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Original Research Article

Comparative effectiveness of open versus endoscopic hernioplasty techniques in inguinal hernia repair: a retrospective study

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ABSTRACT

Background: The optimal surgical approach for inguinal hernia repair remains debated. This study compared open (mesh and non-mesh) and endoscopic hernioplasty techniques, focusing on operative duration, postoperative pain, recovery and early complications.

Methods: A retrospective cohort study was conducted on 334 patients who underwent inguinal hernioplasty at a single university clinic (2022-2024). Five techniques were evaluated: Bassini repair (n=32), Kimbarovsky repair (n=34), Lichtenstein tension-free repair (n=178), transabdominal preperitoneal repair (TAPP; n=71) and extended totally extraperitoneal repair (eTEP, n=19). Outcomes assessed included operative duration, postoperative pain intensity (Visual Analog Scale-VAS), pain duration and hospital stay, narcotic analgesic requirements and early complications.

Results: Endoscopic techniques (TAPP and eTEP) demonstrated superior perioperative outcomes compared with open repairs. Patients undergoing TAPP/eTEP reported lower VAS scores ($p<0.001$) and a shorter duration of pain, with no narcotic analgesic use, versus 7.3% (Lichtenstein) and 34.8% (Bassini/Kimbarovsky). Median hospital stay was shorter after endoscopic repair (4 days) than following Lichtenstein repair (6–7 days). However, endoscopic procedures required longer operative times than open techniques. Early complication rates were low across all groups; seromas occurred more frequently after TAPP/eTEP repair (3.3%) than after Lichtenstein repair (0.5%), while hematomas were not observed in endoscopic cases.

Conclusions: Endoscopic inguinal hernioplasty is associated with reduced postoperative pain, minimal narcotic requirement and shorter hospital stay, but longer operative duration. These techniques should be considered preferentially when adequate surgical expertise and resources are available and rapid recovery is prioritised. Lichtenstein repair remains a reliable open alternative, while non-mesh techniques demonstrated less favourable outcomes.

Keywords: Inguinal hernia, Lichtenstein repair, TAPP repair, Endoscopic inguinal hernia repair, Open inguinal hernia repair, Post-operative pain

INTRODUCTION

Inguinal hernia is a common surgical pathology characterised by the abnormal protrusion of the peritoneal sac containing intestinal structures, adipose tissue or both, through the inguinal region beyond their normal anatomical boundaries. This protrusion occurs either through the physiological pathway of the inguinal canal or an acquired defect in the abdominal wall musculature.[1] Anatomically, inguinal hernias are classified as direct or indirect based on their relationship to the inferior epigastric vessels and the inguinal canal. Direct hernia

emerges through acquired defects in the transversalis fascia within Hesselbach's triangle, medial to the inferior epigastric vessels, reflecting weakness in the posterior wall of the inguinal canal.

In contrast, indirect hernias follow a congenital pathway through the deep inguinal ring, lateral to inferior epigastric vessels, resulting from failed obliteration of embryological processus vaginalis.[2] Inguinal hernias account for approximately 75% of all anterior abdominal wall hernias, demonstrating a marked male predominance. The lifetime incidence is estimated at 32% in men with peak occurrence between the third and sixth decades of life, compared to approximately 3% in women. Although less frequent in females, specific risk factors, most notably pregnancy and parturition, contribute to occasional presentations. In paediatric populations, the incidence ranges from 1–5%, with a substantially higher prevalence among preterm neonates, reaching 10–30%. Overall, inguinal hernia repair constitutes nearly 10% of all digestive surgical procedures, underscoring its considerable clinical significance.[1,3]

The surgical management of inguinal hernias has evolved significantly over decades. It involves anatomical reduction of the herniated viscera and/or omentum, followed by excision of the peritoneal sac in indirect hernias or invagination in direct hernias. Subsequent reconstruction of the myofascial defect and reinforcement of the posterior inguinal wall are essential to reduce recurrence risk.[4,5] Early surgical approaches of inguinal hernia were based on open techniques, beginning with the Bassini and later Kimbarovsky repair, which introduced anatomical reconstruction of the inguinal floor and was later refined into the Shouldice technique. The advent of tension-free repairs marked a major paradigm shift, most notably with the Lichtenstein technique using prosthetic mesh, which later became the gold standard in management due to its superior clinical outcomes.

