



Original Research

Operative Feasibility and Intra-Operative Outcomes of the Two Commonly Performed Methods of Laparoscopic Inguinal Hernia Repair: A Comparative Study

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Abstract

Background: Laparoscopic inguinal hernia repair is widely practiced, with Total Extra-Peritoneal (TEP) and Transabdominal Pre-Peritoneal (TAPP) approaches forming the two most commonly used minimally invasive techniques. Although both methods are well established, differences in operative feasibility and intra-operative performance continue to influence technique selection in routine surgical practice. **Objectives:** To compare laparoscopic TEP and TAPP mesh repair of inguinal hernia with specific emphasis on operative feasibility and intra-operative outcomes. **Methods:** This prospective comparative study included sixty patients undergoing elective laparoscopic inguinal hernia repair at a tertiary care centre. Thirty patients underwent TEP repair and thirty underwent TAPP repair. Operative duration, intra-operative complications, and anaesthetic requirements were analysed using descriptive and inferential statistical methods. **Results:** The mean operative time was significantly shorter in the TEP group compared to the TAPP group (70.83 ± 22.25 minutes vs 88.00 ± 13.80 minutes; $P = 0.001$). No major intra-operative complications were observed in either group. Minor complications occurred in 13.3% of patients in the TEP group and 6.7% in the TAPP group, with no statistically significant difference between the two techniques. Both approaches were completed successfully in the majority of patients, indicating good operative feasibility. **Conclusion:** Both TEP and TAPP laparoscopic inguinal hernia repair were safe and feasible in this study. TEP demonstrated an advantage in operative efficiency while maintaining comparable intra-operative safety. These findings support selecting the operative approach based on surgeon experience and procedural context rather than inherent superiority of either technique.

Keywords: Inguinal Hernia, Laparoscopic Hernia Repair, Total Extra-Peritoneal Repair, Transabdominal Pre-Peritoneal Repair, Operative Feasibility, Intra-Operative Complications

Introduction

Inguinal hernia surgery is often spoken of as routine. In practice, it rarely feels that way. The diagnosis is straightforward, but the operation itself still invites variation. Surgeons make small decisions during dissection, mesh placement, and closure that are difficult to standardise, even when the procedure is familiar. Cooper's remark on the precision demanded by hernia surgery is frequently quoted, perhaps because it continues to describe what happens in the operating room more accurately than many modern summaries.[1]

The condition itself remains common. Most patients are men, many present late, and bilateral disease is not unusual. In India, this pattern is accentuated by delayed consultation, occupational strain, and limited follow-up in some settings.[2] These factors do not necessarily alter the indication for surgery, but they do influence how reliably a technique can be performed and completed without difficulty.

Historically, hernia repair evolved through trial rather than theory. Bassini's repair restored anatomy but relied on tissue strength that was not always durable.[3] Mesh reinforcement improved recurrence rates, and Lichtenstein's tension-free repair simplified anterior open surgery to a large extent.[4] Even then, postoperative pain and groin discomfort persisted in a subset of patients, prompting interest in posterior approaches that avoided dissection of the inguinal canal.

Laparoscopic repair grew out of this need. Early attempts were limited, but they demonstrated that mesh could be placed from behind the myopectineal orifice.[5] Over time, two techniques came into regular use. Transabdominal Pre-Peritoneal (TAPP) repair provided wide exposure and clear identification of anatomical landmarks, at the cost of entering the peritoneal cavity.[6] Total Extra-Peritoneal (TEP) repair avoided this step, confining the operation to the pre-peritoneal space, which many surgeons find technically demanding, particularly in the early phase of experience.[7]

These differences are not theoretical. They shape the operation itself. TAPP offers space and orientation but requires peritoneal incision and closure. TEP reduces peritoneal handling but limits working room and tolerates little error in dissection. Reports comparing the two techniques describe variations in operative time, need for conversion, and intra-operative complications, but the findings are inconsistent across centres.[8] This inconsistency suggests that feasibility may depend as much on operative conditions and familiarity as on the procedure chosen.

In day-to-day practice, the decision between TEP and TAPP is rarely made after formal comparison of operative metrics. More often, it reflects training background, institutional routine, or the surgeon's comfort with a particular approach. Studies that focus heavily on postoperative pain or recovery do not always clarify how the operation itself unfolded.

For this reason, the present study was planned with a narrower aim. By comparing TEP and TAPP laparoscopic mesh repair of inguinal hernia specifically in terms of operative duration, conversion to open surgery, and intra-operative complications, the study seeks to examine how these two commonly performed techniques differ at the level of operative feasibility, independent of postoperative outcomes or patient-reported experience.

