Medical Journal of Bakırköy

Med J Bakirkoy 2026;22(3):274-282
DOI: 10.4274/BMJ.galenos.2026.2026.4-11

Research

Clinical Outcomes of TEP and Lichtenstein Repair in Bilateral Inguinal Hernia Surgery: A Retrospective Comparative Study

Bilateral İnguinal Herni Cerrahisinde TEP ve Lichtenstein Onarımının Klinik Sonuçları: Retrospektif Karşılaştırmalı Çalışma

Nurettin Şahin[1], Mahmut Said Değerli[1], Ferman Tevfik Özyalvaç[1], Sezer Bulut[1], Müge Yurdacan Şahin[1], İlhan Gök[2], Burak Altunpak[1], Allanur Mametkulyyev[1], Duhan Kanmaz[1], Murat Çikot[1], Ahmet Sürek[1]

[1]University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of General Surgery, İstanbul, Türkiye
[2]University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinic of General Surgery, İstanbul, Türkiye

ABSTRACT

Objective: The optimal surgical approach for bilateral inguinal hernia repair remains controversial. This study aimed to compare the clinical outcomes of laparoscopic total extraperitoneal repair (TEP) and open Lichtenstein repair in patients undergoing elective bilateral inguinal hernia surgery.

Methods: Patients who underwent elective surgery for bilateral inguinal hernia between January 2021 and December 2025 were retrospectively evaluated. Patients were divided into two groups according to the surgical technique: TEP and Lichtenstein repair. Demographic characteristics, perioperative findings, postoperative complications, recurrence, chronic pain, and length of hospital stay were compared between the groups.

Results: A total of 264 patients were included in the study. Of these, 145 underwent TEP repair and 119 underwent Lichtenstein repair. Operative time was significantly shorter in the TEP group compared with the Lichtenstein group (73.4±26.8 vs. 101.2±35.2 minutes, p<0.001). Overall morbidity rates were similar between the groups (22.1% vs. 30.3%, p=0.130). Chronic postoperative pain was significantly lower in the TEP group (2.8% vs. 8.4%, p=0.042). Although recurrence was numerically higher in the TEP group (6.9% vs. 3.4%), the difference was not statistically significant (p=0.202). No significant difference was observed in length of hospital stay (p=0.235).

Conclusion: Both TEP and Lichtenstein repairs are safe and effective options for bilateral inguinal hernia surgery, with comparable morbidity and recurrence rates. However, TEP repair was associated with shorter operative time and lower chronic postoperative pain. Surgical approach should be individualized according to patient characteristics, anesthetic risk, and surgeon experience.

Keywords: Bilateral inguinal hernia, total extraperitoneal repair, Lichtenstein repair, laparoscopic hernia repair, chronic postoperative pain

ÖZ

Amaç: Bilateral inguinal herni onarımında optimal cerrahi yaklaşım hala tartışmalıdır. Bu çalışmada, elektif bilateral inguinal herni cerrahisi uygulanan hastalarda laparoskopik total ekstraperitoneal onarım (TEP) ile açık Lichtenstein onarımının klinik sonuçlarının karşılaştırılması amaçlandı.

Gereç ve Yöntem: Ocak 2021 ile Aralık 2025 tarihleri arasında bilateral inguinal herni nedeniyle elektif cerrahi uygulanan hastalar retrospektif olarak değerlendirildi. Hastalar uygulanan cerrahi tekniğe göre TEP ve Lichtenstein grupları olarak ikiye ayrıldı. Demografik özellikler, perioperatif bulgular, postoperatif komplikasyonlar, nüks, kronik ağrı ve hastanede yatış süresi iki grup arasında karşılaştırıldı.

Bulgular: Toplam 264 hasta çalışmaya dahil edildi. Bunların 145'ine TEP, 119'una Lichtenstein onarımı uygulandı. Ameliyat süresi TEP grubunda Lichtenstein grubuna göre anlamlı olarak daha kısa bulundu (73,4±26,8 dk'ya karşı 101,2±35,2 dk, p<0,001). Toplam morbidite oranları iki grup arasında benzerdi (%22,1'e karşı %30,3, p=0,130). Kronik postoperatif ağrı oranı TEP grubunda anlamlı olarak daha düşük saptandı (%2,8'e karşı %8,4, p=0,042). Nüks oranı TEP grubunda sayısal olarak daha yüksek olmasına rağmen (%6,9'a karşı %3,4), anlamlı fark izlenmedi (p=0,202). Hastanede yatış süresi açısından gruplar arasında fark saptanmadı (p=0,235).

