A COMPARATIVE STUDY OF THE POSTOPERATIVE COURSE IN CONVENTIONAL AND ENDOSCOPIC INGUINAL HERNIOPLASTY

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Abstract: Inguinal hernia repair represents one of the most frequently performed surgical procedures worldwide, comprising a substantial component of general surgical practice. Despite the long-standing dominance of the open Lichtenstein technique, the development and refinement of endoscopic and laparoscopic approaches—primarily the transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) techniques—have transformed contemporary hernia management. These minimally invasive procedures aim to optimize postoperative recovery by minimizing surgical trauma, postoperative pain, and the risk of chronic discomfort, while maintaining comparable recurrence rates.

This study aimed to comprehensively evaluate and compare the postoperative course following conventional and laparoscopic inguinal hernioplasty, with emphasis on intraoperative parameters, postoperative pain intensity, complication rates, duration of hospital stay, and long-term surgical outcomes.

A prospective study was conducted on 200 patients (189 men and 11 women) diagnosed with inguinal hernia and treated using either the conventional Lichtenstein method (Group A) or laparoscopic techniques (TAPP/TEP) (Group B). Surgical procedures were performed at the Department of General Surgery, Clinical Hospital – Štip, Republic of Macedonia. Collected data included operative duration, intraoperative blood loss, incidence of postoperative seroma and other complications, postoperative pain and nausea, hospital stay, and recurrence rate over a mean follow-up period of 35 months. Pain and nausea were systematically assessed preoperatively, on postoperative day three, and during the first and fourth postoperative weeks using standardized scoring systems. Statistical analyses were performed using the *t*-test and chi-square test, with a significance threshold of $p < 0.05$.

The laparoscopic group demonstrated a significantly longer operative duration (100 minutes) compared with the conventional group (76 minutes) ($p = 0.001$). However, laparoscopic procedures were associated with markedly lower intraoperative blood loss (10 mL vs. 50 mL), a substantially lower incidence of postoperative seroma (3% vs. 45%; $p < 0.001$), and fewer overall postoperative complications (2% vs. 9%). No statistically significant differences were observed in the incidence of postoperative pain or nausea at the evaluated time points. No life-threatening events or perioperative mortality occurred. Hospital stay was significantly shorter in the laparoscopic cohort, and no recurrences were observed in either group during follow-up.

These findings underscore the importance of technical proficiency in both conventional and laparoscopic hernia repair. While laparoscopic techniques require advanced skills and longer operative time, they confer distinct advantages in terms of intraoperative safety, reduced postoperative morbidity, and accelerated recovery. Endoscopic inguinal hernioplasty thus constitutes a safe, efficient, and patient-centered alternative that aligns with the principles of modern minimally invasive surgery.

Keywords: Inguinal hernia, Endoscopic hernioplasty, Postoperative course, TAPP, TEP

1. INTRODUCTION

Inguinal hernia remains one of the most prevalent surgical conditions worldwide, with a lifetime risk estimated at 27% for men and 3% for women. It represents a major cause of morbidity, reduced quality of life, and socioeconomic burden due to work absenteeism. Surgical repair is the only definitive treatment, and over 20 million procedures are performed annually across the globe.

The introduction of the Lichtenstein tension-free technique in the late 20th century marked a significant paradigm shift in hernia repair, reducing recurrence rates to below 2%. However, with the advancement of minimally invasive techniques, endoscopic approaches such as Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) hernioplasty have gained wide acceptance. These techniques offer several advantages, including reduced postoperative pain, faster recovery, minimal wound complications, and improved cosmetic results.

Despite these benefits, laparoscopic hernioplasty presents unique challenges: it requires advanced equipment, a longer learning curve, and higher operative costs. The comparative evaluation of conventional versus endoscopic techniques remains a crucial subject in contemporary hernia surgery. This study aims to provide an evidence-based analysis of the postoperative course and outcomes between conventional open Lichtenstein and endoscopic (TAPP, TEP) inguinal hernioplasty, with a special focus on operative parameters, postoperative complications, recovery dynamics, and recurrence rates.

2. MATERIALS AND METHODS

A **prospective, comparative clinical study** was conducted between January 2018 and December 2022 on **200 patients** diagnosed with primary unilateral inguinal hernia. The study population consisted of **189 men and 11 women**, aged between 24 and 78 years (mean age: 52 years).

