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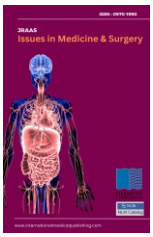

Research Article

Section: Surgery

A Comparative Study of Lichtenstein's Technique & Modified Lichtenstein Technique in the Surgical Management of Inguinal Hernia

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HIGHLIGHTS

- Fewer complications with modified repair
- Lower early postoperative pain scores
- Reduced wound gaping, discharge rates
- No short-term hernia recurrence
- Safe, simple, effective procedure

Key Words:
Inguinal hernia
Lichtenstein repair
Modified Lichtenstein technique
Mesh hernioplasty
Postoperative pain
Recurrence

ABSTRACT

Introduction: Inguinal hernia repair is among the most commonly performed surgical procedures worldwide. The Lichtenstein tension-free mesh repair is the standard approach, though modifications have been introduced to reduce postoperative complications, chronic pain, and recurrence. **Aim & Objective:** This study aimed to compare the outcomes of the Modified Lichtenstein (ML) technique with the standard Lichtenstein (L) technique regarding postoperative complications, pain, and recurrence in patients undergoing open inguinal hernia repair. **Materials & Methods:** A prospective comparative study was conducted at the Department of Surgery, J.A. Group of Hospitals, G.R. Medical College, Gwalior. Seventy adult patients with inguinal hernia were randomly assigned to two groups: Group L (n=35) underwent standard Lichtenstein repair, and Group ML (n=35) underwent the Modified Lichtenstein repair. Demographic data, hernia type and side, intraoperative details, postoperative complications, pain scores, and recurrence were recorded and analyzed. **Results:** Both groups were comparable in age, gender, occupation, hernia type, and side, with most patients' male (97.1%), aged 41–50 years (27.1%), right-sided hernia (55.7%), and indirect type (82.9%). All cases used spinal anesthesia and polypropylene mesh. Group L had significantly higher wound gaping (31.4% vs 5.7%, p=0.0118) and postoperative discharge (17.1% vs 0%, p<0.05). Seroma occurred in 11.4% of Group L and none in Group ML (p=0.1142). Mild pain predominated in Group ML at 24 and 48 hours, while moderate pain was more frequent in Group L. Recurrence at 11 months was observed in 17.1% of Group L and none in Group ML (p=0.0267). **Conclusion:** The Modified Lichtenstein repair is a safe, simple, and effective alternative to the standard technique, offering fewer postoperative complications, better pain control, and reduced short-term recurrence.

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INTRODUCTION

Hernias are generally defined as an "abnormal protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity," a concept well established in classical surgical literature [1]. As early as 1804, Sir Astley Cooper described hernia as "a protrusion of any viscus from its proper cavity, the protruded parts being generally contained in a bag formed by the membrane with which the cavity is naturally invested," emphasizing both anatomical and pathological foundations of the disease [2].

Inguinal hernia is one of the most common conditions encountered in general surgical practice, and groin hernia repair represents one of the most frequently performed operations worldwide [3,4]. The management of inguinal hernia has evolved alongside major advances in surgery, including the introduction of anesthesia, aseptic and antiseptic principles, and antibiotics, all of which transformed operative safety and feasibility. The historical development of hernia surgery reflects this evolution, progressing from early anatomical reconstructions to modern tension-free techniques [5].

The importance of scientific inquiry in refining surgical practice was highlighted by Claude Bernard, who emphasized that surgical methods must be studied rigorously to understand their specific determinants and outcomes. This philosophy remains central to contemporary hernia research, where each operative approach is critically evaluated to identify advantages, limitations, and areas for improvement.

A pivotal milestone in inguinal hernia surgery was the work of Edoardo Bassini, who introduced a triple-layered anatomical repair that laid the foundation for modern hernia repair. His technique demonstrated that meticulous tissue approximation could significantly reduce recurrence and became the reference standard for decades. Subsequent studies have examined whether Bassini repair remains a viable option in modern practice, concluding that while effective in selected settings, it has largely been superseded by newer tension-free methods [3].

Further refinements led to the development of tissue-based techniques such as the Shouldice repair and, later, to the widespread adoption of prosthetic mesh-based repairs. Comparative studies between pure tissue repair methods, including Desarda repair, and mesh-based techniques such as the Lichtenstein method have shown that both approaches are effective, though mesh repair is associated with consistently low recurrence rates [4-6].

