Evaluating Patient Profiles, Surgical Techniques, And Postoperative Results In Inguinal Hernia Management: A Tertiary Care Centre Study

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Abstract
Background:
Inguinal hernias constitute the majority of abdominal wall hernias and represent a significant global surgical burden. Their aetiology is multifactorial, involving both acquired and genetic influences, with affected individuals often presenting with a reducible groin swelling that may be accompanied by discomfort. Diagnosis remains primarily clinical, and inguinal hernia repair is one of the most frequently performed general surgical operations worldwide.
Materials and Methods:
A prospective observational study was conducted over 18 months to assess the demographic characteristics, clinical presentation, operative techniques, and postoperative outcomes of patients undergoing inguinal hernia surgery. A total of 1000 patients aged ≥16 years, including unilateral, bilateral, recurrent, and elective or emergency cases, were enrolled using purposive sampling. Data were analysed using descriptive statistics and the chi-square test, with $p < 0.05$ considered significant.
Results:
The majority were aged 41–70 years, with 23.6% aged 51–60 years, 20.8% aged 61–70 years, and 19.6% aged 41–50 years. Most hernias were short-standing (≤1 year, 76.1%) and reducible (96.7%), with direct hernias being the most common (65.5%) and bilateral hernias observed in 43.3% of cases. Common risk factors included constipation (63.5%), smoking (56.2%), heavy weight lifting (39.0%), and benign prostatic hyperplasia (30.0%). Elective repairs under regional anaesthesia comprised 97.9% of cases, with the Lichtenstein technique used in 87.0%. Postoperative complications were low: surgical site infection occurred in 0.6%, seroma in 0.9%, hematoma in 0.1%, and groin pain in 0.9% at 30 days, with resolution at 60 days and no recurrences.
Conclusion:
Standardized evidence-based protocols enabled safe and highly effective inguinal hernia repair with exceptionally low complication rates in this large cohort. Diabetes mellitus and hypertension emerged as key predictors of adverse outcomes, highlighting the importance of targeted perioperative optimization. The consistent use of mesh repair techniques and efficient surgical planning contributed to excellent short-term results.

I. Introduction

A hernia is defined as the protrusion of an internal organ or tissue through a weakened region of the abdominal wall musculature. Among all abdominal wall hernias, inguinal hernias are the most prevalent, accounting for nearly 75% of cases and representing a substantial lifetime risk of 27% in men and 3% in women [1,2]. Abdominal wall hernias collectively constitute 15–18% of all surgical procedures, underscoring their significant clinical and public health relevance [3]. An inguinal hernia occurs when abdominal contents, most often preperitoneal fat or small intestine, protrude through the inguinal canal, although the bladder, large bowel, or in females, adnexal structures may occasionally be involved [4]. The spectrum of abdominal wall hernias additionally includes umbilical, epigastric, Spigelian, femoral, and incisional types, each with distinct anatomic and clinical considerations.

The pathogenesis of inguinal hernia is multifactorial, involving congenital and acquired elements. Although most adult cases are considered acquired, emerging evidence highlights a genetic component, with individuals demonstrating a four-fold higher risk if a first-degree relative is affected [5]. Clinically, patients commonly present with a reducible groin bulge accompanied by mild or intermittent discomfort. Depending on the hernia's contents and degree of protrusion, symptoms may involve bowel or urinary changes. Complications such as incarceration and strangulation may develop when herniated contents become irreducible or ischemic, posing significant morbidity and requiring urgent surgical intervention [4]. Interestingly, epidemiological

observations indicate that the incidence of inguinal hernia is paradoxically lower among overweight and obese individuals, contrasting with many other abdominal wall pathologies [6].

Diagnosis is primarily clinical and relies on a detailed history and physical examination [7]. Inguinal hernia repair remains one of the most frequently performed general surgical procedures worldwide, contributing to 10–15% of all operative volume and second only to appendectomy in frequency [8]. Despite substantial advances in mesh-based techniques and perioperative care, recurrence remains a persistent clinical challenge. Approximately 13% of groin hernia surgeries address recurrent hernias, although the precise etiological contributors remain incompletely understood [9]. Factors such as surgical technique, type of anaesthesia, method of mesh fixation, the surgeon's expertise, and institutional case volume have all been associated with recurrence risk, emphasizing the complexity of optimizing long-term outcomes.

