 3 months [18]. Also, the majority of studies suggest that pain scores in the postoperative period are similar for both TEP and TAPP procedures [15, 16, 20]. Despite the expectation that TEP repair would lead to decreased postoperative pain scores since it does not involve entering the abdominal cavity, many studies do not fully support these assumptions [1]. However, the findings of this study have pointed towards better pain scores for the TEP procedure.

In the TAPP procedure, there is a possibility of visceral injuries arising from the unregulated use of trocars and other surgical instruments within the abdominal cavity [9]. Intraoperative vascular injuries are associated with TEP procedures [21]. This is consistent with several comparative studies where TEP procedures were linked to intraoperative vascular injuries [4, 9]. But in the present study, none of the patients in either group sustained a visceral or vascular injury during the intraoperative period. There was no significant difference between the TAPP and TEP groups regarding postoperative complications. Many studies also showed no difference in both intra- and postoperative complications between TAPP and TEP procedures [15, 20, 22]. Seroma stands out as the most common complication following laparoscopic inguinal hernia repair, observed in 11 and 13 patients in the TAPP and TEP groups, respectively. Factors contributing to seroma incidence include large hernia defects extending into the scrotum, advanced age, and indirect hernia [23]. Scrotal edema is predominantly observed in TEP repair [24], and this study also showed a higher number of patients in the TEP group, but this result was not statistically significant. The recurrence rate following TEP is approximately 1%–2%, while after TAPP, it ranges from 0% to 3% [10]. The factors that lead to recurrence can be attributed to incomplete hernia sac excision and mesh space, surgical inexperience, insufficient dissection of the myopectineal orifice, under-sizing of the prosthesis, insufficient overlap with hernia defects, improper fixation, and prosthesis folding or twisting [9, 25]. In

our study, total complications were higher in the TEP group. However, we did not find any significant association between recurrence rates in the postoperative and follow-up periods in either the TAPP or TEP groups. This finding is consistent with many other studies [15, 20, 26]. Both TEP and TAPP procedures carry a low risk of hernia recurrence when appropriate mesh sizes are utilized [27].

This comparative study was a retrospective study, and the follow-up data was for up to 3 months only. As this study was not a randomized study, the difference in the participants baseline characteristics cannot be said to be due to chance alone. This issue was tried to minimize by applying systematic random sampling while selecting the patients from the records. However, it is to be noted that the question of the generalizability of the result of this study exists. Also, this study could not study the financial burden of the procedure as the study institute was a military hospital where the cost of care is not borne by the patients. Since this study found that the TEP group had a faster return to normal activities, this should be further studied through randomized study in a military setting.

5 | Conclusions

TEP repair was found to be superior to TAPP in terms of procedural time, return to normal activities, and pain score at 1 week. There is no difference between the two procedures in terms of duration of hospital stay, complications, and recurrence.

Author Contributions

Sunil Basukala: conceptualization, formal analysis, writing-review and editing. **Oshan Shrestha:** conceptualization, formal analysis, writing-original draft. **Suchit Thapa Chhetri:** data curation, writing-original draft. **Niranjan Thapa:** conceptualization, data curation, writing-original draft. **Samana Oli:** data curation, writing-original draft. **Bipin K. Mehta:** writing-review and editing. **Nabin Pokhrel:** writing-review and editing. **Bishal Tiwari:** writing-review and editing.

Acknowledgments

The authors have nothing to report.

Ethics Statement

Ethical clearance for this study was received from Institutional Review Committee of Nepalese Army Institute of Health Sciences (Ref no: 965).