Address for Correspondence: Nurettin Şahin, MD, University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of General Surgery, İstanbul, Türkiye
E-mail: dr.nurettinsahin@gmail.com **ORCID ID:** orcid.org/0000-0001-7440-0574

Cite as: Şahin N, Değerli MS, Özyalvaç FT, Bulut S, Yurdacan Şahin M, Gök İ, et al. Clinical outcomes of TEP and Lichtenstein repair in bilateral inguinal hernia surgery: a retrospective comparative study. Med J Bakirkoy. 2026;22(3):274-282

Received: 24.04.2026
Accepted: 08.06.2026
Publication Date: 14.09.2026

ÖZ

Sonuç: TEP ve Lichtenstein onarımları, bilateral inguinal herni cerrahisinde benzer morbidite ve nüks oranları ile güvenli ve etkili yöntemlerdir. Bununla birlikte TEP tekniği daha kısa ameliyat süresi ve daha düşük kronik postoperatif ağrı oranı ile ilişkili bulunmuştur. Cerrahi yaklaşım hasta özellikleri, anestezi riski ve cerrah deneyimine göre bireyselleştirilmelidir.

Anahtar Kelimeler: Bilateral inguinal herni, total ekstraperitoneal onarım, Lichtenstein onarımı, laparoskopik herni onarımı, kronik postoperatif ağrı

INTRODUCTION

Inguinal hernias are among the most frequently encountered surgical conditions and account for nearly 75% of all abdominal wall hernias. An inguinal hernia is expected to occur over a lifetime in nearly 27% of men and 3% of women (1). Both open repair and laparo-endoscopic methods are widely accepted as standard surgical options for the management of inguinal hernias (2,3). With recent advances in surgical techniques, laparoscopic approaches have increasingly been preferred because of benefits including less postoperative pain, shorter recovery time, and quicker resumption of normal daily activities (3,4). International HerniaSurge guidelines recommend that laparo-endoscopic approaches be considered the preferred option for bilateral inguinal hernias in experienced centers (2,3).

Bilateral inguinal hernias represent a more complex group of patients for surgical planning than unilateral cases. The requirement for simultaneous repair of both sides increases the importance of surgical approach selection with regard to operative time, anesthesia choice, postoperative complication profile, chronic pain development, and recurrence rates (4,5). Laparoscopic total extraperitoneal repair (TEP) may offer advantages in bilateral cases, as it allows simultaneous treatment of bilateral defects through a single preperitoneal approach. In contrast, open Lichtenstein repair remains a widely preferred and reliable method because of its technical feasibility, short learning curve, and safe applicability in a broad patient population (2,5).

Although numerous studies have compared laparoscopic and open techniques, most have evaluated unilateral and bilateral cases together, leaving data specific to bilateral inguinal hernia relatively limited (5,6). In a limited number of studies evaluating bilateral hernias, laparoscopic approaches have been associated with less early postoperative pain, shorter hospital stay, and lower rates of chronic pain. However, most of these data are derived from the transabdominal preperitoneal (TAPP) approach, whereas direct comparisons between TEP and open Lichtenstein repair remain scarce (6,7).

This study evaluated the surgical outcomes of laparoscopic TEP and open Lichtenstein repair in patients undergoing surgery for bilateral inguinal hernias. The two techniques were compared with respect to operative duration, length of hospitalization, development of long-term pain, postoperative adverse events, and hernia recurrence. In addition, the study aimed to contribute to the selection of an appropriate surgical strategy for the treatment of bilateral inguinal hernia.

METHODS

The medical records of patients who underwent elective bilateral inguinal hernia surgery in the Department of General Surgery at our hospital between January 2021 and December 2025 were retrospectively analyzed. Based on the surgical approach, the cases were evaluated in two groups: patients treated with TEP and those who underwent open Lichtenstein repair.

The study included adult patients aged 18 years or older who underwent elective bilateral inguinal hernia repair, either via TEP or open Lichtenstein repair. Excluded were patients treated under emergency conditions; those undergoing surgery for unilateral inguinal hernia; cases converted from laparoscopy to open surgery; patients who underwent laparoscopic repair on one side and open repair on the contralateral side; patients treated with the TAPP technique; cases requiring additional surgical procedures; and patients with incomplete clinical data.

Age, sex, body mass index (BMI), American Society of Anesthesiologists (ASA) score, Charlson comorbidity index, accompanying comorbidities, smoking and alcohol use, history of abdominal surgery, anticoagulant use, presenting complaints, and duration of symptoms were recorded.