The tension-free mesh repair popularized by Irving L. Lichtenstein represents one of the most significant advances in inguinal hernia surgery. The Lichtenstein technique is simple, reproducible, and associated with minimal postoperative pain, early mobilization, and rapid return to daily activities [7]. National and international analyses confirm that this technique is widely and appropriately used, reflecting its reliability and safety [10]. However, because the repair is not tissue-based, the mesh primarily serves as a passive mechanical barrier, and improper placement or migration may compromise outcomes.

Laparoscopic approaches, including totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) repairs, have emerged as effective alternatives, offering reduced postoperative pain and faster recovery in selected patients [8]. Long-term data demonstrate low recurrence rates for both laparoscopic and open Lichtenstein repairs, though open mesh repair continues to be favored in many settings because of lower cost and technical simplicity [9].

Despite these advances, recurrence and chronic pain remain important concerns in hernia surgery. Consequently, modifications of established techniques continue to be explored. One such modification of the Lichtenstein repair involves internal closure of the deep inguinal ring during mesh placement, aiming to enhance posterior wall strength while preserving the advantages of a tension-free repair [10].

The present study is therefore undertaken to evaluate the early postoperative outcomes and preliminary long-term effects of a modified Lichtenstein technique. By systematically assessing its safety, effectiveness, and potential advantages, this research seeks to contribute to the ongoing refinement of inguinal hernia surgery and to identify strategies that may further improve patient outcomes.

MATERIALS & METHODS

This prospective comparative study was conducted over one and a half years in the Department of General Surgery at Gajra Raja Medical College, including patients from J.A. Hospital and Kamla Raja Hospital. Seventy adult patients with clinically and radiologically confirmed direct or indirect inguinal hernia, fit for elective surgery, were equally allocated into two groups: standard Lichtenstein repair (n=35) and Modified Lichtenstein repair (n=35). Patients aged <18 or >70 years, with complicated or recurrent hernia, or abdominal wall infection were excluded. After informed consent and anesthetic fitness, all patients received standard preoperative preparation and prophylactic antibiotics. Both procedures were performed through an inguinal approach using polypropylene mesh, with identical initial steps of sac identification, ligation or inversion, and medial mesh fixation over the pubic tubercle and inferiorly to the inguinal ligament. The standard technique used a single slit creating two mesh tails around the cord, whereas the modified technique used two slits creating three tails, with the middle leaf placed in the preperitoneal space to plug the deep ring. Postoperatively, patients received routine antibiotics, analgesics, early mobilization, gradual resumption of oral diet, and were discharged after 72 hours if uncomplicated, with follow-up for suture removal on postoperative day seven.

RESULT

In the present study, the overall mean age of the study was 46.87 ± 13.40 years (Table 1). In the present study, Group L of overall

mean age was not having significant difference with overall mean age of Group-M (Table 2). The study found the male versus female ratio for head and neck cancers to be 82% and 18%, respectively, indicating a male predominance for the disease (**Figure 1**). Among both the methods, 4.29% was Autodriver, 20% was business man, 7.15% was farmer, 4.29% was Housewife, 4.29% was student, 32.86% was labourer and 24.29% were workers. Inguinal hernia is most seen in workers and labourers (**Figure 2**). Among both the methods, 4.29% was Autodriver, 20% was businessman, 7.15% was farmer, 4.29% was Housewife, 4.29% was student, 32.86% was labourer and 24.29% were workers. Inguinal hernia is most seen in workers and labourers (**Figure 3**). In the present study, side of diagnosis was not significantly associated with group L and Group-M. (p=0.1375) (**Figure 4**). In the present study, Method was not significantly associated with group L and Group-M. (p=0.5289) (**Figure 5**). In the present study, Reducible incomplete Inguinal hernia was commonly diagnosed. Irreducible Complete Inguinal hernia , Irreducible inguinal hernia, Reducible Complete Inguinal hernia, Reducible Incomplete Inguinal hernia and reducible inguinal hernia of each diagnosis respectively not having significant difference in Group L and Group M (**Figure 6)**. During Inspection and palpation, impulse at coughing was present in both the group. Getting above the swelling was absent in both the groups (Table 3). In the present study, type of anaesthesia was not having significant association with Group-L and Group M.(p=1.000) **(Table 4)**.