Advancements in open inguinal hernia repair techniques led to the development and widespread adoption of minimally invasive laparoscopic approaches, such as extended totally extraperitoneal (eTEP) and transabdominal preperitoneal (TAPP), which are associated with reduced postoperative pain and rapid recovery.

Most recently, robotic-assisted surgery has emerged as an extension of the TAPP technique, offering the benefits of minimally invasive surgery with enhanced precision and ergonomics, although concerns regarding cost-effectiveness and long-term outcomes remain under evaluation.[6-10] According to current International Guidelines from the HerniaSurge Group, contemporary management of inguinal hernias has been consolidated into three evidence-based approaches: open anterior mesh repair using Lichtenstein technique, extended totally extraperitoneal patch plasty (eTEP) and transabdominal preperitoneal patch plasty (TAPP). These guidelines emphasise individualised decision-making based on institutional resources, surgical expertise and patient-specific factors.[11]

Despite advancements, inguinal hernia repair is associated with several clinically significant postoperative complications. Recurrence remains the most critical outcome measure and is highly dependent on anatomical precision and surgical technique, particularly in endoscopic procedures where minor technical variations can significantly affect long-term success. Seroma and hematoma formation (5–25% incidence) commonly occur following laparoscopic repair, especially in large indirect hernias. Urinary retention (1.3–5.8%) predominantly affects elderly men with preexisting prostatic symptoms and may require preoperative catheterisation in high-risk cases. Testicular complications (0.9–1.5%), including transient swelling and rare cases of orchitis, usually result from excessive dissection of spermatic cord structures. Although rare, mesh infection underscores the importance of strict aseptic techniques and thorough preoperative infection control.

Chronic postoperative neuralgias (0.5–4.6%), often involving the lateral cutaneous or genitofemoral nerves, may result from mesh fibrosis or improper tack placement, emphasising the need to avoid the "triangle of pain" during mesh fixation.[12] The widespread adaptation of mesh-augmented techniques, whether via open or laparoscopic access, has transformed inguinal hernia repair into a routine yet imperfect intervention. Clinical data indicate that chronic neuropathic pain affects up to 12% of patients, while recurrence rates may reach 12–13% within the first postoperative year, with both outcomes strongly dependent on surgical expertise.[13] Ongoing debate regarding optimal mesh fixation strategies reflects the complex balance between mechanical stability and postoperative morbidity in prosthetic hernia repair.[14]

These findings highlight a critical gap in institution-specific comparative analyses, particularly concerning postoperative recovery patterns and complication profiles. This retrospective comparative study aims to address this gap by systematically evaluating clinically relevant outcome measures across different inguinal hernia repair techniques. These include operative duration, postoperative pain assessed using the Visual analog scale (VAS), duration of pain syndrome, frequency of analgesic use and incidence of procedure-specific complications such as seroma and hematoma formation. By analysing these objective parameters, the study seeks to provide evidence-based insights to support surgical decision-making and optimise patient-centred postoperative outcomes in hernioplasty.

METHODS

Study design and setting

This retrospective comparative cohort study was conducted at the Surgical Department of Grodno University Clinic, analysing clinical data from patients who underwent inguinal hernioplasty between 2022 and 2024.

The study was designed to evaluate comparative effectiveness across different open and endoscopic hernioplasty techniques in inguinal hernia repair including postoperative outcomes, with an emphasis on operative duration, postoperative pain, analgesic requirements and procedure-specific complications.

Study population

A total of 334 consecutive patients who underwent inguinal hernia repair at the Department of Surgical Diseases, Grodno University Clinic, between January 2022 and December 2024 were included in the analysis.

The cohort consisted of 263 (78.7%) male and 71 (21.2%) female patients, with a median age of 60 years (interquartile range (IQR): 51–68). The majority of cases (n=331, 99.1%) were performed electively, while three (0.9%) were emergency procedures. Primary inguinal hernias accounted for 97.3% (n=325) of cases, with recurrent hernias constituting the remaining 2.7% (n=9).