Groin hernia defects were assessed according to the European Hernia Society classification. Based on clinical characteristics, hernias were classified as primary or recurrent, and anatomical distribution was defined as lateral, medial, or femoral. The size of the hernia defect was determined based on the transverse width of the hernia opening and classified into three categories: Grade 1 (<1.5 cm), Grade 2 (1.5-3 cm), and Grade 3 (>3 cm). Right- and

left-sided hernias were recorded separately according to this classification (8).

Radiological findings (ultrasonography and computed tomography), defect diameters, anesthesia method, operative time, drain use, postoperative morbidity, chronic pain, recurrence rates, and length of hospital stay were also evaluated. Chronic pain was defined as groin pain persisting beyond the third postoperative month. Hernia recurrence was defined as detection during follow-up by physical examination and/or radiological imaging.

The study groups were compared with respect to operative duration, postoperative adverse events, chronic postoperative pain, recurrence, and duration of hospitalization.

Ethical Approval

The study protocol was conducted in line with the ethical standards outlined in the Declaration of Helsinki. Prior to commencing study, approval was obtained from the University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee (approval no: 2026-07-08, date: 18.03.2026). Informed consent was obtained from all patients included in the study.

Statistical Analysis

Statistical findings were expressed using measures of central tendency and dispersion, together with frequency distributions. Data distribution was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Parametric continuous variables were compared using Student's t-test, whereas non-parametric variables were analyzed using the Mann-Whitney U test. Relationships between categorical parameters were evaluated by chi-square analysis, and Fisher's exact test was preferred in cases where chi-square assumptions were not fulfilled. All analyses were conducted with IBM SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA).

RESULTS

A total of 308 patients who underwent elective bilateral inguinal hernia repair during the study interval were retrospectively evaluated. Among them, 9 patients who required conversion from laparoscopic to open surgery and 8 patients who were treated with a laparoscopic approach on one side and an open repair on the opposite side were excluded. Of the 291 patients who met the eligibility criteria, 167 had received laparoscopic surgery and 124 had undergone open repair. Within the laparoscopic cohort, 17 patients who were managed with the TAPP technique and 5 patients with missing data were further excluded. In the open surgery cohort, 5 additional patients were excluded because of incomplete records. As a result, the final study population consisted of 264 patients, including 145 in the TEP group and 119 in the Lichtenstein group. Figure 1 presents the patient selection process and study grouping.

The mean age of the 264 included patients was 56.7±12.3 years, and the vast majority were male (97.7%). The mean BMI was 26.6±3.3 kg/m^2. While 74.2% of the patients were classified as ASA II, the mean Charlson comorbidity index was 1.7±1.4. The most common presenting complaint was swelling (48.5%), followed by pain (40.5%). At least one comorbidity was present in 60.6% of patients; smoking was present in 41.3%, and anticoagulant use in 20.8%. Demographic and baseline clinical characteristics are summarized in Table 1.

The most common hernia type on the right side was PL2 (28.4%), followed by PL1 (24.6%) and PM1 (17.0%). On the left side, PL1 was the most common type (31.1%), followed by PL2 (22.3%) and PM1 (15.9%). Primary lateral hernias constituted the predominant subgroup on both sides. Ultrasonographic evaluation was available for 84.1% of the cohort. The average defect size measured 18.5±9.5 mm on the right side and 17.9±8.3 mm on the left side. Computed tomography was performed in 17.0% of patients, and bilateral hernia defects were detected in 66.7% of these patients. Details regarding hernia classification and radiological assessment findings are presented in Table 2.

TEP repair was performed in 54.9% of patients, and Lichtenstein repair in 45.1%. The most preferred anesthesia method was general anesthesia (72.3%), followed by spinal anesthesia (18.9%) and laryngeal mask airway anesthesia (8.7%). Average operative duration was calculated as 86.0±33.8 minutes, while the average hospitalization period was 1.1±0.6 days. Drain use was required in 12.1% of patients. The overall morbidity rate was 25.8%. The most common postoperative complications were hematoma, chronic pain, and recurrence (5.3% each), followed by seroma and scrotal edema (3.8% each). Wound infection was observed in 2.7% of patients, urinary complaints and groin numbness or burning sensation in 0.8%, and testicular ischemia in 0.4%. No mortality was observed. Postoperative outcomes were assessed using hospital records and outpatient follow-up data, with a mean follow-up duration of 16.2±8.4 months. Operative and postoperative outcomes are summarized in Table 3.