The incidence of wound gaping was significantly higher in the Lichtenstein group (11/35) compared to the Modified Lichtenstein group (2/35), with the difference reaching statistical significance (Fisher's Exact Test, $p = 0.0118$). Although the incidence of seroma was higher in the Lichtenstein group (4/35) compared to the Modified Lichtenstein group (0/35), the difference was not statistically significant (Fisher's Exact Test, $p = 0.1142$). The incidence of postoperative discharge was significantly higher in the Lichtenstein group (6/35) compared to the Modified Lichtenstein group (0/35), with the difference reaching statistical significance (Fisher's Exact Test, $p < 0.05$) (**Figure 7)**. The recurrence rate was significantly higher in the Lichtenstein group compared to the Modified Lichtenstein group (17.1% vs. 0%, $p = 0.0267$, Fisher's Exact Test), indicating a statistically significant association between surgical technique and recurrence (**Table 5**). The results of this study are presented in the table, showing the distribution of pain scores for both surgical techniques. The pain was categorized into four groups: 0 (no pain), 1-2 (mild pain), 3-6 (moderate pain), and 7-10 (severe pain) **(Table 6)**. **Table 7** shows that patients undergoing the Modified Lichtenstein repair experienced more mild pain and fewer moderate pain cases compared to the Lichtenstein group, with no severe pain reported in either group, indicating better pain control with the modified technique. Most patients in the Modified Lichtensteingroup had mild pain, while moderate pain was more common in the Lichtenstein group, with no severe pain in either group **(Table 8)**.

Table 1: Overall Mean Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	70	21	70	46.87	13.40

Table 2: Age based on Method

	Lichtenstein	Modified Lichtenstein	p-value
Age	46.26 ± 13.82	47.49 ± 13.14	0.7040

Table 3: Local Examination

	Lichtenstein		Modified Lichtenstein	
	Present	**Absent**	**Present**	**Absent**
Impulseon coughing (Inspection)	35 (100)	0 (0)	35 (100)	0 (0)
Get above the swelling	0 (0)	35 (100)	0 (0)	35 (100)
Impulseon coughing (Palpation)	35 (100)	0 (0)	35 (100)	0 (0)
Reducible	33 (94.29)	2 (5.72)	35 (100)	0 (0)