Inclusion criteria

Adult patients (≥18 years) who underwent elective or emergency inguinal hernia repair at Grodno University Clinic between January 2022 and December 2024. Surgically confirmed diagnosis of inguinal hernia (direct, indirect or combined), classified according to the European Hernia Society (EHS) groin hernia classification system. Patients who underwent one of the following five hernioplasty techniques: Bassini repair (open, non-mesh). Kimbarovsky repair (open, non-mesh). Lichtenstein tension-free mesh repair (open, mesh). Transabdominal preperitoneal repair (TAPP, endoscopic). Extended totally extraperitoneal repair (eTEP, endoscopic)

Availability of complete perioperative data, including operative duration documented in anaesthesia records. Postoperative pain assessment using the Visual Analog Scale (VAS) recorded during hospitalization. Analgesic requirements (type, frequency and route of administration).

Length of hospital stay (admission to discharge date). Postoperative follow-up documentation for a minimum of 30 days to assess early complications. Primary unilateral or bilateral inguinal hernia (recurrent hernias were included if primary repair had been performed at least 6 months prior and complete surgical records were available).

Exclusion criteria

Patients under 18 years of age, as paediatric inguinal hernia pathophysiology and surgical management differ substantially from adult populations. Femoral, obturator or other non-inguinal groin hernias, due to distinct anatomical characteristics and surgical approaches that would confound comparative analysis. Emergency procedures for strangulated or incarcerated hernia requiring intestinal resection, as these cases carry inherently higher risks of surgical site infection, prolonged ileus and extended hospital stay, which would bias postoperative recovery outcomes.

Concurrent abdominal or pelvic surgery performed during the same operative session (e.g., cholecystectomy, prostatectomy, colorectal resection, umbilical hernia repair), as additional procedures independently influence operative duration, pain profiles, analgesic requirements and length of hospitalisation. Patients with American Society of Anaesthesiologists' (ASA) Physical Status classification IV or V, due to significantly elevated perioperative risk and potential confounding of recovery parameters unrelated to the hernia repair technique itself.

History of ipsilateral groin surgery (excluding previous hernia repair), including vascular access procedures, orchidopexy or pelvic lymph node dissection, which may distort normal anatomical planes and artificially increase surgical difficulty and complication rates. Incomplete or missing medical records (specifically: Absence of intraoperative details regarding technique or duration, Missing postoperative pain scores, Lack of documentation regarding analgesic use, No follow-up data within the first 30 postoperative days). Active systemic infection (e.g., pneumonia, urinary tract infection, sepsis), which may impair wound healing and confound complication rate analysis.

Immunosuppressive therapy or known malignancy at the time of surgery (chronic corticosteroid use, chemotherapy, biologic agents), due to altered wound healing and infection risk profiles.

Coagulopathy or ongoing anticoagulation therapy that could not be safely interrupted perioperatively, as these significantly increase hematoma risk and would bias complication rates. Chronic pain syndromes or preoperative opioid use, to avoid confounding of postoperative pain assessment and analgesic requirement analysis. Liver cirrhosis with ascites, as increased intra-abdominal pressure and coagulopathy may independently influence hernia recurrence and complication rates. Pregnancy or lactation at the time of surgery, due to physiological changes affecting surgical decision-making and recovery.

All medical records were systematically reviewed by two independent investigators to determine eligibility based on the above criteria. Any discrepancies in eligibility assessment were resolved through consensus or consultation with a senior author. The final study cohort comprised 334 patients who met all inclusion criteria and did not meet any exclusion criteria.

Surgical techniques

Five distinct hernioplasty methods were evaluated; Bassini repair (n=32, 9.5%), Kimbarovsky repair (n=34, 10.1%), Lichtenstein tension-free mesh repair (n=178, 53.2%). TAPP laparoscopic repair (n=71, 21.2%). Extended totally extraperitoneal endoscopic (eTEP) repair (n=19, 5.6%)

Outcome measures

Primary outcome variables included operative duration (minutes). Postoperative pain intensity, assessed via the VAS. Duration of postoperative pain syndrome (days). Frequency of analgesic use (number of doses required). Procedure-specific complications, including seroma formation, hematoma, surgical site infection and recurrence. Secondary outcomes included length of hospital stay (bed days), time to return to normal activity.

Data collection

Clinical data were extracted from electronic medical records, including operative notes, anaesthesia records and postoperative follow-up documentation. Long term outcomes including chronic pain and recurrence beyond 30 days were not evaluated. Continuous variables were reported as medians with interquartile ranges (IQR: Q1–Q3) due to non-normal distribution. Categorical variables were expressed as frequencies and percentages.