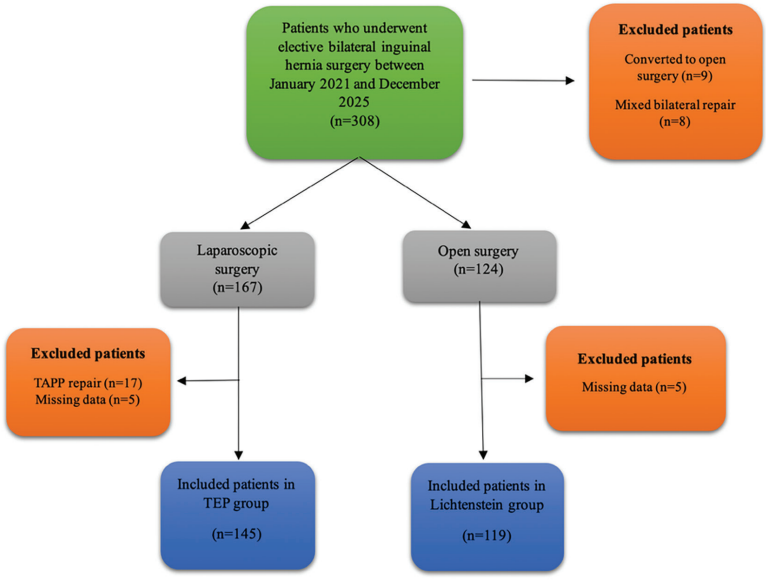

Figure 1. Flowchart of patient selection and allocation into the TEP and Lichtenstein groups
TEP: Total extraperitoneal repair, TAPP: Transabdominal preperitoneal

Baseline demographic and clinical characteristics, including age, sex, BMI, Charlson comorbidity index, and accompanying comorbid conditions, were comparable between the TEP and Lichtenstein groups (all p>0.05). The Lichtenstein group had significantly higher ASA scores (p=0.016), and anticoagulant use was more common in this group (p=0.028). Regarding presenting symptoms, pain was reported more frequently in the Lichtenstein group, whereas swelling alone and combined pain and swelling were more prevalent in the TEP group (all p<0.001). Regarding anesthesia preference, general anesthesia was used more often in the TEP group, while spinal anesthesia was used more often in the Lichtenstein group (p<0.001). The TEP group demonstrated a significantly shorter operative duration compared with the Lichtenstein group (73.4±26.8 vs. 101.2±35.2 minutes, p<0.001). Recurrence rates, overall morbidity, drain utilization, and length of hospitalization did not differ significantly across the study groups (all p>0.05). Detailed comparative results are shown in Table 4.

Postoperative morbidity rates did not differ significantly between the study groups (22.1% vs. 30.3%, p=0.130). Evaluation of individual postoperative complications demonstrated a statistically significant difference only for chronic postoperative pain, which occurred less frequently in patients treated with TEP than in those undergoing Lichtenstein repair (2.8% vs. 8.4%, p=0.042). Although recurrence was observed more often in the TEP cohort (6.9% vs. 3.4%), this difference did not reach statistical significance (p=0.202). The frequencies of hematoma, seroma, scrotal edema, wound infection, urinary symptoms, groin numbness

Table 1. Baseline demographic and clinical characteristics of the study population

		Min-max	Median	Mean±SD/n-%	
Age (years)		18.0-87.0	58.0	56.7±12.3	
Sex	Female			6	2.3%
	Male			258	97.7%
BMI (kg/m^2)		18.3-36.9	26.5	26.6±3.3	
ASA score	I			28	10.6%
	II			196	74.2%
	III			38	14.4%
	IV			2	0.8%
CCI		0.0-6.0	1.0	1.7±1.4	
COPD				10	3.8%
Prostate disease				23	8.7%
Constipation				2	0.8%
Comorbidity present				160	60.6%
Smoking				109	41.3%
Alcohol use				14	5.3%
Previous abdominal surgery				72	27.3%
Anticoagulant use				55	20.8%
Presenting complaint					
Pain				107	40.5%
Swelling				128	48.5%
Pain+swelling				29	11.0%
Constipation				1	0.4%
Symptom duration (months)		1.0-144.0	2.0	5.8±12.9	

BMI: Body mass index, ASA: American Society of Anesthesiologists, CCI: Charlson comorbidity index, COPD: Chronic obstructive pulmonary disease, SD: Standard deviation

or burning sensation, and testicular ischemia were similar in both treatment groups (all p>0.05). Detailed postoperative complication data are summarized in Table 5.