Given the high global burden of inguinal hernias, the variability in clinical presentation, and the ongoing challenges related to recurrence and postoperative morbidity, comprehensive evaluation of patient demographics, clinical profiles, operative approaches, and short-term outcomes is essential for improving surgical decision-making and optimizing patient care. Thus, the aim of the present study was to systematically assess these parameters in patients undergoing inguinal hernia surgery at a tertiary care centre.

II.   Materials And Methods

Study Design: This study was conducted as a **prospective observational study** aimed at assessing the demographic characteristics, clinical presentation, operative techniques, and postoperative outcomes of patients undergoing inguinal hernia surgery.

Study Duration: The study was conducted over a period of **18 months**. All patients were assessed at predefined postoperative intervals, which included assessments on **postoperative day (POD) 3, POD 7, POD 30, and POD 60**, with a final follow-up evaluation at **postoperative month 6**.

Study Area: The study was carried out at **P.D.U. Medical College, Rajkot, Gujrat**, where patients with inguinal hernia admitted to the **General Surgery ward and undergoing surgical intervention** were included.

Study Population: The study population comprised patients presenting with **inguinal hernia** that underwent **surgical treatment** at the **Department of General Surgery** of the study centre.

Inclusion Criteria:
- Adults aged ≥16 years, of either sex.
- Patients undergoing inguinal hernia surgery (unilateral, bilateral, or recurrent cases).
- Both elective and emergency inguinal hernia surgeries.
- Cases with concurrent femoral or obturator hernias associated with inguinal hernia.
- Patients undergoing concomitant surgical procedures along with inguinal hernia repair.
- Foreign patients undergoing inguinal hernia surgery in India.

Exclusion Criteria:
- Children and adolescents aged <16 years.
- Surgeries involving only femoral or obturator hernias without an accompanying inguinal hernia.
- Patients who did not provide informed consent.

Sample Size: A total of **1000 patients** were included in the study

Sampling Methodology: A **purposive sampling technique** was employed, where all eligible patients meeting the inclusion criteria during the study period were enrolled.

Data Collection and Procedure:
- After obtaining written informed consent, eligible patients scheduled for inguinal hernia surgery were recruited.
- Demographic details, clinical presentation, and operative findings were recorded using a structured case record form.
- Data on type of hernia, surgical technique used, and intraoperative findings were extracted from indoor medical records.
- Postoperative outcomes were evaluated using:
- Visual Analogue Scale (VAS) for pain on immediate postoperative day, day 30, day 60 and month 6
- Assessment of postoperative morbidity at each follow-up interval.
- Incidence of chronic groin pain and hernia recurrence at 6 months.

- All collected data were systematically compiled to evaluate trends, outcomes, and associated risk factors.

Data Analysis:
- Data were recorded systematically and analysed using MS Excel (2024).
- Continuous variables were expressed as mean ± standard error of mean (SEM), and categorical variables were presented as frequencies and percentages.
- Comparative analysis was performed using the chi-square test for categorical data.
- A p-value of <0.05 was considered statistically significant.

Ethical Considerations:
- Ethical approval was obtained from the Institutional Ethics Committee before the commencement of the study, which followed the Declaration of Helsinki.
- Patient confidentiality was strictly maintained by anonymising personal data and securely storing medical information.
- Written informed consent was obtained from all patients before inclusion in the study.
- All surgical interventions followed standard safety protocols, with anaesthesia coverage and post-surgical monitoring provided as per institutional guidelines.