Statistical analysis

Comparative analyses were performed to assess differences in outcomes across surgical techniques. Non-parametric tests (Mann-Whitney U, Kruskal-Wallis) were used for continuous variables, while chi-square or Fisher's exact tests were applied for categorical comparisons. A p value <0.05 was considered statistically significant. Statistical analyses were conducted using R (version 4.2.0, R Foundation for Statistical Computing).

Ethical considerations

The study was performed in accordance with Good Clinical Practice standards and the principles of the Declaration of Helsinki. As this was a retrospective study, the need for informed consent was not required. All data were anonymised to maintain confidentiality and ethical integrity.

RESULTS

Demographic and clinical characteristics of the study population

A total of 334 patients who underwent inguinal hernioplasty at the Grodno University Clinic between January 2022 and December 2024 were included in this retrospective analysis. The demographic and baseline clinical characteristics of the study population are presented in Table 1.

Distribution of surgical techniques

The distribution of hernia repair techniques performed during the study period is illustrated in Table 2.

Intraoperative outcomes

Operative characteristics across the five surgical techniques are presented in Table 3.

Postoperative pain outcomes

In the early postoperative period, the frequency of complications, the degree of pain syndrome using a VAS, the duration of pain syndrome and analgesic requirement were assessed. Comparative data on these indicators are presented in Table 4.

Early postoperative complications

The incidence of early postoperative complications (within 30 days) is summarized in Table 5.

Postoperative recovery and hospital stay

Length of hospital stay and recovery parameters are presented in Table 7.

Based on data obtained in recent years, a clear trend towards increased utilisation of endoscopic hernioplasty techniques has been observed. Furthermore, the analysis indicates that patients undergoing endoscopic repair have a shorter hospital stay by an average of 3±1 days compared with open surgical interventions, resulting in a favourable economic impact.

Table 1: Demographic and baseline clinical characteristics of patients undergoing inguinal hernia repair (n=334).

Characteristics	Category	Number of patients (N)	(%)
Age (in years)	Mean±SD	58.4±14.2	-
	Median (IQR)	60 (51–68)	-

Continued.

Characteristics	Category	Number of patients (N)	(%)
	Range	19–89	-
Sex	Male	263	78.7
	Female	71	21.2
Body mass index (kg/m²)	Mean±SD	26.8±3.4	-
	<18.5 (Underweight)	12	3.6
	18.5–24.9 (Normal)	98	29.3
	25.0–29.9 (Overweight)	158	47.3
	≥30.0 (Obese)	66	19.8
ASA physical status classification	ASA I	89	26.6
	ASA II	191	57.2
	ASA III	54	16.2
Hernia laterality	Unilateral - right	182	54.5
	Unilateral - left	128	38.3
	Bilateral	24	7.2
Hernia type (EHS classification)	Direct (medial)	141	42.2
	Indirect (lateral)	167	50.0
	Combined (pantaloon)	26	7.8
Hernia presentation	Primary	325	97.3
	Recurrent	9	2.7
Admission type	Elective	331	99.1
	Emergency	3	0.9
Comorbidities	Hypertension	142	42.5
	Diabetes mellitus	58	17.4
	COPD/Asthma	37	11.1
	Benign prostatic hyperplasia	64	19.2
	Coronary artery disease	41	12.3
	Chronic constipation	53	15.9
Smoking status	Never smoked	178	53.3
	Former smoker	72	21.5
	Current smoker	84	25.2
Occupation/physical activity	Sedentary	119	35.6
	Light manual	98	29.3
	Heavy manual	117	35.1

Abbreviations: SD: standard deviation, IQR: interquartile range; ASA: American Society of anaesthesiologists, EHS: European Hernia Society, COPD: chronic obstructive pulmonary disease.

Table 2: Distribution of inguinal hernia repair techniques (n=334).

Surgical technique	Approach	Mesh utilization	Number of patients (N)	(%)
Bassini repair	Open	Non-mesh	32	9.6
Kimbarovsky repair	Open	Non-mesh	34	10.2
Lichtenstein tension-free repair	Open	Mesh	178	53.3
TAPP	Endoscopic	Mesh	71	21.2
eTEP	Endoscopic	Mesh	19	5.7
Total	-	-	334	100

Data are presented as median and quartiles (Q1; Q3).

Table 3: Intraoperative characteristics by hernioplasty technique.