DISCUSSION

In our cohort, patients treated with TEP demonstrated a markedly reduced operative duration in comparison with those who underwent Lichtenstein repair (73.4±26.8 vs. 101.2±35.2 minutes, p<0.001). Traditionally, laparoscopic inguinal hernia repair has been considered more time-consuming than open surgery because of technical complexity and the learning curve (2,4). However, in bilateral cases, simultaneous repair of both defects through a single preperitoneal dissection plane may provide an important time advantage for the TEP approach. In a prospective randomized study by Ielpo et al. (6) comparing TAPP and Lichtenstein repair in bilateral inguinal hernias, operative times were similar. In contrast, Mahon et al. (7) reported shorter operative times in the laparoscopic group in bilateral cases. Likewise, Feliu et al. (9) demonstrated shorter operative duration in the TEP group compared with Lichtenstein repair in bilateral inguinal hernias. The difference observed in our cohort may be explained by the open technique's requirement for separate dissections on each side, whereas TEP allows bilateral repair through a single working space. In addition, the experience of our center in laparoscopic hernia surgery may have contributed to this result. These findings suggest that TEP may also be an efficient time-saving option in experienced centers with appropriate infrastructure.

Table 2. Hernia characteristics and radiological findings

		Min-max	Median	Mean±SD/n-%	
Right-sided hernia type	None			2	0.8%
	PL1			65	24.6%
	PL2			75	28.4%
	PL3			15	5.7%
	PM1			45	17.0%
	PM2			34	12.9%
	PM3			2	0.8%
	RL1			5	1.9%
	RL2			9	3.4%
	RL3			3	1.1%
	RM1			3	1.1%
	RM2			4	1.5%
	RM3			2	0.8%
Left-sided hernia type	None			2	0.8%
	PL1			82	31.1%
	PL2			59	22.3%
	PL3			21	8.0%
	PM1			42	15.9%
	PM2			27	10.2%
	PM3			5	1.9%
	RL1			11	4.2%
	RL2			7	2.7%
	RL3			1	0.4%
	RM1			5	1.9%
	RM2			1	0.4%
	RM3			1	0.4%
USG				222	84.1%
Right USG defect diameter (mm)		4.0-62.0	16.0	18.5±9.5	
Left USG defect diameter (mm)		4.0-50.0	16.0	17.9±8.3	
CT				45	17.0%
CT defect status	No hernia			6	13.3%
	Unilateral			9	20.0%
	Bilateral			30	66.7%

USG: Ultrasonography, CT: Computed tomography, SD: Standard deviation

Table 3. Operative and postoperative outcomes of the study population

		Min-max	Median	Mean±SD/n-%	
Surgical technique	TEP			145	54.9%
	Lichtenstein			119	45.1%
Type of anesthesia	Spinal			50	18.9%
	LMA			23	8.7%
	General anesthesia			191	72.3%
Operative time (minutes)		24.0-220.0	85.0	86.0±33.8	
Length of hospital stay (days)		1.0-7.0	1.0	1.1±0.6	
Drain use				32	12.1%
Morbidity				68	25.8%
Hematoma				14	5.3%
Chronic pain				14	5.3%
Recurrence				14	5.3%
Seroma				10	3.8%
Scrotal edema				10	3.8%
Wound infection				7	2.7%
Urinary complaints				2	0.8%
Groin numbness/burning sensation				2	0.8%
Testicular ischemia				1	0.4%
Follow-up duration (months)				16.2±8.4	
Mortality				0	0.0%

TEP: Total extraperitoneal repair, LMA: Laryngeal mask airway, SD: Standard deviation

A significantly lower incidence of chronic postoperative pain was observed in the TEP group compared with the Lichtenstein group (2.8% vs. 8.4%, p=0.042). Chronic pain following inguinal hernia repair is a major long-term postoperative concern and can negatively affect patients' quality of life. The risk of postoperative neuralgia may be greater in anterior open techniques because of more extensive tissue dissection and increased manipulation of the ilioinguinal, iliohypogastric, and genitofemoral nerves (10,11). Numerous studies have shown that laparo-endoscopic techniques offer an advantage with respect to chronic pain. In the prospective randomized study by Yosypenko et al. (12) involving bilateral inguinal hernia patients, lower postoperative pain scores were reported in the TEP group. Feliu et al. (9) also reported better postoperative comfort in patients undergoing TEP repair.