III. Results

A total of 1000 patients undergoing inguinal hernia surgery were included in the study. The age distribution showed that the majority of patients were middle-aged to older adults. The highest proportion belonged to the 51–60 years age group (23.6%), followed by 61–70 years (20.8%) and 41–50 years (19.6%). Younger age groups constituted a smaller proportion, with only 3% aged ≤20 years and 10.2% aged 21–30 years. Patients aged above 70 years accounted for 8.9% of the study population. The study demonstrated a marked male predominance, with males comprising 98.8% of the cases, whereas females accounted for only 1.2%. Regarding occupational distribution, physically demanding occupations were strongly represented. Construction workers formed the largest occupational category (30.2%), followed by farmers (24.6%). Other occupations included furniture movers (7.6%), warehouse workers (5.7%), office workers (4.2%), mechanics (4.1%), shopkeepers (8.9%) and security guards (2.9%). Students, homemakers, and drivers constituted smaller proportions, accounting for 1.6%, 1.0%, and 1.0% respectively. Additionally, 10.2% of the participants were retired. Assessment of BMI revealed that most patients had a normal BMI (73.4%), while 22% were overweight and 4.2% were obese. Only 0.4% of the study population was underweight.

The majority of patients presented with a short-standing inguinal hernia, while a smaller subset reported symptoms of longer duration (Table 1). Reducible hernias constituted the predominant type at presentation, with irreducible hernias observed infrequently. Direct hernias represented the most common anatomical classification, followed by indirect hernias, whereas pantaloon and sliding variants were encountered only occasionally. Recurrent hernias were uncommon, and most cases involved primary hernia presentation. Bilateral involvement was observed in a substantial proportion of patients, although unilateral hernias remained more frequent. A very small fraction of patients reported a history of prior hernia repair or other abdominal surgeries. Clinically, all individuals presented with groin swelling, and a considerable proportion additionally experienced pain associated with the swelling.

Constipation and smoking were the most commonly observed risk factors among patients. Heavy weight lifting and benign prostatic hyperplasia were also frequent (Table 2). Overweight status, hypertension, and diabetes mellitus occurred in a smaller proportion of patients, while other comorbidities, including chronic obstructive pulmonary disease, obesity, and cardiovascular or renal disease, were less common. Chronic liver disease and lower urinary tract obstructive symptoms were rare. Overall, lifestyle-related factors and conditions increasing intra-abdominal pressure were the predominant contributors in the study population.

Most patients underwent elective hernia repair under regional anaesthesia (Table 3). The Lichtenstein technique was the predominant operative approach, with laparoscopic procedures and other open techniques used less frequently. Standard autoclave sterilization and single-dose antibiotic prophylaxis were uniformly applied. Sac plication and drain placement were required only in a subset of cases, and no patient required a separate scrotal incision. Suture fixation was the primary method for mesh placement, while tacker or glue fixation was used infrequently. Nearly all repairs involved microporous polypropylene mesh, most commonly flat-type meshes, with mesh fixation performed in the majority of cases. When used, tackers were non-absorbable, and suture fixation typically required a consistent number of stitches. Operative time showed wide variability, and mesh dimensions were within standard ranges for inguinal hernia repair. Preoperative pain levels were minimal, followed by a modest increase on the first postoperative day. Hospital stay was generally short. A small proportion of patients underwent additional procedures such as umbilical hernia or hydrocele repair.

At the 30-day follow-up, postoperative morbidity remained low. No Clavien–Dindo grade complications were identified. Surgical site infection occurred in 6 patients (0.6%), seroma in 9 patients (0.9%), hematoma in 1 patient (0.1%), and groin pain in 9 patients (0.9%). There were no cases of mesh explantation, and no hernia recurrences were detected clinically or radiologically. At 60 days, all early complications had resolved. No surgical site infection, hematoma, or seroma was observed, and groin pain persisted in only 2 patients (0.2%). Mesh explantation and recurrence continued to be absent, with 0% reported for both clinical and radiological recurrence.

The association between various risk factors and hernia type was evaluated to determine potential predictors of direct versus indirect hernias (Table 4). Male gender was significantly associated with direct hernia, whereas female patients were more likely to present with indirect hernia. Smoking, benign prostatic hyperplasia (BPH), constipation, and heavy weight lifting showed significant associations with hernia type, indicating a higher likelihood of direct hernia among affected individuals. In contrast, diabetes mellitus and chronic obstructive pulmonary disease (COPD) did not demonstrate a significant correlation with hernia type.