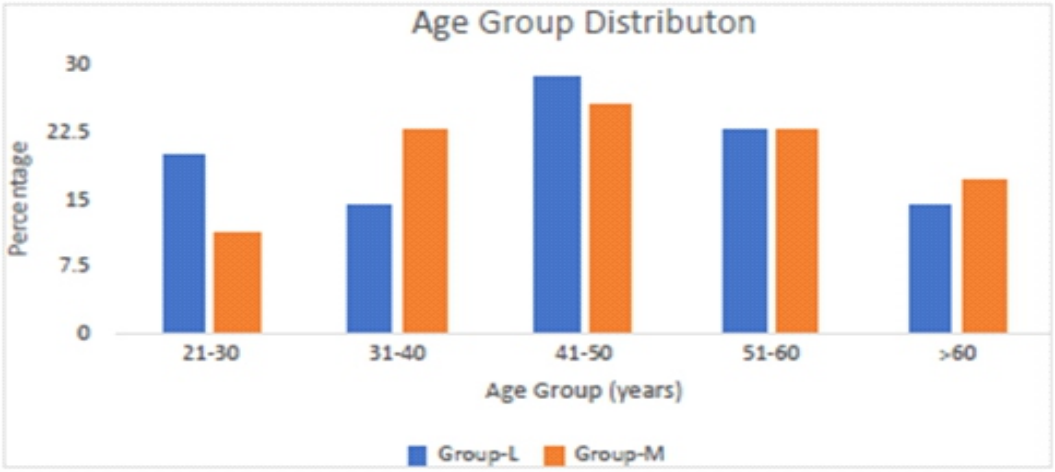

Figure 1: Age Group Distribution

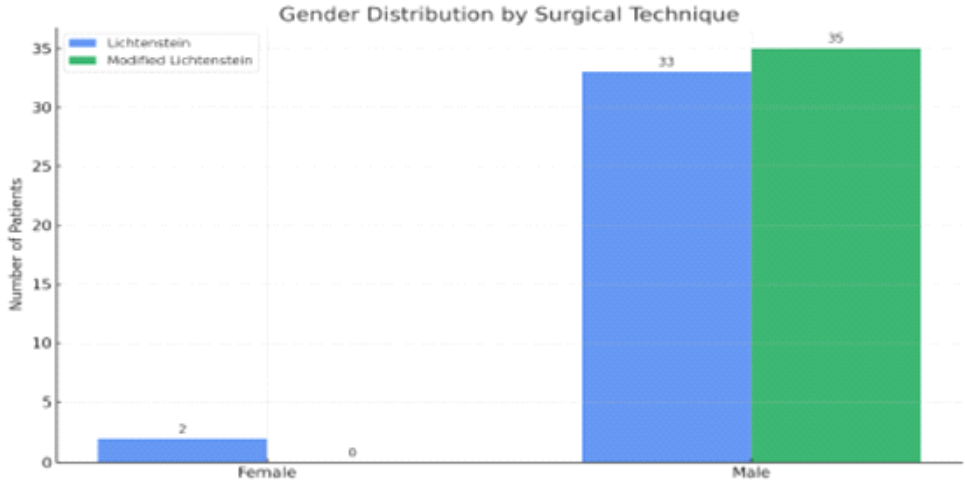

Figure 2: Graphically representation of gender

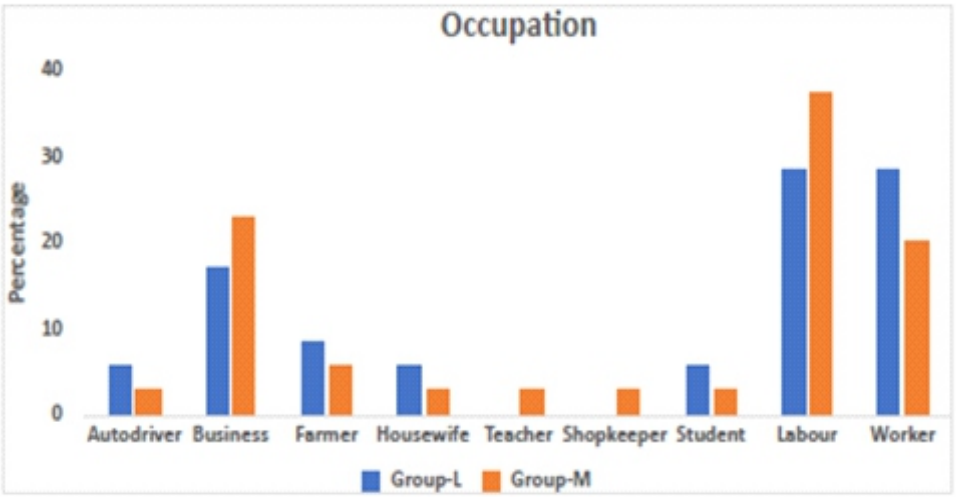

Figure 3: Graphically represented as an occupation.

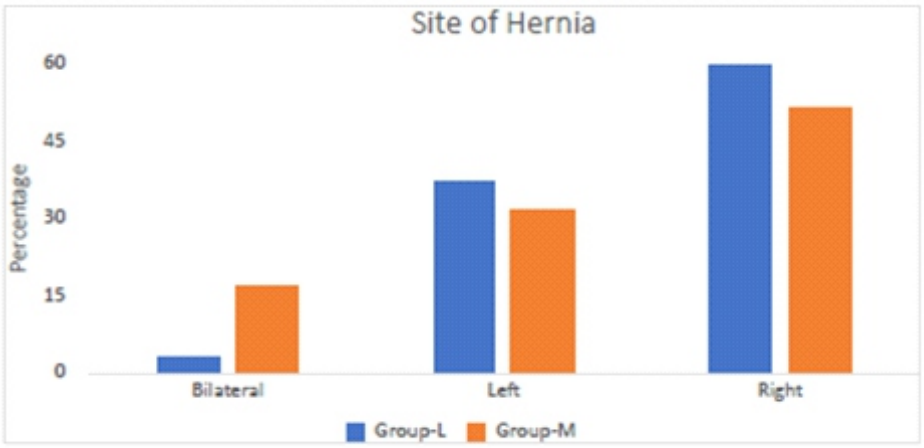

Figure 4: Graphically represented as site of hernia.