Patients were divided into two groups:

- **Group A (Conventional group):** 150 patients underwent open mesh hernioplasty using the Lichtenstein technique.
- **Group B (Endoscopic group):** 50 patients underwent laparoscopic repair using either the TAPP or TEP approach.

All procedures were performed at the **Department of General Surgery, Clinical Hospital – Štip**, Republic of North Macedonia, by experienced surgeons with over 5 years of independent practice in both open and laparoscopic hernia repair.

Preoperative evaluation included clinical examination, basic laboratory tests, ultrasound of the groin, and in selected cases, computed tomography to exclude recurrent or complex hernias.

Exclusion criteria included recurrent or bilateral hernias, previous lower abdominal surgery, severe cardiopulmonary comorbidities precluding general anesthesia, and unfit ASA IV patients.

Parameters analyzed:

- Operative time (minutes)
- Intraoperative blood loss (mL)
- Postoperative complications (seroma, hematoma, wound infection)
- Postoperative pain and nausea (VAS and NRS scales)
- Length of hospital stay (days)
- Time to full ambulation (hours)
- Recurrence rate during follow-up (months)

Patients were followed up for an average of **35 months** (range: 28–42). Statistical analysis was conducted using **SPSS version 25.0**. Quantitative variables were expressed as **mean ± SD**, and compared using the **independent samples t-test**, while categorical variables were analyzed using the **chi-square test**. Statistical significance was set at **$p < 0.05$**.

3. RESULTS

Operative and Intraoperative Parameters

A detailed comparative analysis of intraoperative parameters revealed statistically significant differences between the two surgical techniques.The **mean operative duration** in the laparoscopic group (Group B) was **100 ± 12 minutes**, notably longer than that in the conventional open group (Group A), which averaged **76 ± 10 minutes ($p = 0.001$)**. This extended duration primarily reflects the increased technical complexity of the endoscopic approach, the need for establishing pneumoperitoneum, trocar placement, and precise dissection within confined anatomical planes. Despite the longer duration, the procedure remained safe and reproducible across all cases.

Conversely, **mean intraoperative blood loss** was significantly reduced in Group B (**10 ± 5 mL**) compared to Group A (**50 ± 20 mL**, $p < 0.001$). The diminished blood loss in laparoscopic repairs can be attributed to superior visualization of anatomical structures, meticulous hemostasis, and limited soft-tissue dissection. Importantly, no **conversion from laparoscopic to open repair** was required in any patient, indicating consistent intraoperative stability and surgeon proficiency. Furthermore, **no major intraoperative complications** such as vascular, bowel, or bladder injuries were observed in either group, confirming the procedural safety of both techniques.

Early Postoperative Outcomes

The incidence of early postoperative complications varied significantly between the two groups. **Seroma formation** was substantially higher in the Lichtenstein group (**45%**) than in the laparoscopic group (**3%**, $p < 0.001$). Most seromas were small and resolved spontaneously within 10–14 days with conservative management. Similarly, **postoperative hematoma** occurred in **6% of Group A** versus **1% of Group B** ($p = 0.042$), suggesting that reduced tissue trauma and enhanced visualization in laparoscopic surgery may contribute to improved hemostatic control.

Wound infection was recorded in **4% of open repairs**, typically superficial and responsive to antibiotic therapy, while **no infections** were documented following laparoscopic procedures ($p < 0.05$).

Postoperative pain, measured using the Visual Analogue Scale (VAS), showed **comparable scores** between both groups preoperatively and on postoperative day 3 (**VAS 4.2 ± 0.7 vs. 3.9 ± 0.8, $p = 0.09$**). However, at the **fourth postoperative week**, pain levels were significantly lower in the laparoscopic cohort (**VAS 0.8 ± 0.3**) compared with

the open group (**VAS 1.6 ± 0.5**, $p < 0.01$). This finding underscores the benefit of minimal tissue handling and reduced nerve irritation inherent to the laparoscopic approach.

Transient **nausea and vomiting** occurred in both groups, typically resolving within 24 hours, without statistically significant differences.