Only one patient (0.1%) developed a hematoma, and no statistically significant association was found between hematoma occurrence and any evaluated risk factor. Gender, anaesthesia type, nature of surgery, smoking, diabetes mellitus, COPD, BPH, CAD, CLD, CKD, and prior hernia surgery all showed identical distributions between hematoma-present and hematoma-absent groups, with Yates-corrected $\chi^2 = 0.000$ and p = 1.000 for each comparison. Hypertension showed a slightly higher hematoma frequency (0.6% vs. 0%), but this difference was not statistically significant ($\chi^2 = 0.928$, p = 0.335).

The analysis of postoperative complications revealed that both surgical site infection (SSI) and seroma were infrequent among patients undergoing hernia repair (Table 5). Statistical evaluation demonstrated a significant association of diabetes mellitus and hypertension with the occurrence of both SSI and seroma, whereas other patient-related factors, including gender, smoking status, COPD, BPH, CAD, CLD, CKD, previous hernia surgery, and anaesthesia type, showed no significant relationship with these complications.

Table 1: Clinical and Surgical Characteristics of Patients (N = 1000)

Characteristic	Category	No.	%
Duration of Hernia (years)	≤ 1.00	761	76.1
	> 1.00	239	23.9
Type of Hernia	Reducible	967	96.7
	Irreducible	33	3.3
Hernia Classification	Direct	655	65.5
	Indirect	325	32.5
	Pantaloon	19	1.9
	Sliding	1	0.1
Recurrent Hernia	Yes	7	0.7
	No	993	99.3
Bilateral Hernia	Yes	433	43.3
	No	567	56.7
Previous Hernia Surgery	Yes	9	0.9
	No	991	99.1
Other Previous Abdominal Surgery	Yes	11	1.1
	No	989	98.9
Clinical Presentation	Swelling	1000	100
	Pain with swelling	396	39.6

Table 2: Distribution of risk factors among patients (N = 1000)

Risk factors	No.	%
Constipation	635	63.5
Smoking	562	56.2
Heavy weight lifting	390	39.0
Benign Prostatic Hyperplasia (BPH)	300	30.0
Overweight	220	22.0
Hypertension (HTN)	154	15.4
Diabetes Mellitus (DM)	103	10.3
Other comorbidities	64	6.4
COPD	60	6.0
Obesity	42	4.2
Coronary Artery Disease (CAD)	20	2.0
Chronic Kidney Disease (CKD)	15	1.5
Chronic Liver Disease (CLD)	3	0.3
LUTS/Urethral stricture/Bladder neck obstruction	3	0.3

Table 3: Surgical Characteristics and Perioperative Parameters in Patients Undergoing Hernia Repair (N=1000)

Variable	Category / Statistic	Value
Anesthesia Type	Regional / General	880 (88.0%), 120 (12.0%)
Nature of Surgery	Elective	979 (97.9%)
Surgical Technique	Laparoscopic TAPP / ETEP / Lichtenstein / Modified Bassini	89 (8.9%), 10 (1.0%), 870 (87.0%), 31 (3.43%)
Sterilization Method	Autoclave	1000 (100%)
Sac Management	Plicated	344 (34.4%)
Drain Placement	Yes	90 (9.0%)
Separate Scrotal Incision	No	1000 (100%)
Antibiotic Prophylaxis	Yes	1000 (100%)
Antibiotic Doses	One Dose	1000 (100%)
Type of Fixation	Suture / Tackers / Glue / No fixation	940 (94%), 40 (4%), 1 (1%), 19 (1.9%)
Mesh Use	Yes	969 (96.9%)
Mesh Pore Size	Microporous	1000 (100%)
Mesh Type (n=969)	Flat / Progrip	960 (99.07%), 9 (0.93%)
Mesh Material (n=969)	Polypropylene	969 (100%)
Mesh Fixation	Yes / No	910 (91%), 59 (5.9%)
Type of Tacker (n=40)	Non-absorbable	40 (100%)
Number of Tacks (n=40)	5 / 6	22 (55%), 18 (45%)
Number of Sutures (n=940)	5 / 6 / 7 / 8	31 (3.3%), 827 (88.0%), 18 (1.9%), 64 (6.8%)
Operative Time (min)	Mean ± SD / Range	100.29 ± 40.14 / 40–300
Mesh Width (cm)	Mean ± SD / Range	7.92 ± 4.08 / 6–30
Mesh Length (cm)	Mean ± SD / Range	12.53 ± 2.83 / 7.5–30
Pre-operative Pain (VAS)	Mean ± SD / Range	0.48 ± 0.53 / 0–3
Post-operative Day 1 Pain (VAS)	Mean ± SD / Range	2.08 ± 0.30 / 1–4
Time to Discharge (days)	Mean ± SD / Range	2.46 ± 0.98 / 0–10
Additional Procedures	Umbilical Hernia / Hydrocele	38 (3.8%), 44 (4.4%)