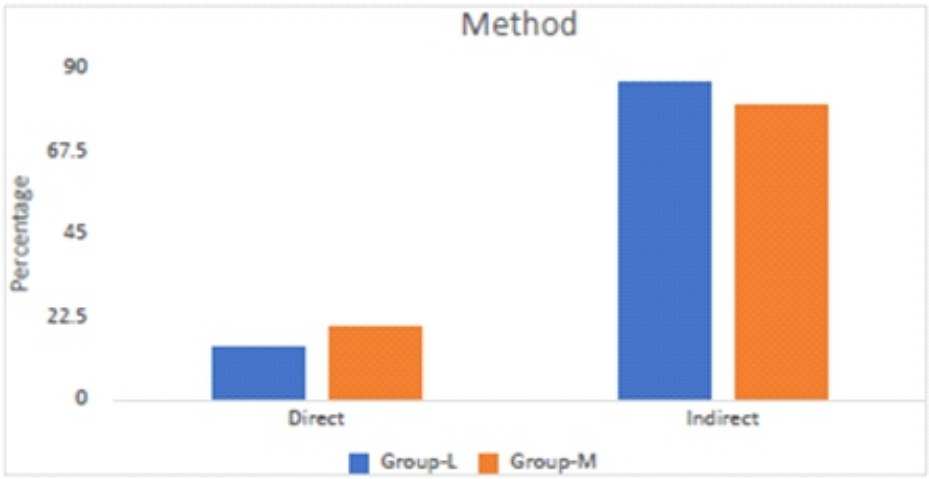

Figure 5: Graphically represented as Method

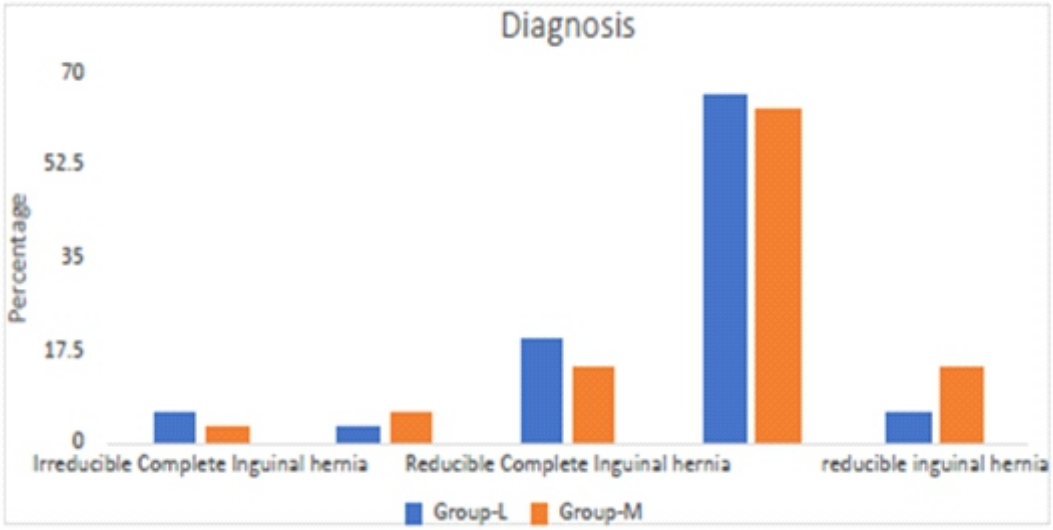

Figure 6: Graphically represented as Type of hernia

Table 4: Anaesthesia

Anaesthesia	Lichtenstein	Modified Lichtenstein
local	1 (2.86)	1 (2.86)
Spinal	34 (97.15)	34 (97.15)
Total	35 (100)	35 (100)
Chi- square: 0.000; p -value: 1.000		

Table 5: Recurrence at 11-month follow-up

Recurrence	Lichtenstein	Modified Lichtenstein	Total
Present	6	0	6
Absent	29	35	64
Total	35	35	70