Characteristic	Parameter	Bassini (n=32)	Kimbarovsky (n=34)	Lichtenstein (n=178)	TAPP (n=71)	eTEP (n=19)	P value
Operative duration (in minutes)	Mean±SD	52.3±12.8	45.6±10.4	72.5±16.2	82.4±18.6	96.8±15.4	<0.001
	Median (IQR)	50 (40–65)	45 (35–51)	70 (58–88)	80 (60–100)	97.5 (82.5–110)	
	Range	35–85	28–70	45–125	50–145	70–135	
Bilateral repair	(n, %)	2 (6.3%)	1 (2.9%)	8 (4.5%)	9 (12.7%)	4 (21.1%)	0.012

Table 4: Postoperative pain profile by hernioplasty technique.

Characteristic	Parameter	Open non-mesh (Bassini+Kimbarovsky) (n=66)	Lichtenstein (n=178)	Endoscopic (TAPP+eTEP) (n=90)	P values
VAS pain score (Mean±SD)	Postoperative day 1	5.6±1.2	4.2±1.1	2.8±0.9	<0.001
	Postoperative day 2	4.3±1.1	3.1±0.9	1.7±0.7	<0.001
	Postoperative day 3	3.2±0.9	2.3±0.8	1.2±0.5	<0.001
	Postoperative day 5	2.1±0.8	1.5±0.6	0.8±0.4	<0.001
	Postoperative day 7	1.4±0.6	0.9±0.5	0.3±0.3	<0.001
Pain assessment (VAS)	summary	4–7 points on the first day, decreases to 1–2 by the 7th day	3–5 points on the first day, decreases to 1–2 by 3-5 days	2–4 points on the first day, decreases to 1–2 by the 2nd day	
Duration of pain syndrome (days)	Mean±SD	6.8±1.4	4.2±1.3	2.1±0.9	<0.001
	Median (IQR)	7 (6–8)	4 (3–5)	2 (2–3)	
Narcotic analgesic requirement	Patients requiring narcotics (N, %)	23 (34.8%)	13 (7.3%)	0 (0%)	<0.001
	Mean narcotic doses per patient	2.4±1.1	1.8±0.8	0	
Non-narcotic analgesic requirements	Patients requiring NSAIDs (N, %)	66 (100%)	165 (92.7%)	41 (45.6%)	<0.001
	Mean duration of NSAID use (days)	5.8±1.6	3.9±1.4	1.8±0.9	<0.001

Abbreviations: VAS: Visual Analog Scale; SD: standard deviation; IQR: interquartile range; NSAIDs: non-steroidal anti-inflammatory drugs.

Table 5: Early postoperative complications by hernioplasty technique.

Complication	Bassini (n=32)	Kimbarovsky (n=34)	Lichtenstein (n=178)	TAPP (n=71)	eTEP (n=19)	Total (n=334)
Seroma	0 (0%)	0 (0%)	1 (0.6%)	2 (2.8%)	1 (5.3%)	4 (1.2%)
Hematoma	1 (3.1%)	1 (2.9%)	3 (1.7%)	0 (0%)	0 (0%)	5 (1.5%)
Surgical site infection	1 (3.1%)	0 (0%)	2 (1.1%)	0 (0%)	0 (0%)	3 (0.9%)
Urinary retention	2 (6.3%)	1 (2.9%)	8 (4.5%)	3 (4.2%)	1 (5.3%)	15 (4.5%)
Scrotal edema	3 (9.4%)	2 (5.9%)	6 (3.4%)	1 (1.4%)	0 (0%)	12 (3.6%)
Orchitis/testicular pain	1 (3.1%)	1 (2.9%)	2 (1.1%)	0 (0%)	0 (0%)	4 (1.2%)
Mesh infection	-	-	1 (0.6%)	0 (0%)	0 (0%)	1 (0.3%)
Ileus/bowel obstruction	0 (0%)	0 (0%)	0 (0%)	1 (1.4%)	0 (0%)	1 (0.3%)
Port site bleeding	-	-	-	1 (1.4%)	0 (0%)	1 (0.3%)
Overall complications	6 (18.8%)	4 (11.8%)	20 (11.2%)	7 (9.9%)	2 (10.5%)	39 (11.7%)

Note: Some patients experienced more than one complication.

Table 6: Complication rates by surgical approach category.