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Transparency Statement

The lead author Suchit Thapa Chhetri affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

References

1. F. X. Wei, Y. C. Zhang, W. Han, Y. L. Zhang, Y. Shao, and R. Ni, "Transabdominal Preperitoneal (TAPP) Versus Totally Extraperitoneal (TEP) for Laparoscopic Hernia Repair: A Meta-Analysis," *Surgical Laparoscopy, Endoscopy & Percutaneous Techniques* 25, no. 5 (November 2015): 375–383.
2. M. Verheij, A. E. Abdalla, and P. Chandran, "Comparative Review of Outcomes of Totally Extraperitoneal (TEP) and Transabdominal Preperitoneal (TAPP) Primary Inguinal Hernia Repair," *Cureus* 15, no. 12 (December 2023): 49790.
3. R. Pulikkal Reghunandan, A. Ali Usman, S. Basheer, L. Kuttichi, J. Els Jojo, and M. F. Abdul Rasheed, "Laparoscopic Versus Open Inguinal Hernia Repair: A Comparative Study," *Cureus* 15, no. 11 (November 2023): e48619.
4. A. Krishna, M. C. Misra, V. K. Bansal, S. Kumar, S. Rajeshwari, and A. Chabra, "Laparoscopic Inguinal Hernia Repair: Transabdominal Preperitoneal (TAPP) Versus Totally Extraperitoneal (TEP) Approach: A Prospective Randomized Controlled Trial," *Surgical Endoscopy* 26, no. 3 (March 2012): 639–649.
5. R. Bittner, M. E. Arregui, T. Bisgaard, et al., "Guidelines for Laparoscopic (TAPP) and Endoscopic (TEP) Treatment of Inguinal Hernia [International Endohernia Society (IEHS)]," *Surgical Endoscopy* 25, no. 9 (2011): 2773–2843.
6. E. von Elm, D. G. Altman, M. Egger, S. J. Pocock, P. C. Gøtzsche, and J. P. Vandenbroucke, "The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for Reporting Observational Studies," *Journal of Clinical Epidemiology* 61, no. 4 (April 2008): 344–349, <http://www.jclinepi.com/article/S08955435607004362/fulltext>.
7. B. Rosner, *Fundamentals of Biostatistics* (Boston, MA: Brooks/Cole, 2011).
8. K. B. Gurung, N. Banepali, R. R. Sthapit, and B. Adhikari, "Laparoscopic Inguinal Hernia Repairs: Comparison Between TAPP and TEP at a Tertiary Center of Nepal," *International Surgery Journal* 5, no. 11 (2018): 3719–3726, <https://www.ijurgery.com/index.php/isj/article/view/3403/2447>.
9. A. Yildiz, "Laparoscopic Transabdominal Preperitoneal and Totally Extraperitoneal in Inguinal Hernia Surgery: Comparison of Intraoperative and Postoperative Early Complications of Two Techniques," *Journal of Minimally Invasive Surgery* 25, no. 1 (March 2022): 18–23.
10. D. Sharma, K. Yadav, P. Hazrah, S. Borgharia, R. Lal, and S. Thomas, "Prospective Randomized Trial Comparing Laparoscopic Transabdominal Preperitoneal (TAPP) and Laparoscopic Totally Extra Peritoneal (TEP) Approach for Bilateral Inguinal Hernias," *International Journal of Surgery* 22, (October 2015): 110–117.
11. M. Gass, V. M. Banz, L. Rosella, M. Adamina, D. Candinas, and U. Güller, "TAPP or TEP? Population-Based Analysis of Prospective Data on 4,552 Patients Undergoing Endoscopic Inguinal Hernia Repair," *World Journal of Surgery* 36, no. 12 (2012): 2782–2786.
12. A. Aiolfi, M. Cavalli, S. Del Ferraro, et al., "Total Extraperitoneal (TEP) Versus Laparoscopic Transabdominal Preperitoneal (TAPP) Hernioplasty: Systematic Review and Trial Sequential Analysis of Randomized Controlled Trials," *Hernia* 25, no. 5 (October 2021): 1147–1157.
13. M. Lepere, S. Benchetrit, M. Debaert, et al., "A Multicentric Comparison of Transabdominal Versus Totally Extraperitoneal Laparoscopic

Hernia Repair Using PARIETEX® Meshes,” *Journal of the Society of Laparoendoscopic Surgeons* 4, no. 2 (2000): 147–153.