Table 4. Comparison of demographic, clinical, and perioperative characteristics between TEP and Lichtenstein groups

		TEP group, n=145			Lichtenstein group, n=119			p-value	
		Mean±SD/n-%		Median	Mean±SD/n-%		Median		
Age (years)		55.5±12.0		58.0	58.2±12.5		58.0	0.114	m
Sex	Female	5	3.4%		1	0.8%		0.157	x2
	Male	140	96.6%		118	99.2%			
BMI (kg/m^2)		26.6±3.3		26.6	26.5±3.3		26.2	0.784	t
ASA score	I	16	11.0%		12	10.1%		0.016	x2
	II	114	78.6%		82	68.9%			
	III	14	9.7%		24	20.2%			
	IV	1	0.7%		1	0.8%			
CCI		1.6±1.5		2.0	1.7±1.4		1.0	0.450	m
Comorbidity present		85	58.6%		75	63.0%		0.466	x2
Smoking		61	42.1%		48	40.3%		0.776	x2
Alcohol use		10	6.9%		4	3.4%		0.202	x2
Previous abdominal surgery		45	31.0%		27	22.7%		0.130	x2
Anticoagulant use		23	15.9%		32	26.9%		0.028	x2
Presenting complaint									
Pain		22	15.2%		85	71.4%		<0.001	x2
Swelling		97	66.9%		31	26.1%		<0.001	x2
Pain+swelling		26	17.9%		3	2.5%		<0.001	x2
Symptom duration (months)		5.5±13.6		2.0	6.2±12.0		3.0	0.002	m
USG performed		120	82.8%		102	85.7%		0.514	x2
Right USG defect diameter (mm)		18.2±9.1		15.0	18.8±10.0		17.0	0.600	m
Left USG defect diameter (mm)		17.3±7.5		16.0	18.6±9.2		17.0	0.564	m
CT performed		27	18.6%		18	15.1%		0.452	x2
CT hernia laterality	No hernia	4	14.8%		2	11.1%		0.912	x2
	Unilateral	5	18.5%		4	22.2%			
	Bilateral	18	66.7%		12	66.7%			
Type of anesthesia	Spinal	3	2.1%		47	39.5%		<0.001	x2
	LMA	5	3.4%		18	15.1%			
	General anesthesia	137	94.5%		54	45.4%			
Operative time (minutes)		73.4±26.8		69.0	101.2±35.2		105.0	<0.001	m
Drain use		22	15.2%		10	8.4%		0.094	x2
Morbidity		32	22.1%		36	30.3%		0.130	x2
Length of hospital stay (days)		1.1±0.5		1.0	1.2±0.7		1.0	0.235	m

t: Independent samples t-test, m:Mann-Whitney U test, x2: Chi-square test (Fisher's exact test)
TEP: Total extraperitoneal repair, BMI: Body mass index, ASA: American Society of Anesthesiologists, USG: Ultrasonography, CT: Computed tomography, CCI: Charlson comorbidity index, SD: Standard deviation, LMA: Laryngeal mask airway

Table 5. Comparison of postoperative complications between TEP and Lichtenstein groups

	TEP group, n=145			Lichtenstein group, n=119			p-value	
	Mean±SD/n-%		Median	Mean±SD/n-%		Median		
Chronic pain	4	2.8%		10	8.4%		0.042	x2
Recurrence	10	6.9%		4	3.4%		0.202	x2
Hematoma	7	4.8%		7	5.9%		0.704	x2
Seroma	4	2.8%		6	5.0%		0.334	x2
Scrotal edema	5	3.4%		5	4.2%		0.758	x2
Wound infection	3	2.1%		4	3.4%		0.515	x2
Urinary complaints	0	0.0%		2	1.7%		0.202	x2
Groin numbness	1	0.7%		1	0.8%		1.000	x2
Testicular ischemia	0	0.0%		1	0.8%		0.451	x2

x2: Chi-square test (Fisher's exact test)
SD: Standard deviation, TEP: Total extraperitoneal repair

Furthermore, the meta-analysis by Bobo et al. (13) demonstrated that TEP repair was associated with lower rates of chronic pain than the Lichtenstein technique. Our findings are consistent with these data and suggest that the TEP approach may provide an advantage in long-term pain control and in quality of life for patients with bilateral inguinal hernias. Reduced contact with neural structures in the posterior preperitoneal approach and less irritating mesh placement, compared with the anterior plane, may partly explain this difference.