Materials and Methods

This study was conducted as a prospective comparative analysis in patients diagnosed with inguinal hernia and planned for elective laparoscopic repair. The work was carried out at a tertiary care teaching hospital over a defined study period extending from December 2007 to October 2009, with all procedures performed by surgeons experienced in laparoscopic hernia repair. A minimum postoperative follow-up of six months was ensured for all enrolled patients.

Study Population and Selection Criteria

A total of sixty adult patients were included in the study. Eligibility was restricted to patients aged eighteen years and above who were clinically diagnosed with unilateral or bilateral inguinal hernia and were considered fit to undergo laparoscopic surgery under general or regional anaesthesia. Patients with recurrent inguinal hernia following previous open repair were also included, provided no contraindication to laparoscopy existed.

Patients presenting with complicated hernias requiring emergency intervention, such as those with intestinal obstruction, strangulation, or gangrene, were excluded. Individuals with a history of failed laparoscopic inguinal hernia repair were likewise not considered for inclusion. Written informed consent was obtained from all participants after explaining the nature of the procedure, including the possibility of conversion to open surgery if required.

Group Allocation and Operative Technique

Patients were allocated into two groups based on the laparoscopic approach employed. Thirty patients underwent laparoscopic Total Extra-Peritoneal (TEP) mesh repair, while the remaining thirty underwent laparoscopic Transabdominal Pre-Peritoneal (TAPP) mesh repair. The choice of procedure was made after preoperative counselling, taking into account patient preference and surgeon discretion.

Both procedures were performed using standard laparoscopic equipment. Polypropylene mesh measuring approximately 15 × 15 cm was used in all cases, with trimming performed intra-operatively to suit individual pelvic anatomy. In the TEP group, access to the pre-peritoneal space was obtained without breaching the peritoneal cavity, and mesh placement was carried out after adequate medial and lateral dissection. In the TAPP group, pneumoperitoneum was established, followed by peritoneal incision, pre-peritoneal dissection, mesh placement, and reperitonealisation.

Peri-Operative Management

All patients underwent detailed preoperative evaluation, including routine laboratory investigations and cardiopulmonary assessment where indicated. Prophylactic antibiotics were administered prior to incision. A Foley catheter was placed selectively, particularly in elderly patients or those with symptoms suggestive of prostatic enlargement.

Postoperatively, patients were monitored for immediate complications and encouraged to ambulate early once the effects of anaesthesia subsided. Analgesics were administered as per institutional protocol, with transition to oral medications as early as feasible. Discharge was planned once patients were clinically stable and able to resume basic activities.

Outcome Measures

The primary focus of the study was operative feasibility and intra-operative outcomes. Parameters assessed included duration of surgery, requirement for conversion to open procedure, and intra-operative complications such as vascular injury, peritoneal breach, or visceral injury. Operative findings were documented contemporaneously using a predefined proforma.

Statistical Analysis

Data were entered and analysed using standard statistical software. Continuous variables were expressed as mean with standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between the two groups were performed using appropriate statistical tests for continuous and categorical data, with significance assessed at a 5% level.

Results

This prospective comparative study included sixty patients diagnosed with inguinal hernia who underwent laparoscopic mesh repair during the study period. Thirty patients were managed using the Total Extra-Peritoneal (TEP) technique and thirty using the Transabdominal Pre-Peritoneal (TAPP) technique. Operative and peri-operative data were available for all patients and were analysed as per the predefined protocol.

Baseline Demographic Profile

The age distribution of patients in both groups was comparable. In the TEP group, patients ranged from 20 to 61 years, with a mean age of 35.77 ± 13.47 years, whereas in the TAPP group, the age range was 19 to 68 years, with a mean age of 41.70 ± 14.71 years. The difference between groups was not statistically significant ($P = 0.109$), indicating adequate age matching (Table 1). The age-wise distribution is illustrated in Figure 1.