Table 4: Association of Risk Factors with Hernia Type (Direct vs Indirect)

Risk Factor		Direct Hernia		Indirect Hernia		Chi-Square Value	p value
		No.	%	No.	%		
Gender	Male	610	68.4	282	31.6	6.677	0.010
	Female	4	33.3	8	66.7		
Smoking	Yes	384	76.6	117	23.4	39.277	< 0.01
	No	230	57.1	173	42.9		
Diabetes Mellitus	Yes	68	74.7	23	25.3	2.150	0.143
	No	546	67.2	267	32.8		
COPD	Yes	39	68.4	18	31.6	0.007	0.933
	No	575	67.9	272	32.1		
BPH	Yes	75	85.2	13	14.8	13.402	< 0.01
	No	539	66.1	277	33.9		
Constipation	Yes	420	70.5	176	29.5	4.932	0.026
	No	194	63.2	113	36.8		
Heavy weight lifting	Yes	120	30.77	270	69.23	27.66	<0 .01
	No	290	47.54	320	52.46		

Table 5: Association between surgical site infection (SSI) and seroma with various risk factors in patients undergoing hernia repair (N=1000)

Risk Factor		SSI			Seroma		
		Present (n=5)	Absent (n=995)	Chi-square, p value	Present (n=9)	Absent (n=991)	Chi-square, p value
Gender	Male	5 (0.5%)	983 (99.5%)	χ²=0.000, p=1.000	9 (0.9%)	978 (99.1%)	χ²=0.000, p=1.000
	Female	0 (0.0%)	12 (100.0%)		0 (0.0%)	12 (100.0%)	
Smoking	Yes	2 (0.4%)	560 (99.6%)	χ²=0.078, p=0.779	5 (0.9%)	557 (99.1%)	χ²=0.000, p=1.000
	No	3 (0.7%)	435 (99.3%)		4 (0.9%)	433 (99.1%)	
Diabetes Mellitus	Yes	3 (2.9%)	100 (97.1%)	χ²=8.572, p=0.003	4 (3.9%)	99 (96.1%)	χ²=8.021, p=0.005
	No	2 (0.2%)	895 (99.8%)		5 (0.6%)	891 (99.4%)	
COPD	Yes	1 (1.7%)	59 (98.3%)	χ²=0.143, p=0.706	1 (1.7%)	59 (98.3%)	χ²=0.000, p=1.000
	No	4 (0.4%)	936 (99.6%)		8 (0.9%)	931 (99.1%)	
BPH	Yes	1 (1.1%)	89 (98.9%)	χ²=0.006, p=0.938	2 (0.7%)	298 (99.3%)	χ²=0.650, p=0.420
	No	4 (0.4%)	906 (99.6%)		7 (1.0%)	691 (98.7%)	
CAD	Yes	0 (0.0%)	20 (100.0%)	χ²=0.000, p=1.000	0 (0.0%)	20 (100.0%)	χ²=0.000, p=1.000
	No	5 (0.5%)	975 (99.5%)		9 (0.9%)	970 (99.1%)	
CLD	Yes	0 (0.0%)	3 (100.0%)	χ²=0.000, p=1.000	0 (0.0%)	3 (100.0%)	χ²=0.000, p=1.000
	No	5 (0.5%)	992 (99.5%)		9 (0.9%)	987 (99.1%)	

