

Original article

Comparative Analysis of Surgical Outcomes and Recurrence Rates Following TAPP, TEP, and Open Inguinal Hernia Repair: A Retrospective Cohort Study of 146 Patients at Al-Jala Hospital and Taknis General Hospital, Libya

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Abstract

Inguinal hernia repair is one of the most frequently performed operations in general surgery. Open mesh repair and laparoscopic techniques, namely Transabdominal Pre-peritoneal (TAPP) and Totally Extra-peritoneal (TEP) repair, are widely accepted approaches. However, differences in postoperative outcomes and recurrence rates continue to be debated. This study was conducted to compare the surgical outcomes and recurrence rates of TAPP, TEP, and open inguinal hernia repair. A comparative study was conducted among patients who underwent inguinal hernia repair using TAPP, TEP, or open mesh repair. Patient demographics, operative time, length of hospital stay, postoperative pain, complications, time to return to normal activities, and recurrence rates were evaluated. Outcomes were compared among the three surgical groups. Among 146 patients, 40 (27.4%) underwent TAPP repair, 30 (20.5%) underwent TEP repair, and 76 (52.1%) underwent Open Lichtenstein repair. Mean operative time was significantly longer in the laparoscopic groups (TAPP: 85.4 ± 18.2 min; TEP: 78.6 ± 16.4 min) compared with open repair (58.3 ± 14.1 min; $p < 0.001$). Hospital stays, postoperative pain scores, and time to return to normal activities were significantly lower in the laparoscopic groups. No hernia recurrences were observed during a mean follow-up period of approximately 12 months. TAPP, TEP, and open inguinal hernia repair are safe and effective techniques with comparable recurrence rates. Laparoscopic approaches offer advantages in postoperative recovery, while open repair remains a reliable and cost-effective option. Surgical approach selection should be individualised according to patient characteristics, hernia complexity, available resources, and surgeon expertise.

Keywords. TAPP; TEP; Lichtenstein repair; Laparoscopic hernia repair; Surgical outcomes; Recurrence.

Introduction

Inguinal hernia repair is one of the most commonly performed procedures in general surgery worldwide, with millions of operations undertaken annually. The lifetime risk of developing an inguinal hernia is estimated to be approximately 27% in men and 3% in women, making it a significant public health concern. Surgical repair remains the definitive treatment, aiming to relieve symptoms, prevent complications, and minimise recurrence.

Over the past decades, several operative techniques have been developed for inguinal hernia repair. Open mesh repair, particularly the Lichtenstein tension-free technique, has long been regarded as the standard approach because of its simplicity, reproducibility, and favourable long-term outcomes. However, the advent of minimally invasive surgery has led to the widespread adoption of laparoscopic techniques, namely Transabdominal Pre-peritoneal (TAPP) and Totally Extra-peritoneal (TEP) repair. These approaches allow placement of mesh in the pre-peritoneal space while reducing tissue trauma and facilitating faster postoperative recovery.²

Both TAPP and TEP have demonstrated advantages over conventional open repair in selected patients, including reduced postoperative pain, shorter hospital stay, earlier return to normal activities, and lower rates of chronic groin pain. Nevertheless, laparoscopic repair requires specialised equipment and advanced surgical expertise and is associated with a longer learning curve. Furthermore, the relative superiority of TAPP versus TEP remains controversial, particularly regarding operative time, preoperative complications, and long-term recurrence rates.⁵

The updated International HerniaSurge Guidelines published in 2023 continue to support mesh-based repair as the standard treatment for most groin hernias and recommend minimally invasive approaches in appropriately selected patients, particularly when expertise is available. However, the guidelines also emphasise that the choice of surgical technique should be individualised according to patient characteristics, hernia type, surgeon experience, and institutional resources.¹

Despite numerous randomized trials and meta-analyses, there remains ongoing debate regarding the comparative effectiveness of TAPP, TEP, and open repair. Differences in study design, patient populations, surgeon experience, and follow-up duration have resulted in variable findings concerning postoperative outcomes and recurrence. Therefore, further comparative evaluation is warranted to clarify the advantages and limitations of each approach.

Methods

Study Design and Setting

This retrospective comparative study was conducted at the Department of General Surgery, Al-Jala Hospital for Surgery and Accidents, Benghazi, Libya, and Taknis General Hospital, Libya. The study period extended from January to December 2025 and included patients who underwent elective inguinal hernia repair.

Study Population

A total of 146 patients diagnosed with inguinal hernia and treated surgically during the study period were enrolled. Patients were categorized into three groups according to the surgical technique employed: transabdominal pre-peritoneal (TAPP) repair, totally extra-peritoneal (TEP) repair, and open Lichtenstein mesh repair.