Despite a numerically greater recurrence frequency in the TEP cohort (6.9% vs. 3.4%), the intergroup difference did not reach statistical significance (p=0.202). This finding suggests that both techniques provide comparable effectiveness and durability in the treatment of bilateral inguinal hernias. Previous studies have similarly reported no marked difference in recurrence rates between laparoscopic and open mesh repairs. In bilateral cases, both Yosypenko et al. (12) and Feliu et al. (9) reported similar recurrence outcomes between TEP and Lichtenstein techniques. The numerically higher recurrence rate in the TEP group may be attributable to technical factors such as the learning curve, mesh positioning, insufficient overlap area, or mesh fixation strategy. Because bilateral repair requires wider preperitoneal dissection, the surgeon's experience likely plays a decisive role in long-term recurrence rates.

The TEP group demonstrated a lower overall postoperative morbidity rate; however, the observed difference between groups was not statistically significant (22.1% vs. 30.3%, p=0.130). No significant differences were found between the groups regarding hematoma, seroma, scrotal edema, wound infection, or urinary complications. These findings indicate that both approaches have comparable safety profiles. In the randomized controlled study by Langeveld et al. (14), no significant difference in major complications was reported between TEP and Lichtenstein repair. Similarly, the meta-analysis by Bobo et al. (13) showed comparable overall complication rates. In contrast, Neumayer et al. (15) reported higher complication rates in the laparoscopic group, whereas Timişescu et al. (16) found lower complication rates in the TEP group. These heterogeneous findings may be related to differences in surgeon experience, patient selection, complication definitions, and duration of follow-up. The numerically lower morbidity observed in the TEP group in our cohort may be explained by reduced tissue trauma, smaller incisions, and avoidance of anterior inguinal canal dissection. Nevertheless, the lack of statistical significance may be due to the limited sample size and the relatively low number of complication events.

A marked difference was also observed in anesthesia preference. General anesthesia was used more frequently in the TEP group, whereas spinal anesthesia was more commonly used in the Lichtenstein group (p<0.001). This finding is expected, as TEP repair generally requires the creation of a preperitoneal working space and the use of laparo-endoscopic equipment, and is therefore most often performed under general anesthesia. In contrast, Lichtenstein repair can be safely performed with spinal or other regional anesthesia. The higher ASA scores observed in the open surgery group also suggest that the open technique may have been preferred for patients with greater anesthetic risk. Therefore, open Lichtenstein repair remains an important alternative, particularly in patients at high risk for general anesthesia.

This study has several strengths. First, focusing exclusively on patients with bilateral inguinal hernia provided a more homogeneous study population than heterogeneous series that included both unilateral and bilateral cases.

Second, the evaluation of all cases at a single center under similar surgical practice increased internal consistency. A comprehensive assessment of both techniques in terms of demographic characteristics, perioperative outcomes, and postoperative complications adds value to the study.

Study Limitations

Nevertheless, several limitations should be acknowledged. The retrospective single-center design cannot completely eliminate the risk of selection bias. Another limitation of the study is the lack of a standardized postoperative pain scoring system, such as the visual analog scale, due to the retrospective design. The non-randomized choice of surgical technique and the higher ASA scores in the open surgery group may have led to baseline differences between the groups. In addition, the sample size may have limited the statistical power, particularly for rare complications and recurrence outcomes. Additionally, the inability to perform multivariate analysis due to the limited number of outcome events, particularly for chronic pain and recurrence, represents another limitation of the study. Larger multicenter prospective randomized studies are needed to validate these findings.

CONCLUSION

Both TEP and Lichtenstein repairs can be safely performed in cases of bilateral inguinal hernia, with comparable overall morbidity and recurrence rates. However, TEP repair was associated with shorter operative time and lower rates of chronic postoperative pain. Open Lichtenstein repair remains an important alternative, particularly in patients with increased anesthetic risk. Surgical technique should be individualized according to patient characteristics, anesthetic risk, surgeon experience, and institutional resources. Larger prospective randomized studies may help determine the optimal approach for the treatment of bilateral inguinal hernia.

ETHICS

Ethics Committee Approval: The study protocol was conducted in line with the ethical standards outlined in the Declaration of Helsinki. Prior to commencing study, approval was obtained from the University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee (approval no: 2026-07-08, date: 18.03.2026).

Informed Consent: Informed consent was obtained from all patients included in the study.