Complication category	Open non-mesh (n=66)	Lichtenstein (n=178)	Endoscopic (n=90)	P values
Wound-related complications (seroma/hematoma/infection)	3 (4.5%)	7 (3.9%)	3 (3.3%)	0.892
Urinary complications (urinary retention)	3 (4.5%)	8 (4.5%)	4 (4.4%)	0.999
Testicular complications	2 (3.0%)	2 (1.1%)	0 (0%)	0.168
Overall complications	10 (15.2%)	20 (11.2%)	9 (10.0%)	0.542

Table 7: Hospital stay by hernioplasty technique.

Characteristic	Parameter	Bassini (n=32)	Kimbarovsky (n=34)	Lichtenstein (n=178)	TAPP (n=71)	eTEP (n=19)	P value
Length of hospital stay (days)	Mean±SD	7.2±1.8	6.1±1.4	6.0±1.5	4.3±1.2	4.1±1.1	<0.001
	Median (IQR)	7 (5–9)	6 (5–7)	6 (5–7)	4 (3–6)	4 (3–6)	
	Range	4–12	4–10	3–14	2–8	2–7	

Abbreviations: SD: standard deviation; IQR: interquartile range.

Table 8: Comparative summary of outcomes across surgical approaches.

Outcome measure	Open non-mesh (n=66)	Lichtenstein (n=178)	Endoscopic (n=90)	P value
Operative duration (min)	48.9±11.8	72.5±16.2	85.4±18.2	<0.001
Hospital stays (days)	6.6±1.7	6.0±1.5	4.2±1.2	<0.001
VAS pain score (day 1)	5.6±1.2	4.2±1.1	2.8±0.9	<0.001
Pain duration (days)	6.8±1.4	4.2±1.3	2.1±0.9	<0.001
Narcotic requirement (%)	34.8%	7.3%	0%	<0.001
Complication rate (%)	15.2%	11.2%	10.0%	0.542

All values presented as mean±SD unless otherwise specified.

DISCUSSION

The present retrospective comparative study provides valuable insights into the outcomes of different inguinal hernioplasty techniques, reinforcing existing evidence while highlighting institution specific trends. Our findings demonstrate significant differences in operative efficiency, postoperative recovery and complication profiles between open techniques (Bassini, Kimbarovsky, Lichtenstein) and endoscopic approaches (TAPP, eTEP), thereby contributing to the ongoing discussion on optimising surgical strategies for inguinal hernia repair.

In our data operative time revealed that open procedures required significantly shorter duration (Bassini: 50 min, Kimbarovsky: 45 min, Lichtenstein: 70 min) compared with endoscopic repairs (TAPP: 80 min, eTEP: 97.5 min). These findings are consistent with existing literature, as laparoscopic techniques demand advanced technical expertise and are associated with a steep learning curve.[15] The extended operative time observed in eTEP repairs likely reflects the technical complexity of extraperitoneal dissection and mesh placement without fixation, which requires precise anatomical orientation and meticulous surgical execution.[16]

Despite longer operative times, endoscopic approaches demonstrated superior postoperative recovery, with hospital stays reduced by approximately 2–3 days compared to open repairs. This advantage is largely attributed to reduced anterior abdominal wall trauma, which preserves the structural musculofascial integrity and minimises postoperative pain.[17] Notably, although the Lichtenstein technique uses a tension-free mesh repair, it still required a median 6-day hospitalisation, indicating that even modern open techniques do not achieve the same recovery advantages of minimally invasive approaches. Postoperative pain management remains a critical determinant of patient satisfaction and functional recovery. In this study, endoscopic techniques (TAPP and eTEP) were associated with superior pain management outcomes, with VAS scores decreasing to 1–2 by postoperative day two. In contrast comparable pain reduction was observed only after 3–5 days in Lichtenstein repair and approximately 7 days in Bassini and Kimbarovsky repairs. These results align with multicentre studies demonstrating that preperitoneal mesh placement minimises nociceptive stimulation of inguinal nerves.[18]

A notable finding was the significantly higher requirement for narcotic analgesics among patients undergoing Bassini and Kimbarovsky repair (34.8%), compared with 7.3% in the Lichtenstein repair and negligible use following TAPP and eTEP procedures. This disparity underscores the physiological impact of tissue tension in non-mesh repairs, which exacerbates acute postoperative pain and prolongs the recovery period.[19] The avoidance of extensive anterior dissection in endoscopic approaches likely contributes to their favourable pain profiles, as reflected by the rapid decline in VAS scores.