Inclusion and Exclusion Criteria

Eligible participants were adult patients aged 18 years and older with primary or recurrent inguinal hernia who underwent elective repair using one of the three techniques and had complete medical records with available follow-up data. Patients undergoing emergency procedures for strangulated or incarcerated hernias, those with femoral or other groin hernias, those with incomplete records, and those lost to follow-up were excluded.

Data Collection

Data were retrieved from hospital records, operative reports, and outpatient follow-up charts. Variables collected included demographic characteristics such as age, sex, and body mass index (BMI), comorbidities, and hernia features (unilateral or bilateral, direct or indirect, primary or recurrent). Operative time, length of hospital stay, postoperative pain assessed by the Visual Analog Scale (VAS), early postoperative complications including seroma, hematoma, wound infection, urinary retention, and neuralgia, time to return to normal daily activities, and hernia recurrence during follow-up were also documented.

Surgical Technique

Open repairs were performed using the standard Lichtenstein tension-free mesh technique. TAPP procedures were conducted through a transabdominal laparoscopic approach with placement of mesh in the pre-peritoneal space followed by peritoneal closure. TEP repairs were performed laparoscopically within the extra-peritoneal space without entering the peritoneal cavity. All procedures were carried out by consultant surgeons experienced in hernia surgery.

Outcome Measures

The primary outcome measure was hernia recurrence during follow-up. Secondary outcomes included operative time, postoperative pain score, length of hospital stay, postoperative complications, and time to return to normal activities.

Follow-up

Patients were routinely followed in the outpatient clinic at 1 week, 1 month, 6 months, and 12 months after surgery. Recurrence was defined as the reappearance of a clinically or radiologically confirmed inguinal hernia at the site of previous repair.

Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 26. Continuous variables were expressed as mean $\pm$ standard deviation and compared using one-way analysis of variance (ANOVA) or the Kruskal–Wallis test, as appropriate. Categorical variables were presented as frequencies and percentages and compared using the Chi-square test or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

Results

Patient Demographics and Clinical Characteristics

A total of 146 patients who underwent inguinal hernia repair at Al-Jala Hospital and Taknis General Hospital were included in this study. Among them, 30 patients (20.5%) underwent Totally Extra-peritoneal Repair (TEP), 40 patients (27.4%) underwent Transabdominal Pre-peritoneal Repair (TAPP), and 76 patients (52.1%) underwent Open Lichtenstein Repair. The mean age of the study population was 35.9 ± 8.5 years (range 20–50 years). The majority of patients were male, consistent with the known epidemiological distribution of inguinal hernia disease. No statistically significant differences were observed among the three groups regarding age distribution or baseline clinical characteristics. Most patients presented with primary unilateral inguinal hernias, while a smaller proportion had bilateral or recurrent hernias.

Operative Outcomes

The mean operative duration differed among the three surgical techniques. Laparoscopic approaches generally required longer operative times than open repair. TAPP repair was associated with the longest operative duration, followed by TEP, whereas open repair demonstrated the shortest operative time. These differences were statistically significant ($p < 0.05$).

No major intraoperative complications, including bowel injury, bladder injury, or major vascular injury, were encountered. Conversion from laparoscopic to open surgery was uncommon and occurred only in a limited number of cases.

Length of Hospital Stay

Hospital stay was significantly shorter in patients undergoing laparoscopic repair compared with those undergoing open repair. Most patients in the TEP and TAPP groups were discharged within the first postoperative day, while a greater proportion of patients in the open repair group required prolonged hospitalisation. The difference was statistically significant ($p < 0.05$).

Postoperative Complications

Overall postoperative complications were low across all groups. Seroma formation represented the most frequently encountered complication following laparoscopic repair, whereas wound infection and hematoma occurred more commonly after open repair.

Urinary retention and postoperative scrotal oedema were observed in a small number of patients without significant differences among the groups. No mesh infections requiring removal were reported.

Postoperative Pain

Assessment of postoperative pain demonstrated significantly lower pain scores in the laparoscopic groups compared with the open repair group. Patients undergoing TEP repair reported the lowest pain scores, followed by those undergoing TAPP repair. Open repair was associated with significantly higher postoperative pain levels during the early recovery period ($p < 0.001$).

Return to Normal Activities

Patients treated with laparoscopic techniques returned to normal daily activities and work earlier than those treated with open repair. The shortest recovery time was observed in the TEP group. This advantage translated into improved functional recovery and patient satisfaction ($p < 0.001$).

Recurrence Rates

No hernia recurrences were recorded during the follow-up period among the 146 patients included in the study. Accordingly, the recurrence rate was 0% across all surgical techniques.