Age Group (years)	TEP (n=30) No (%)	TAPP (n=30) No (%)
<20	1 (3.3)	1 (3.3)
21-30	14 (46.7)	7 (23.3)
31-40	5 (16.7)	7 (23.3)
41-50	6 (20.0)	8 (26.7)
51-60	2 (6.7)	5 (16.7)
61-70	2 (6.7)	2 (6.7)
Total	30 (100.0)	30 (100.0)
Mean ± SD (years)	35.77 ± 13.47	41.70 ± 14.71

Table 1. Age distribution of patients in TEP and TAPP groups

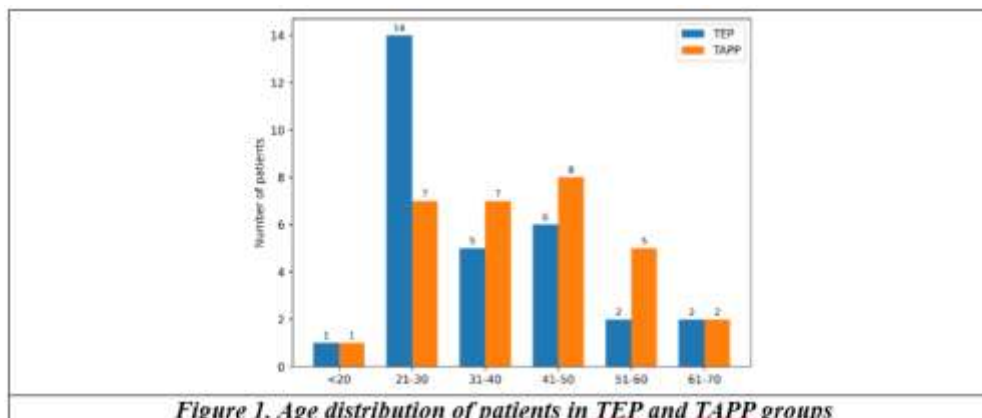


Figure 1. Age distribution of patients in TEP and TAPP groups

Bar chart showing age-wise distribution with distinct colours for each group and values displayed above bars.

Occupational Distribution

Patients in both groups represented a broad occupational background. Agriculture and manual labour constituted a substantial proportion, particularly in the TAPP group. Software professionals were more frequent in the TEP group. The detailed occupational distribution is shown in Table 2 and visually summarised in Figure 2.

Occupation	TEP No (%)	TAPP No (%)
Agriculture	7 (23.3)	10 (33.3)
Business	5 (16.7)	4 (13.3)
Coolie	5 (16.7)	9 (30.0)
Sports person	2 (6.7)	1 (3.3)
Student	3 (10.0)	3 (10.0)
Teacher	1 (3.3)	1 (3.3)
Software engineer	7 (23.3)	2 (6.7)
Total	30 (100.0)	30 (100.0)

Table 2. Occupational distribution of patients

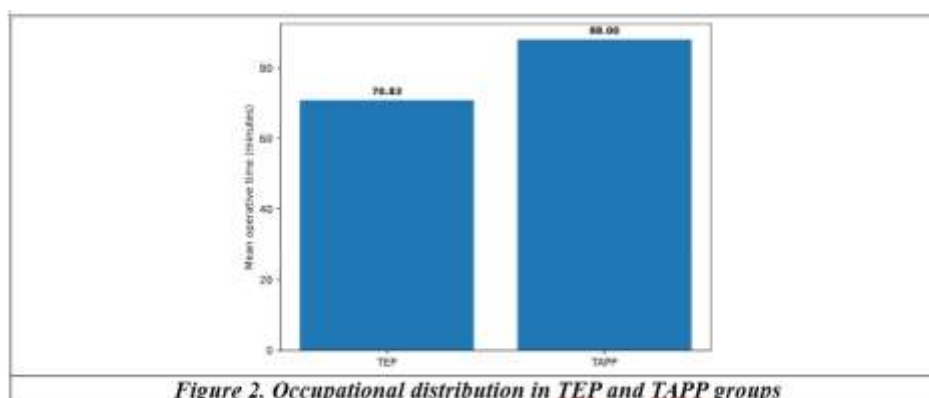


Figure 2. Occupational distribution in TEP and TAPP groups

Stacked bar chart depicting occupational categories with colour-coded segments and percentages labelled.

Hernia Characteristics and Diagnosis

Right-sided hernias were more frequent in both groups. In the TEP group, 53.3% were right-sided, 33.3% left-sided, and 13.3% bilateral. In the TAPP group, 46.6% were right-sided, 40.0% left-sided, and 13.3% bilateral. Both groups showed identical distribution of direct (n = 14) and indirect hernias (n = 20). Diagnostic categorisation is detailed in Table 3.