14. A. Zanghì, M. Di Vita, E. Lo Menzo, et al., “Multicentric Evaluation by Verbal Rate Scale and EuroQoL-5D of Early and Late Post-Operative Pain After TAPP and TEP Procedures With Mechanical Fixation for Bilateral Inguinal Hernias,” *Annali Italiani di Chirurgia* 82, no. 6 (2011): 437–442.

15. U. Bracale, P. Melillo, G. Pignata, et al., “Which Is the Best Laparoscopic Approach for Inguinal Hernia Repair: TEP or TAPP? A Systematic Review of the Literature With a Network Meta-Analysis,” *Surgical Endoscopy* 26, no. 12 (2012): 3355–3366.

16. Y. Hamza, E. Gabr, H. Hammadi, and R. Khalil, “Four-Arm Randomized Trial Comparing Laparoscopic and Open Hernia Repairs,” *International Journal of Surgery* 8, no. 1 (2010): 25–28.

17. P. Schrenk, R. Woisetschlager, R. Rieger, and W. Wayand, “Prospective Randomized Trial Comparing Postoperative Pain and Return to Physical Activity After Transabdominal Preperitoneal, Total Preperitoneal or Shouldice Technique for Inguinal Hernia Repair,” *Journal of British Surgery* 83, no. 11 (1996): 1563–1566.

18. V. K. Bansal, M. C. Misra, D. Babu, 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,” *Surgical Endoscopy* 27, no. 7 (2013): 2373–2382.

19. R. Cohen, G. Alvarez, S. Roll, et al., “Transabdominal or Totally Extraperitoneal Laparoscopic Hernia Repair?,” *Surgical Laparoscopy, Endoscopy & Percutaneous Techniques* 8, no. 4 (August 1998): 264–268.

20. Ö. Günel, Ş. Özer, E. Gürleyik, and T. Bahçebaşı, “Does the Approach to the Groin Make a Difference in Hernia Repair?,” *Hernia* 11, no. 5 (October 2007): 429–434.

21. J. L. Dulucq, P. Wintringer, and A. Mahajna, “Laparoscopic Totally Extraperitoneal Inguinal Hernia Repair: Lessons Learned From 3,100 Hernia Repairs Over 15 Years,” *Surgical Endoscopy* 23, no. 3 (March 2009): 482–486.

22. H. Pokorny, A. Klingler, T. Schmid, et al., “Recurrence and Complications After Laparoscopic Versus Open Inguinal Hernia Repair: Results of a Prospective Randomized Multicenter Trial,” *Hernia* 12, no. 4 (August 2008): 385–389.

23. H. Lau and F. Lee, “Seroma Following Endoscopic Extraperitoneal Inguinal Hernioplasty,” *Surgical Endoscopy* 17, no. 11 (November 2003): 1773–1777.

24. M. C. Misra, S. Kumar, and V. K. Bansal, “Total Extraperitoneal (TEP) Mesh Repair of Inguinal Hernia in the Developing World: Comparison of Low-Cost Indigenous Balloon Dissection Versus Direct Telescopic Dissection: A Prospective Randomized Controlled Study,” *Surgical Endoscopy* 22, no. 9 (September 2008): 1947–1958.

25. R. J. Fitzgibbons and V. Puri, “Laparoscopic Inguinal Hernia Repair,” *American Surgeon* 72, no. 3 (March 2006): 197–206.

26. B. L. Wake, K. McCormack, C. Fraser, L. Vale, J. Perez, and A. M. Grant, “Transabdominal Pre-Peritoneal (TAPP) vs Totally Extraperitoneal (TEP) Laparoscopic Techniques for Inguinal Hernia Repair,” *Cochrane Database of Systematic Reviews* 2005, no. 1 (January 2005): CD004703.

27. T. Heikkinen, S. Bringman, P. Ohtonen, P. Kunelius, K. Haukipuro, and A. Hulkko, “Five-Year Outcome of Laparoscopic and Lichtenstein Hernioplasties,” *Surgical Endoscopy* 18, no. 3 (March 2004): 518–522.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.