Seroma formation was more frequently observed following TAPP and eTEP repairs (3.3%) than after Lichtenstein repair (0.5%), consistent with prior reports attributing this to peritoneal fluid accumulation within the preperitoneal space.[12] Importantly, the majority of seromas resolved spontaneously, without the need for further intervention. Hematoma formation occurred in 1.6% of Lichtenstein repairs, likely related to bleeding from mesh fixation sites, compared with 3% in Bassini and Kimbarovsky procedures. No hematomas were observed following endoscopic repairs, a finding that may be explained by the tamponade effect of pneumoperitoneum during laparoscopic surgery.[11] Although chronic pain was not directly evaluated in this study, early postoperative VAS trends may serve as a

surrogate indicator. The lower pain scores observed in TAPP and eTEP repairs suggest a reduced risk of neuralgia, supporting HerniaSurge guidelines that favour minimally invasive techniques for patients in whom postoperative pain is a primary concern.[20] Recurrence rates were not assessed in this study. However, existing evidence indicates that mesh-based repairs, including Lichtenstein, TAPP and eTEP, are associated with recurrence rates of 1–5%, compared with 10–15% for non-mesh techniques.[10] Nonetheless, mesh fixation in TAPP, often performed using tacks, may increase the risk of chronic pain compared to self-adhering meshes commonly used in eTEP repairs.[14] This interplay underscores the need for long-term follow-up to balance durability against postoperative morbidity.

Finally, the observed 3-day reduction in hospital stay associated with endoscopic repairs suggests substantial potential for cost savings, particularly in high-volume centres. Although laparoscopic equipment and specialised training involve higher initial costs, these may be offset by shorter hospitalisations and faster return to work timelines.[7] The increasing adaptation of TAPP and eTEP at our institution, accounting for 33.6% of cases, reflects this economic consideration, while open repairs continue to play a crucial role in resource-limited settings or where laparoscopic expertise is unavailable.

Limitations

This study has several limitations inherent to its design that should be considered when interpreting the results. The retrospective and non-randomised nature of the analysis introduces potential selection bias, as the choice of surgical technique was likely influenced by surgeon preference, patient-specific characteristics and institutional protocols rather than a randomised protocol.

As a result, unmeasured confounding factors may remain despite the analytical efforts in the study. Additionally, the relatively short follow-up period limits the ability to assess long-term outcomes, particularly hernia recurrence and the development of chronic pain syndromes, which are critical indicators of the long-term success of inguinal hernia repair. Finally, as a single-centre study, the generalizability of these findings may be limited. Nevertheless, the demographic profile of the study population closely reflects established epidemiological patterns of inguinal hernia, thereby supporting the internal validity and relevance of the results for comparable patient populations.

CONCLUSION

This retrospective comparative analysis demonstrates a clear divergence in early postoperative outcomes between contemporary mesh-based techniques and traditional non-mesh repairs for inguinal hernia. Endoscopic approaches (TAPP and eTEP) were associated with superior patient-centred outcomes, including significantly reduced postoperative pain, minimal need for narcotic analgesia and a substantially shorter duration of hospitalization. These findings support preferential consideration of endoscopic hernioplasty for patients who prioritize rapid recovery and reduced postoperative discomfort, provided that adequate surgical expertise and institutional resources are available.

The Lichtenstein open tension-free repair continues to play a pivotal role, offering a reliable, efficient and a cost-effective solution with well-established outcomes. It remains the most appropriate alternative when minimally invasive techniques are contraindicated or unavailable. In contrast, non-mesh techniques such as Bassini and Kimbarovsky techniques were associated with inferior early postoperative outcomes, particularly higher pain scores and increased analgesic requirements. Therefore, their application should be limited to carefully selected clinical cases in which mesh implantation is not feasible.

Although this study confirms the short-term advantages of endoscopic repair, it also highlights the need for high quality prospective research. Future randomised studies with long-term follow-up are required to clarify the impact of mesh fixation strategies on recurrence, chronic pain and cost-effectiveness. Ultimately, optimal surgical management of inguinal hernia repair should be guided by a shared decision-making process that carefully integrates patient expectations, surgeon experience and individual hernia characteristics.

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