Diagnosis	TEP No (%)	TAPP No (%)
Left direct hernia	6 (20.0)	9 (30.0)
Left indirect hernia	4 (13.3)	3 (10.0)
Right/Left direct + indirect	1 (3.3)	1 (3.3)
Right/Left indirect + direct	1 (3.3)	1 (3.3)
Right/Left indirect hernia	2 (6.7)	2 (6.7)
Right direct hernia	6 (20.0)	3 (10.0)
Right indirect hernia	10 (33.3)	11 (36.7)

Table 3. Diagnosis distribution

Associated Comorbidities and Anaesthesia

Associated systemic illnesses were uncommon and similarly distributed between groups (P = 0.706). Hypertension was the most frequent comorbidity. Details are shown in Table 4. General anaesthesia was used in all TAPP cases, while four patients in the TEP group underwent surgery under regional anaesthesia (Table 5).

Condition	TEP No (%)	TAPP No (%)
None	27 (90.0)	25 (83.3)
Any comorbidity	3 (10.0)	5 (16.7)
Hypertension	3 (10.0)	2 (6.7)
Diabetes mellitus	0	1 (3.3)
IHD	0	1 (3.3)
COPD	0	1 (3.3)

Table 4. Associated diseases

Anaesthesia	TEP No (%)	TAPP No (%)
General	26 (86.7)	30 (100.0)
Regional	4 (13.3)	0

Table 5. Type of anaesthesia

Operative feasibility and complications

No major intra-operative complications were observed in either group. Minor complications occurred in 13.3% of TEP cases and 6.7% of TAPP cases, with no statistically significant difference ($P = 0.671$) (Table 6). The distribution of complications is shown in Figure 3.

Complication	TEP No (%)	TAPP No (%)
Major	0	0
Minor	4 (13.3)	2 (6.7)

Table 6. Intra-operative complications

The minor complications in the TEP group included surgical emphysema ($n = 3$) and port-site infection ($n = 1$). In the TAPP group, minor complications included right shoulder pain ($n = 1$) and early transient groin pain ($n = 1$).

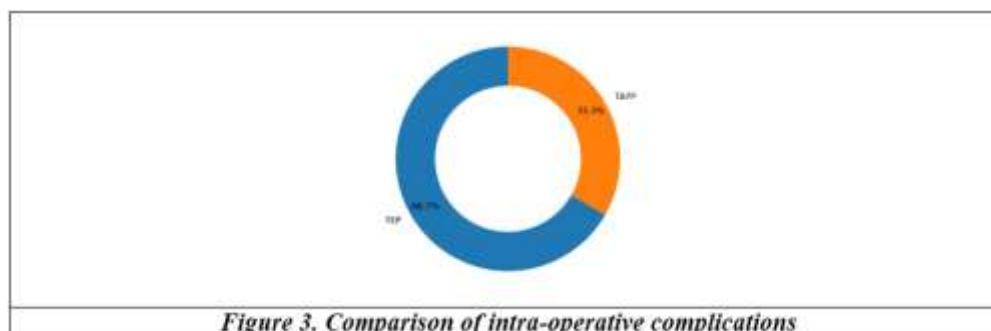


Figure 3. Comparison of intra-operative complications

Donut chart showing proportion of minor complications in both groups with bold percentage labels.

Operative Time

Mean operative time was significantly shorter in the TEP group (70.83 ± 22.25 minutes) compared to the TAPP group (88.00 ± 13.80 minutes). This difference was statistically significant ($t = 3.589$; $P = 0.001$) (Table 7). A graphical comparison is shown in Figure 4.

Parameter	TEP	TAPP
Min-Max (minutes)	40-120	70-130
Mean $\pm$ SD (minutes)	70.83 ± 22.25	88.00 ± 13.80