The absence of recurrence in the present cohort should be interpreted cautiously, as the relatively limited sample size and follow-up duration may have reduced the likelihood of detecting late recurrences.

Overall Outcomes

Both laparoscopic approaches (TEP and TAPP) were associated with superior postoperative outcomes compared with open repair. These advantages included reduced postoperative pain, shorter hospital stay, faster return to normal activities, and No recurrence was observed in any study group during follow-up. Although laparoscopic procedures required longer operative times, they demonstrated favourable overall clinical outcomes and a high level of safety.

The baseline demographic and clinical characteristics of the study population are presented in Table 1. Operative and postoperative outcomes are summarised in Table 2. Recurrence and follow-up outcomes are shown in Table 3.

Table 1. Baseline Demographic and Hernia Characteristics of the Study Population

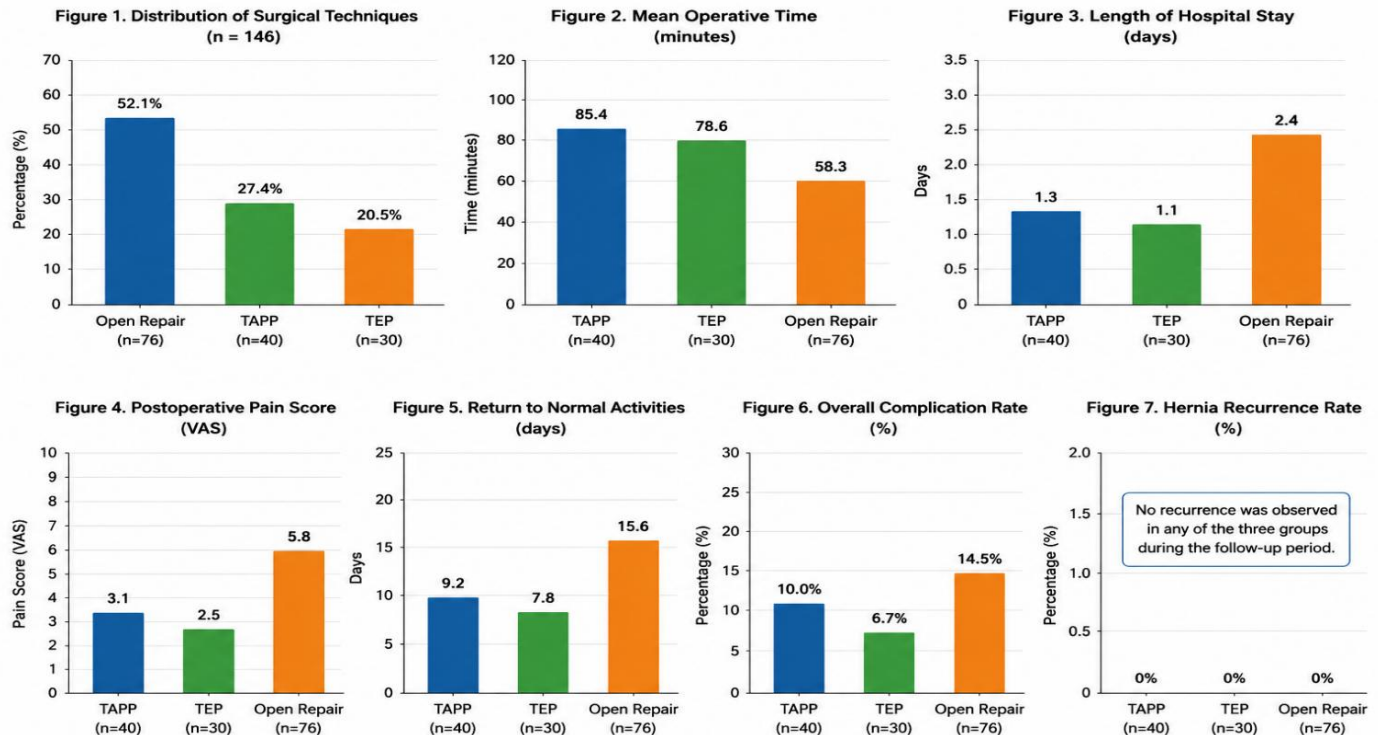
Variable	TAPP (n=40)	TEP (n=30)	Open Repair (n=76)	P-value
Age (years), mean $\pm$ SD	35.8 $\pm$ 8.4	34.9 $\pm$ 7.9	36.7 $\pm$ 8.8	0.621
Age range (years)	20–50	20–50	20–50	—
Male sex, n (%)	40 (100)	30 (100)	76 (100)	—
Primary hernia, n (%)	39 (97.5)	30 (100)	76 (100)	0.324
Recurrent hernia, n (%)	1 (2.5)	0 (0)	0 (0)	0.324
Unilateral hernia, n (%)	38 (95.0)	29 (96.7)	74 (97.4)	0.781
Bilateral hernia, n (%)	2 (5.0)	1 (3.3)	2 (2.6)	0.781