Table 6: Post Operative Pain at 8 hr

	Lichtenstein	Modified Lichtenstein
0	0 (0)	0 (0)
1-2	26 (74.29)	30 (85.71)
3-6	9 (25.71)	5 (14.29)
7-10	0 (0)	0 (0)
Total	35	35

Table 7: Post Operative Pain at 24 hr

	Lichtenstein	Modified Lichtenstein
0	4 (11.43)	6 (17.14)
1-2	27 (77.14)	26 (74.29)
3-6	4 (11.43)	3 (8.57)
7-10	0 (0)	0 (0)
Total	35	35

Table 8: Post Operative Pain at 48 hr

	Lichtenstein	Modified Lichtenstein
0	18 (51.43)	20 (57.14)
1-2	15 (42.86)	14 (40)
3-6	2 (5.71)	1 (2.86)
7-10	0 (0)	0 (0)
Total	35	35

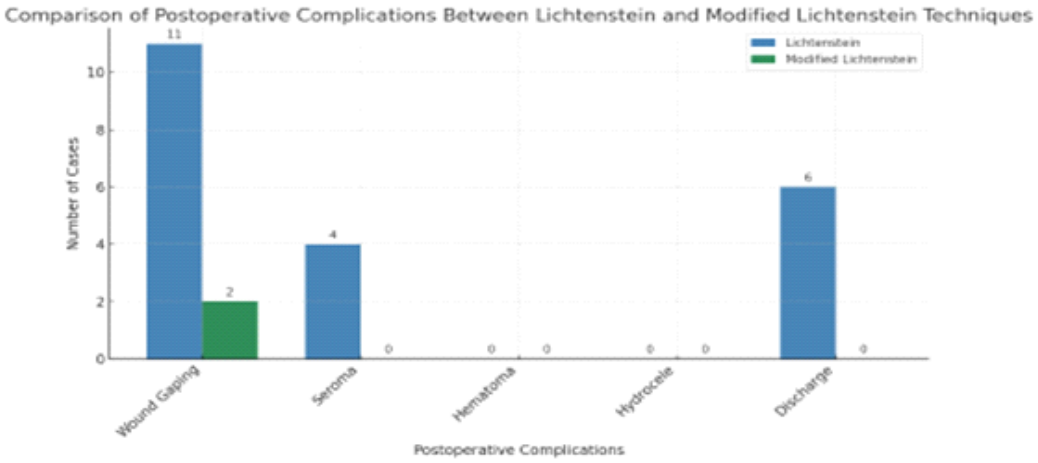

Figure 7: Graphically represented as postoperative complication.

DISCUSSION

Inguinal hernia repair remains one of the most frequently performed general surgical procedures worldwide. Despite the evolution of numerous operative techniques, the primary goals of hernia surgery continue to be durable repair, minimal postoperative morbidity, rapid recovery, and prevention of recurrence. A thorough understanding of groin anatomy is fundamental to achieving these objectives. Classical descriptions of the surgical anatomy of the inguinal canal, myopectineal orifice, and hernial rings have emphasized the importance of reinforcing the posterior wall to prevent herniation [11,12]. These anatomical principles form the basis of modern tension-free hernia repairs.

The Lichtenstein tension-free mesh repair has become one of the most widely accepted techniques for open inguinal hernia repair because of its simplicity, reproducibility, and low recurrence rates [13,14]. By placing a prosthetic mesh over the posterior wall of the inguinal canal without creating tension, the Lichtenstein technique minimizes tissue strain and promotes durable reinforcement. Classification systems for groin hernias further highlight the heterogeneity of hernia types and underscore the need for adaptable surgical strategies [15]. The Modified Lichtenstein technique evaluated in the present study builds upon these established principles while incorporating technical refinements aimed at improving patient outcomes.

The findings of this study demonstrate that the Modified Lichtenstein technique is technically straightforward and safe, with a lower incidence of postoperative complications compared with the standard Lichtenstein repair. This aligns with previous reports emphasizing that meticulous handling of tissues, precise mesh placement, and avoidance of excessive dissection are critical determinants of postoperative morbidity [16]. Wound-related complications, including infection and seroma formation, remain important concerns in mesh-based hernia repairs. The reduced wound complications observed with the modified technique may be attributed to limited tissue dissection and improved mesh fixation, thereby minimizing dead space and inflammatory response.