FOOTNOTES

Authorship Contributions

Surgical and Medical Practices: N.Ş., M.S.D., F.T.Ö., S.B., M.Y.Ş., İ.G., B.A., A.M., D.K., M.Ç., A.S., Concept: N.Ş., M.S.D., A.S., Design: N.Ş., M.S.D., F.T.Ö., Data Collection or Processing: N.Ş., A.M., D.K., Analysis or Interpretation: N.Ş., S.B., M.Y.Ş., Literature Search: N.Ş., İ.G., B.A., Writing: N.Ş., M.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declare that this study received no financial support.

REFERENCES

1. Büyükaşık S, Altundal YE, Kankaya B, Eskioğlu E, Esen C. Our institutional experience in laparoscopic inguinal hernia surgery: is there a difference between right and left-sided procedures? A retrospective analysis of 192 cases. Med J Bakirkoy. 2025;21:392-7.
2. HerniaSurge Group. International guidelines for groin hernia management. Hernia. 2018;22:1-165.
3. Stabilini C, van Veenendaal N, Aasvang E, Agresta F, Aufenacker T, Berrevoet F, et al. Update of the international HerniaSurge guidelines for groin hernia management. BJS Open. 2023;7:zrad080. Erratum in: BJS Open. 2024;8:zrae034.
4. Bittner R, Arregui ME, Bisgaard T, Dudai M, Ferzli GS, Fitzgibbons RJ, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [International Endohernia Society (IEHS)]. Surg Endosc. 2011;25:2773-843.
5. Aiolfi A, Cavalli M, Micheletto G, Lombardo F, Bonitta G, Morlacchi A, et al. Primary inguinal hernia: systematic review and Bayesian network meta-analysis comparing open, laparoscopic transabdominal preperitoneal, totally extraperitoneal, and robotic preperitoneal repair. Hernia. 2019;23:473-84.
6. Ielpo B, Duran H, Diaz E, Fabra I, Caruso R, Malavé L, et al. A prospective randomized study comparing laparoscopic transabdominal preperitoneal (TAPP) versus Lichtenstein repair for bilateral inguinal hernias. Am J Surg. 2018;216:78-83.
7. Mahon D, Decadt B, Rhodes M. Prospective randomized trial of laparoscopic (transabdominal preperitoneal) vs open (mesh) repair for bilateral and recurrent inguinal hernia. Surg Endosc. 2003;17:1386-90.
8. Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, et al. The European hernia society groin hernia classification: simple and easy to remember. Hernia. 2007;11:113-6. Erratum in: Hernia. 2008;12:335.
9. Feliu X, Clavería R, Besora P, Camps J, Fernández-Sallent E, Viñas X, et al. Bilateral inguinal hernia repair: laparoscopic or open approach? Hernia. 2011;15:15-8.
10. McCormack K, Scott NW, Go PM, Ross S, Grant AM; EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. Cochrane Database Syst Rev. 2003;2003:CD001785.
11. Schmedt CG, Sauerland S, Bittner R. Comparison of endoscopic procedures vs Lichtenstein and other open mesh techniques for inguinal hernia repair: a meta-analysis of randomized controlled trials. Surg Endosc. 2005;19:188-99.

12. Yosypenko MO, Shulyarenko OV, Havrylov HO. Bilateral inguinal hernia repair: laparoscopic totally extraperitoneal versus open lichtenstein. Acta Med Litu. 2025;32:369-76.
13. Bobo Z, Nan W, Qin Q, Tao W, Jianguo L, Xianli H. Meta-analysis of randomized controlled trials comparing Lichtenstein and totally extraperitoneal laparoscopic hernioplasty in treatment of inguinal hernias. J Surg Res. 2014;192:409-20.
14. Langeveld HR, van't Riet M, Weidema WF, Stassen LP, Steyerberg EW, Lange J, et al. Total extraperitoneal inguinal hernia repair compared with Lichtenstein (the LEVEL-Trial): a randomized controlled trial. Ann Surg. 2010;251:819-24.
15. Neumayer L, Giobbie-Hurder A, Jonasson O, Fitzgibbons R Jr, Dunlop D, Gibbs J, et al.; Veterans Affairs Cooperative Studies Program 456 Investigators. Open mesh versus laparoscopic mesh repair of inguinal hernia. N Engl J Med. 2004;350:1819-27.
16. Timişescu L, Turcu F, Munteanu R, Gîdea C, Drăghici L, Ginghină O, et al. Treatment of bilateral inguinal hernia -- minimally invasive versus open surgery procedure. Chirurgia (Bucur). 2013;108:56-61.