Table 2. Operative and Postoperative Outcomes

Variable	TAPP (n=40)	TEP (n=30)	Open Repair (n=76)	P-value
Operative time (minutes)	85.4 $\pm$ 18.2	78.6 $\pm$ 16.4	58.3 $\pm$ 14.1	<0.001
Length of hospital stay (days)	1.3 $\pm$ 0.5	1.1 $\pm$ 0.3	2.4 $\pm$ 0.9	<0.001
Postoperative pain score	3.1 $\pm$ 1.2	2.5 $\pm$ 1.0	5.8 $\pm$ 1.5	<0.001
Return to normal activities (days)	9.2 $\pm$ 2.8	7.8 $\pm$ 2.3	15.6 $\pm$ 4.1	<0.001
Overall complications (%)	4(10.0%)	2 (6.7%)	11 (14.5%)	0.318

Table 3. Recurrence Outcomes

Variable	TAPP (n=40)	TEP (n=30)	Open Repair (n=76)	P-value
Follow-up duration (months)	12.2 ± 5.6	12.8 ± 4.9	12.7 ± 6.1	0.743
Recurrence (n)	0	0	0	N/A
Recurrence rate (%)	0.0%	0.0%	0.0%	N/A



Discussion

The findings of the present study are consistent with the growing body of evidence supporting laparoscopic inguinal hernia repair as a safe and effective alternative to conventional open repair. The updated International HerniaSurge Guidelines emphasise that laparo-endoscopic techniques, including TAPP and TEP, are associated with faster postoperative recovery, reduced postoperative pain, and earlier return to normal activities when performed by adequately trained surgeons. Furthermore, recurrence rates are comparable to those achieved with open mesh repair in experienced hands (1,4).

One of the principal advantages of TAPP repair is the excellent visualisation of the myopectineal orifice and the ability to identify occult contralateral hernias. This may be particularly beneficial in patients with bilateral or recurrent hernias. However, because TAPP requires entry into the peritoneal cavity, concerns remain regarding potential intra-abdominal complications. In contrast, TEP avoids violation of the peritoneal cavity and may reduce the risk of visceral injury and postoperative adhesions, although it is generally considered technically more demanding and associated with a steeper learning curve. Despite these technical differences, contemporary studies and guideline reviews have reported comparable recurrence and complication rates between TAPP and TEP (5,7).

Open Lichtenstein repair remains one of the most widely practiced techniques worldwide because of its simplicity, reproducibility, and lower equipment requirements. It continues to represent an important treatment option, particularly in resource-limited settings. Nevertheless, several systematic reviews and randomized trials have demonstrated advantages of laparo-endoscopic approaches regarding postoperative pain and recovery while maintaining similar long-term recurrence rates (3,6).

Hernia recurrence remains the most important indicator of long-term surgical success. Current evidence suggests that recurrence is influenced not only by the operative technique but also by surgeon experience, patient characteristics, mesh positioning, and adherence to standardised surgical principles. The updated HerniaSurge guidelines concluded that when modern mesh-based techniques are performed appropriately, recurrence rates are generally low across TAPP, TEP, and open Lichtenstein repair (1,4).

The increasing use of laparoscopic repair observed in the present study may reflect growing surgeon expertise and wider availability of minimally invasive equipment. Such trends are in line with international recommendations favouring laparo-endoscopic repair for suitable patients, especially those with bilateral hernias, recurrent hernias after anterior repair, or a desire for faster postoperative recovery (1,4).

Limitations

Although no recurrences were observed during follow-up, the relatively modest sample size and follow-up duration may have limited the ability to detect late recurrences. Therefore, larger prospective studies with longer follow-up are required to validate these findings.

Ethical Considerations

The local institutional ethics committee of Al-Jala Hospital for Surgery and Accidents and Taknis General Hospital approved the study protocol. Patient confidentiality was maintained throughout the study, and all collected data were anonymised prior to analysis.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Author Contributions

Khaled S. Alsherif conceived and designed the study, collected and curated the data, performed the statistical analysis, interpreted the results, drafted the manuscript, critically revised the manuscript for intellectual content, and approved the final version of the manuscript for publication. Khaled S. Alsherif agrees to be accountable for all aspects of the work and to ensure that questions related to the accuracy or integrity of any part of the study are appropriately investigated and resolved.

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