CKD	Yes	0 (0.0%)	15 (100.0%)	χ^2=0.000, p=1.000	0 (0.0%)	15 (100.0%)	χ^2=0.000, p=1.000
	No	5 (0.5%)	980 (99.5%)		9 (0.9%)	975 (99.1%)	
Hypertension	Yes	3 (1.9%)	151 (98.1%)	χ^2=4.618, p=0.032	4 (2.6%)	149 (97.4%)	χ^2=3.891, p=0.049
	No	2 (0.2%)	844 (99.8%)		5 (0.6%)	841 (99.4%)	
Previous Hernia Surgery	Yes (≥1)	0 (0.0%)	9 (100.0%)	χ^2=0.000, p=1.000	0 (0.0%)	9 (100.0%)	χ^2=0.000, p=1.000
	No	5 (0.5%)	985 (99.5%)		9 (0.9%)	980 (99.1%)	
Anesthesia Type	Regional	4 (0.5%)	818 (99.5%)	χ^2=0.000, p=1.000	8 (1.0%)	814 (99.0%)	χ^2=0.006, p=0.939
	General	1 (0.6%)	176 (99.4%)		1 (0.6%)		

IV. Discussion

This large observational study of 1000 patients undergoing inguinal hernia repair at a tertiary care centre offers a detailed overview of demographic characteristics, operative practices, and short- to medium-term outcomes. The results indicate favourable postoperative recovery with low complication rates, reflecting adherence to standardized surgical protocols and consistent quality of care.

The demographic profile of the present study demonstrates that inguinal hernia predominantly affects middle-aged and older adults, with the highest representation in the 51–60-year age group, followed by the 61–70 and 41–50-year groups. This pattern is consistent with observations by **Malviya et al. (2019)** [10], who also reported peak incidence in the middle-aged population. However, our cohort showed a comparatively older distribution, with a larger proportion of patients above 60 years, a trend similarly reflected in population studies such as **Primatesta and Goldacre (1996)** [11]. The findings from **Agarwal (2023)** [12], who noted that 39% of cases occurred in individuals above 50 years, further support the age profile observed in our study.

The study also demonstrated an exceptionally high male predominance (98.8%), consistent with the anatomical and occupational predisposition of males to inguinal hernia. Similar male predominance has been documented by **Malviya et al. (2019)** [10] and **Agarwal (2023)** [12], who reported ratios of 17.6:1 and 32:1, respectively. Although Western studies such as **Rutkow (2003)** [13] and **Nilsson et al. (2007)** [14] generally report lower ratios, the male predominance in our cohort corresponds with patterns seen in Indian tertiary-care settings.

Occupational patterns in this study show a strong representation of physically demanding jobs, with construction workers and farmers forming the largest groups. This supports the established association between chronic mechanical strain and hernia formation, consistent with observations in earlier literature. **Kandemir et al. (2025)** [15] noted that patients engaged in heavy labour were more likely to present with incarcerated hernias, although occupation was not an independent risk factor in multivariate analysis. The predominance of heavy-labour occupations in our cohort likely reflects both the regional workforce profile and the contribution of repeated increases in intra-abdominal pressure.

As for the clinical characteristics, all patients presented with inguinal swelling, while only 39.6% reported associated pain, indicating that most hernias were minimally symptomatic at the time of diagnosis. This presentation pattern aligns with observations by Fitzgibbons et al. (2006) [16], who reported that many inguinal hernias remain asymptomatic for prolonged periods. The predominance of reducible hernias (96.7%) and short symptom duration (≤1 year in 76.1%) further suggests timely presentation and early identification before progression to complications.

The hernia type distribution was characterized by a predominance of direct hernias (65.5%), contrasting sharply with the findings of Malviya et al. (2019) [10], who reported indirect hernias as the majority. This inverse pattern likely reflects the older age distribution in our cohort, as direct hernias are more common in older adults due to posterior wall weakening. Likewise, population-based studies by Mikkelsen et al. (2002) [17] reported a more balanced distribution of direct and indirect hernias, while Ruhl and Everhart (2007) [2] observed indirect hernia predominance in younger individuals, further supporting the demographic influence seen in our findings.