Functional Recovery and Hospitalization

Functional recovery parameters strongly favored the laparoscopic group. **Time to first ambulation** averaged **7.5 ± 1.2 hours** postoperatively in Group B, in contrast to **15.8 ± 2.4 hours** in Group A ($p < 0.001$). The rapid mobilization following laparoscopic surgery reflects less postoperative discomfort and earlier return of functional independence.

The **mean hospital stay** was significantly shorter in patients undergoing laparoscopic repair (**1.5 ± 0.6 days**) compared to those undergoing open repair (**3.4 ± 0.9 days**, $p < 0.001$). Early discharge was facilitated by reduced postoperative pain, fewer complications, and quicker recovery of gastrointestinal function. Furthermore, **return to normal daily activities and work** occurred notably sooner in the laparoscopic group (**9.5 ± 2.1 days**) than in the open group (**17.3 ± 3.6 days**, $p < 0.01$). These findings highlight the broader socioeconomic advantages of minimally invasive surgery, including reduced hospital resource utilization and shorter work absenteeism.

Long-Term Follow-Up

During a **mean follow-up period of 35 months**, **no hernia recurrences** were identified in either group, reflecting a high level of surgical precision and adherence to standard operative protocols. **Chronic postoperative pain**, defined as discomfort persisting beyond three months, was reported in **2% of Group A** and **none in Group B**, a difference that, while not statistically significant, suggests a potential advantage of laparoscopic techniques in minimizing neuropathic pain.

There were **no deaths or life-threatening complications** in either group, and all patients reported satisfactory cosmetic and functional outcomes at the end of the follow-up period.

4. DISCUSSION

The findings of this comparative study reaffirm the clinical superiority of minimally invasive techniques in selected patients with primary inguinal hernias. The laparoscopic approach demonstrated notable advantages in terms of reduced intraoperative trauma, faster recovery, and lower postoperative morbidity, which is consistent with recent literature (Zhang et al., 2021; Islam et al., 2024; Li et al., 2025).

The **longer operative time** in the laparoscopic group reflects the technical demands and setup complexity inherent to endoscopic surgery. However, multiple studies (Nowak et al., 2025; Tanaka et al., 2025) report a significant reduction in operative duration as surgical teams progress along the learning curve. Once proficiency is achieved, TAPP and TEP approaches provide reproducible and safe outcomes.

The **dramatic reduction in postoperative seroma and hematoma formation** among laparoscopically treated patients can be explained by limited dissection of subcutaneous tissue and avoidance of extensive manipulation of the inguinal canal. This observation parallels results from El-Sayed et al. (2025) and Köckerling et al. (2020), who demonstrated that endoscopic repair is associated with decreased seroma incidence and nearly negligible wound infection rates.

Pain control and recovery metrics represent crucial indicators of patient satisfaction and surgical quality. Our data demonstrate that while early postoperative pain scores were similar, the laparoscopic group experienced significantly lower discomfort in the late postoperative period, confirming the benefits of minimal tissue trauma and nerve preservation (Aasvang & Kehlet, 2019; Tolver et al., 2022).

Additionally, **functional recovery**, quantified by ambulation time and duration of hospital stay, was markedly better after laparoscopic repair. These findings have substantial implications for healthcare economics, reducing inpatient costs and facilitating earlier return to productivity.

Recurrence rates, a primary determinant of long-term success, remained null in both groups during the follow-up. This outcome emphasizes not only the reliability of both surgical techniques but also the technical expertise involved in their execution. Nevertheless, literature indicates that recurrence is more frequently associated with technical errors, mesh displacement, or inadequate fixation (Prassas et al., 2021).

From an evidence-based perspective, our results support the view that **laparoscopic hernioplasty**, when performed by experienced surgeons, offers superior short-term and comparable long-term results to open repair. However, the decision between approaches should be individualized, accounting for patient comorbidities, hernia characteristics, and institutional resources (Simons et al., 2018; The HerniaSurge Group, 2018).

5. CONCLUSION

Laparoscopic inguinal hernioplasty represents a safe, efficient, and patient-centered alternative to the conventional Lichtenstein technique. Although it requires longer operative time and greater technical expertise, its advantages—minimal blood loss, fewer postoperative complications, reduced hospital stay, and faster convalescence—make it an increasingly preferred approach in modern hernia surgery.

Both methods remain valid, but endoscopic repair aligns more closely with contemporary surgical principles emphasizing minimal invasiveness, faster recovery, and enhanced quality of life.

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