Table 7. Comparison of operative time

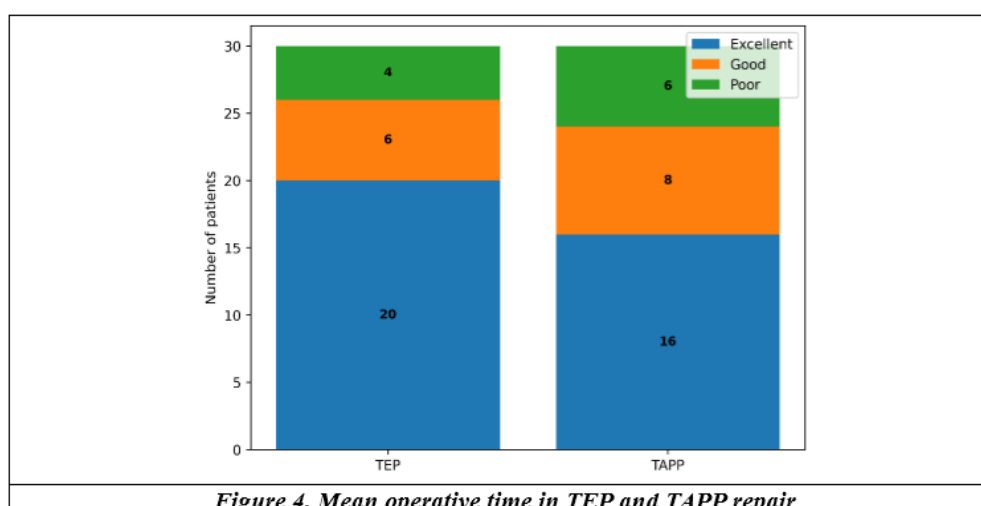


Figure 4. Mean operative time in TEP and TAPP repair

Bar chart with distinct colours and mean values displayed above bars.

Discussion

When the operative details from both groups were examined side by side, the most noticeable difference was not in safety, but in how smoothly the procedures progressed. Both TEP and TAPP could be completed without major difficulty in most patients, yet the sequence of steps and the time taken to complete them varied in a way that became apparent only after looking beyond individual cases.

Operative time stood out early in the analysis. In this series, TEP procedures were completed faster than TAPP repairs, and the difference was consistent enough to reach statistical significance. This was not entirely unexpected. Once the pre-peritoneal space is established and anatomical landmarks are recognised, TEP tends to proceed without interruption. TAPP, by comparison, offers excellent visual orientation but involves additional steps that naturally extend the duration of surgery. Differences in operative duration related to the extent of tissue dissection have been reported in comparative studies of posterior laparoscopic repair and anterior open techniques, where reduced dissection was associated with shorter operating times.[9]

What is perhaps more relevant is what did not differ. Despite the shorter operative time, TEP was not associated with an increase in serious intra-operative complications. In fact, major complications were absent in both groups. Minor complications occurred slightly more often in the TEP group, but the difference was small and statistically insignificant. This mirrors the experience reported by other authors, who have

suggested that minor technical issues during TEP are more reflective of the confined working space than of any inherent procedural risk.[10] With familiarity, these events tend to diminish.

From a practical perspective, these findings fit with everyday surgical experience. TEP demands careful orientation in a limited space, particularly in the early stages of dissection. Once this phase is negotiated, the remainder of the procedure is usually straightforward. TAPP, on the other hand, feels more intuitive initially but carries its own technical requirements that add time without necessarily improving safety. Large series comparing the two techniques have reached similar conclusions, emphasising that complication rates are largely influenced by surgeon experience rather than the chosen approach.[11]

The absence of recurrence during follow-up in both groups should be interpreted cautiously. Early recurrence after laparoscopic hernia repair is uncommon and often related to technical factors rather than the operative approach itself.[12] Given the follow-up duration in this study, the findings primarily reflect early technical success. Longer observation would be required to assess durability more reliably.

It is also worth noting that the patient population in this study reflects routine clinical practice rather than selected cases. Both techniques were applied across a comparable range of hernia types, and this likely contributed to the similar safety profile observed. Other studies have pointed out that TAPP may be preferred in certain situations, such as previous lower abdominal surgery or when inspection of the opposite groin is required.[13] In contrast, TEP may be advantageous when avoidance of peritoneal entry is considered desirable.

Overall, the distinction between TEP and TAPP in this study appears to lie more in operative efficiency than in safety. When performed by surgeons familiar with the technique, TEP offered a modest advantage in operative duration without compromising intra-operative outcomes. This perspective is consistent with contemporary reviews that emphasise individualised selection of laparoscopic approach based on surgeon experience, patient factors, and institutional practice rather than rigid preference for a single technique.[14] No recurrences were observed during the available follow-up period; however, recurrence was not a primary endpoint of this analysis.

The study does have limitations. It was conducted at a single centre, and while adequate for comparing operative parameters, the sample size may not detect rare complications. Follow-up was also limited. Even so, by focusing specifically on operative feasibility, the study highlights aspects of laparoscopic hernia repair that are often under-represented when attention is directed primarily toward postoperative recovery.

Conclusion

Both TEP and TAPP laparoscopic repair were feasible and safe in this series, with no major intra-operative complications observed. The primary difference between the techniques was operative efficiency, with TEP requiring a shorter operative time while maintaining comparable safety. TAPP remained a dependable alternative, particularly where intraperitoneal access was advantageous. Overall, the findings support selecting the operative approach based on surgeon experience and procedural context rather than inherent superiority of either technique.

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