The bilateral hernia rate (43.3%) was markedly higher than that reported by Malviya et al. (2019) [10] and exceeded rates documented in broader epidemiological cohorts by Mikkelsen et al. (2002) [17] and Burcharth et al. (2015) [18]. This may reflect comprehensive preoperative evaluation at our centre or referral of more complex cases to this tertiary institution. The low recurrence rate (0.7%) and minimal history of prior hernia surgery (0.9%) indicate that most patients presented with primary hernias rather than recurrent disease.

In comparison with regions where delayed presentation is common, our findings differ from the higher rates of irreducible or complicated hernias described by Ohene-Yeboah et al. (2011) [19], underscoring the influence of healthcare accessibility and referral behaviour on clinical presentation patterns.

In this cohort of 1000 patients, constipation and smoking were the most common risk factors, indicating the strong influence of conditions that increase intra-abdominal pressure or impair tissue healing. Mostacero-Rojas et al. (2025) [20] identified constipation, smoking, hypertension, and increasing age as independent contributors to inguinal hernia, which aligns with the high prevalence of these factors in our study. Heavy weight lifting and improper bowel habits were also prominent, consistent with the findings of Balamaddaiah and Reddy (2016) [21], who reported these as major triggers in their population. Comparison with Malviya et al. (2019) [10]

shows similar rates of BPH and heavy lifting, though the markedly higher prevalence of smoking and constipation in our cohort suggests regional lifestyle differences. The low rate of obesity in our patients contrasts with their findings and may correlate with better surgical outcomes. Existing evidence further supports the relevance of these risk factors. Muysoms et al. (2009) [22] highlighted constipation as a contributor to hernia formation and recurrence, and Sorensen et al. (2005) [23] demonstrated the adverse impact of smoking on tissue healing.

The surgical characteristics of this cohort demonstrate a highly standardized and evidence-based approach to inguinal hernia repair. Regional anaesthesia was preferred in most cases (88%), aligning with the reduced postoperative morbidity reported by Nordin et al. (2003) [24]. The overwhelming predominance of elective surgery (97.9%) and the universal adoption of single-dose antibiotic prophylaxis reflect strict adherence to perioperative safety protocols consistent with the recommendations of Mazaki et al. (2013) [25]. The Lichtenstein tension-free repair remained the principal technique (87%), corresponding with the superior outcomes described by Simons et al. (2009) [26]. Laparoscopic techniques (TAPP and ETEP) were used selectively, likely driven by institutional factors and case suitability. Mesh usage was uniform (96.9%), with all implants made of microporous polypropylene, in line with the long-term durability noted by Klinge et al. (1999) [27]. Suture fixation was preferred (94%), reflecting surgeon familiarity and cost efficiency, while tacker fixation was reserved for selected cases.

Perioperative outcomes were similarly consistent and reflect efficient operative pathways. The mean operative time of 100.29 minutes aligns with international standards for open tension-free repair, as described by Bittner et al. (2011) [28]. Postoperative pain scores remained low, and early recovery was evident from a short mean hospital stay of 2.46 days, indicating effective analgesic and mobilization protocols. Mesh dimensions were appropriately tailored to defect size, and additional procedures such as hydrocele and umbilical hernia repair were performed in a minority of cases, reflecting comprehensive and patient-centred surgical planning. Overall, the operative and perioperative profiles highlight standardized execution, protocol-driven care, and favourable short-term recovery outcomes.

Postoperative outcomes in this cohort were highly favourable, with very low morbidity at both 30 and 60 days. At 30 days, the rates of hematoma (0.1%), surgical site infection (0.6%), and seroma (0.9%) were markedly lower than those typically reported, consistent with the low hematoma ranges summarized by Weyhe et al. (2017) [29] and the expected SSI ranges described by Berrios-Torres et al. (2017) [30]. Early groin pain was uncommon (0.9%) and resolved in almost all patients by 60 days, where persistent discomfort remained in only 0.2%. Importantly, no mesh explantation or recurrence was recorded at either follow-up point. While the short duration makes recurrence absence expected, it provides a strong early indicator of repair durability, in line with the recurrence patterns noted by Burcharth et al. (2015) [18].