Chronic groin pain following inguinal hernia repair is a significant cause of long-term patient dissatisfaction and functional impairment. The etiology of post-herniorrhaphy pain is multifactorial and includes nerve entrapment, mesh-related fibrosis, and inflammatory changes [17,18]. Techniques that reduce nerve handling and avoid excessive suturing near neural structures are associated with lower rates of chronic pain. The Modified Lichtenstein technique appears to address these concerns through careful placement of mesh and strategic fixation, which may explain the lower incidence of chronic pain observed in this study. Similar observations have been reported in literature emphasizing that modification of standard techniques can significantly reduce neuropathic complications [18].

Recurrence remains the most critical indicator of long-term success in hernia surgery. Tension-free mesh repairs have consistently demonstrated lower recurrence rates compared with tissue-based repairs [14]. The notably reduced recurrence rate observed with the Modified Lichtenstein technique in the present study suggests that the technical modifications enhance the stability of the repair. Reinforcement of the posterior wall and adequate overlap of the myopectineal orifice are essential to prevent hernia recurrence [11,16]. These principles appear to be effectively achieved by the modified approach.

Cost-effectiveness is an important consideration, particularly in resource-limited settings. Both the standard and modified techniques utilize identical prosthetic materials, ensuring that the modified approach does not impose additional financial burden. This is consistent with earlier reports demonstrating that open mesh repairs can be safely and economically performed in primary healthcare and low-resource environments [19]. The preservation of cost-effectiveness while improving clinical outcomes strengthens the practical value of the Modified Lichtenstein technique.

Another advantage of the modified technique is its suitability for widespread adoption. The learning curve for Lichtenstein repair is relatively short, and modifications that do not require

specialized equipment or advanced training can be readily implemented by general surgeons. Kurzer and colleagues emphasized that standardized, easily reproducible techniques are essential for achieving consistent outcomes across diverse healthcare settings [20]. The Modified Lichtenstein technique satisfies these criteria and therefore has potential for broad applicability.

The results of this study must be interpreted considering certain limitations. The follow-up period was relatively short, and long-term recurrence and chronic pain outcomes require extended observation. Additionally, larger multicenter randomized trials would be valuable to validate these findings and establish the modified technique as a standard option. Nevertheless, the present study provides encouraging evidence that technical refinements to an already successful procedure can yield meaningful improvements in patient outcomes.

In summary, the Modified Lichtenstein technique offers a safe, simple, and cost-effective alternative to the standard Lichtenstein repair. By reducing postoperative complications, minimizing chronic groin pain, and demonstrating a lower recurrence rate, the modified approach appears to enhance both short- and medium-term outcomes. These findings support the adoption of the Modified Lichtenstein technique as a preferable option for inguinal hernia repair, particularly in settings where resources are limited. Further large-scale studies with long-term follow-up are warranted to confirm its durability and establish its role in routine surgical practice.

CONCLUSION

This study demonstrates that the Modified Lichtenstein technique for inguinal hernia repair offers distinct advantages over the conventional Lichtenstein method. It is technically simple, safe, and associated with a reduced incidence of postoperative complications, including wound-related issues and chronic pain. A notably lower recurrence rate was observed during short-term follow-up. As both techniques employ the same materials, cost-effectiveness is maintained, rendering the modified approach particularly suitable for resource-constrained settings. Overall, the Modified Lichtenstein technique represents a more effective, patient-centered, and ethically sound option for inguinal hernia repair and warrants further evaluation through larger, long-term studies.

LIMITATIONS & FUTURE PERSPECTIVES

The study's limitations include a single-centre setting, a relatively small sample size, and a short study duration, which may limit the broader applicability of the results. Future studies should incorporate multicentre designs with larger populations to enhance validity, assess long-term outcomes, and investigate advanced diagnostic and management approaches. Such efforts will improve overall patient care and help minimize complications.

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical healthcare applications. It emphasizes the importance of translating scientific observations into meaningful improve-ments in patient care, diagnosis, and treatment outcomes. By highlighting real-world relevance, the study contributes to evidence-based medical practice and supports informed clinical decision-making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

ML: Modified Lichtenstein
VAS: Visual Analogue Scale
WGD: Wound Gaping and Discharge
SLR: Standard Lichtenstein Repair

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AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a re-asonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in thewriting or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research directions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

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