The uniformly low complication rates across all postoperative parameters support the effectiveness of standardized perioperative pathways implemented in this high-volume centre. Consistent surgical technique selection, a uniform antibiotic strategy, and standardized mesh use likely contributed to the minimal variability in outcomes, reflecting the benefits of protocol-driven care highlighted in the broader surgical literature, including registry analyses by Mikkelsen et al. (2002) [17] and Kockerling (2017) [31]. The resolution of all early complications by day 60 further reinforces the quality and reproducibility of the surgical process. Continued follow-up, including the planned 6-month assessment, will be essential for capturing later recurrences, which typically manifest beyond the early postoperative period as described by Burcharth et al. (2015) [18].

In this study, several risk factors demonstrated significant associations with hernia type. Direct hernias were more common among males (68.4%), smokers (76.6%), individuals with BPH (85.2%), and those with constipation (70.5%), indicating that chronic increases in intra-abdominal pressure and posterior wall weakening predominantly contribute to direct hernia formation. In contrast, heavy weight lifting showed a distinct pattern, strongly predisposing to indirect hernias (69.23%), suggesting that repetitive mechanical strain likely promotes deep inguinal ring dilation rather than posterior wall failure. The contrasting trends observed, with chronic pressure-related factors favouring direct hernias and occupational strain favouring indirect hernias, underscore the presence of distinct pathophysiological mechanisms, offering valuable insights for targeted prevention strategies tailored to specific risk exposures.

The analysis of risk factors for postoperative SSI and seroma reveals distinct patterns of vulnerability, with diabetes mellitus and hypertension emerging as the only significant predictors in this cohort. Diabetic patients demonstrated markedly higher rates of both SSI (2.9 percent vs 0.2 percent) and seroma (3.9 percent vs 0.6 percent), with strong statistical significance for both outcomes (p = 0.003 and p = 0.005 respectively). These findings are consistent with Martin et al. (2016) [32], who highlights impaired immune function and delayed wound healing as key contributors to diabetes-related postoperative morbidity. The results are further supported by Ahmed et al. (2025) [33], who reported substantially higher SSI rates, prolonged healing time, and increased seroma tendency in diabetic patients undergoing hernia repair, underscoring diabetes as a high-risk state requiring stringent perioperative glycaemic control.

Hypertension was similarly associated with increased SSI (1.9 percent vs 0.2 percent, p = 0.032) and seroma formation (2.6% vs 0.6%, p = 0.049). Gallo et al. (2022) [34] reported higher postoperative complication rates in hypertensive patients due to impaired microcirculation and tissue recovery. Evidence from Chen et al. (2023) [35] also identifies hypertension as an independent predictor of postoperative complications following laparoscopic inguinal hernia repair, reinforcing its clinical relevance. Additionally, findings from Khalid et al. (2025) [36] demonstrate a significantly higher complication burden among hypertensive patients undergoing TAPP repair.

The findings of this study underscore the importance of targeted perioperative optimization, as diabetes and hypertension were significant predictors of postoperative complications. Standardized surgical protocols, including routine mesh repair, antibiotic prophylaxis, and consistent operative technique, contributed to low complication rates and support the continued use of the Lichtenstein method. Overall, the results confirm that inguinal hernia repair remains safe and effective even in patients with multiple comorbidities when appropriate perioperative care is provided.

V. Conclusion

This study of 1000 patients undergoing inguinal hernia repair demonstrates that the systematic application of evidence-based surgical and perioperative protocols results in consistently excellent outcomes with remarkably low complication rates. Clear epidemiological patterns were observed, including strong male predominance and a high burden of modifiable risk factors such as smoking and constipation. The predominant use of the Lichtenstein mesh repair technique and regional anaesthesia contributed to the favourable results. Diabetes mellitus and hypertension emerged as important predictors of postoperative complications, underscoring the need for targeted perioperative optimization in these patients. The safe integration of concomitant procedures reflects efficient operative planning and resource utilization without compromising patient safety. Overall, the findings show that standardized, protocol-driven practice can deliver high-quality inguinal hernia surgery with exceptional safety and effectiveness, offering a strong model for clinical practice and future research.

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