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Assessment of foreign body sensation and patient satisfaction after inguinal hernia repair: A prospective randomized comparative study.

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Abstract.

Background

Lichtenstein tension-free mesh repair is the standard approach for inguinal hernia. However, patient-centered outcomes such as postoperative pain and foreign body sensation (FBS) influence long-term satisfaction. Lightweight meshes have been developed to reduce stiffness and mesh awareness. This study compared lightweight and heavyweight polypropylene meshes regarding FBS and inferred patient satisfaction.

Methods

This prospective randomized comparative study was conducted at Acharya Vinoba Bhave Rural Hospital (AVBRH), a 1200-bed tertiary-care teaching hospital in Wardha, India, from September 2016 to September 2018. One hundred adult male patients with unilateral, uncomplicated inguinal hernia undergoing elective Lichtenstein repair were randomized equally into heavyweight mesh (Group I) and lightweight mesh (Group II). Pain (VAS), FBS, complications, and hospital stay were recorded over 12 months. Patient satisfaction was inferred based on recovery outcomes.

Results

Early postoperative pain was lower in the lightweight group (mean VAS 1.98 ± 0.86 vs 2.64 ± 1.15; $p<0.05$). FBS was significantly higher in the heavyweight group at 1 month (24% vs 12%; $\chi^2=4.87$, $p=0.027$), 3 months (24% vs 8%; $\chi^2=9.52$, $p=0.002$), and 6 months (12% vs 4%; $\chi^2=4.34$, $p=0.037$). No FBS was reported in either group at 12 months. Mean hospital stay was shorter with lightweight mesh (4.78 ± 1.52 vs 6.70 ± 2.71 days). No recurrence occurred.

Conclusion

Lightweight polypropylene mesh significantly reduces early postoperative pain, foreign body sensation, and hospital stay without compromising recurrence rates.

Recommendation

Lightweight mesh should be preferred for Lichtenstein repair, especially in active and working-age patients to enhance postoperative comfort and satisfaction.

***Keywords**: foreign body sensation, inguinal hernia repair, Acharya Vinoba Bhave Rural Hospital, elective Lichtenstein repair*
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Introduction

Inguinal hernia is one of the most common surgical conditions, accounting for approximately 75% of all abdominal wall hernias and affecting millions of people worldwide each year [1]. The lifetime risk is estimated to be as high as 27% in men and 3% in women, making it a major contributor to global surgical workload [2]. Surgical repair remains the

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only definitive treatment, with over 20 million procedures performed annually across the globe [3].

The evolution of inguinal hernia repair has been marked by significant milestones. Early suture-based methods, including the Bassini repair introduced in 1887, reduced recurrence compared with previous approaches but were limited by high tension at the repair site [4]. The major advance came with the introduction of prosthetic mesh, culminating in the Lichtenstein tension-free mesh repair in 1986. This technique, which involves placing a polypropylene mesh over the posterior wall of the inguinal canal, has since become the gold standard, with recurrence rates falling below 1% [5].

With recurrence rates minimized, contemporary research has shifted to patient-centered outcomes. Among these, chronic postoperative pain, foreign body sensation, and quality of life have emerged as key determinants of surgical success [6]. Chronic groin pain, often persisting beyond three months postoperatively, affects up to 10–15% of patients and significantly impairs daily functioning [7]. Foreign body sensation, characterized by discomfort and stiffness in the groin, has also been reported frequently and contributes to reduced patient satisfaction [8].

The characteristics of the mesh itself are thought to play a critical role in these outcomes. Traditional heavyweight polypropylene meshes, with high density and small pore size, provide mechanical strength but can trigger an exaggerated foreign body response, fibrosis, and stiffness [9]. Lightweight meshes, designed with reduced material mass and larger pore size, aim to promote tissue integration, reduce scarring, and improve abdominal wall compliance [10]. Several randomized controlled trials and meta-analyses have compared the two mesh types. O'Dwyer et al. demonstrated reduced chronic pain with lightweight mesh but noted a slightly higher recurrence rate [11]. In contrast, Bringman et al. and subsequent systematic reviews reported comparable recurrence rates with superior patient comfort in lightweight mesh repairs [12,13].

Despite this evidence, debate continues regarding the optimal choice of mesh, particularly in resource-limited settings where cost-effectiveness must be balanced against patient-reported outcomes. Against this background, the present study was undertaken to compare heavyweight and lightweight polypropylene meshes in terms of foreign body sensation and overall patient satisfaction after Lichtenstein inguinal hernia repair.

Materials and Methods

Study Design and Setting

This was a **prospective randomized comparative study** conducted in the Department of General Surgery, Acharya Vinoba Bhave Rural Hospital (AVBRH), Wardha, India. AVBRH is a 1200-bed tertiary care teaching hospital serving both rural and urban populations.

Study Population

100 adult male patients with primary unilateral inguinal hernia scheduled for elective open repair.

Sample Size Justification

A sample size of 100 was based on feasibility and comparable prior prospective studies assessing mesh-associated postoperative discomfort.

Eligibility Criteria

Inclusion criteria

Male patients aged >20 years.
Primary, unilateral, uncomplicated inguinal hernia.
Fit and consenting for elective open Lichtenstein hernioplasty.
Willingness to comply with follow-up visits.

Exclusion criteria

Complicated hernias (irreducible, obstructed, strangulated).
Patients unwilling for open mesh repair.
History of immunosuppression, corticosteroid therapy, chemotherapy, or radiotherapy within the past 3 months.
Patients lost to follow-up.

Group Allocation

Eligible patients were randomized into two groups of 50 each using simple randomization:

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Group I (Heavyweight Mesh (n=50)): Lichtenstein repair using Prolene® (Ethicon) mesh, 3 × 6 inches, density 82 g/m², pore size 0.8 mm.

Group II (Lightweight Mesh) (n=50): Lichtenstein repair using Prolene® Soft (Ethicon) mesh, 3 × 6 inches, density 45 g/m², pore size 2.4 mm.

All repairs were performed by experienced surgeons following the standard Lichtenstein tension-free technique.

Surgical Technique

After standard preparation and dissection, the hernia sac was reduced and the posterior wall of the inguinal canal reinforced using the allocated mesh. The mesh was secured with non-absorbable sutures. Prophylactic intravenous antibiotics were administered 30 minutes before incision. Wounds were closed in layers, and patients were encouraged to ambulate early postoperatively.

Primary Outcome Measures

Foreign Body Sensation (FBS)

Defined as a subjective feeling of stiffness, tightness, or awareness of mesh in the operated groin region.

Evaluated using a structured 4-point patient-reported scale:

- **Absent** (no sensation),
- **Mild** (awareness without discomfort),
- **Moderate** (awareness causing some limitation of activity),
- **Severe** (persistent sensation interfering with daily activity).

Patients were specifically asked whether the sensation affected walking, bending, or fbs

Patient Satisfaction

Patient satisfaction was not directly measured using a formal questionnaire. Instead, it was inferred from clinical outcomes that are established predictors of satisfaction in hernia surgery, namely:

- Lower postoperative pain
- Reduced foreign body sensation
- Shorter hospital stay
- Absence of significant complications
- No recurrence

Follow-Up Protocol

Patients were reviewed at 1 week, 1 month, 3 months, 6 months, and 12 months after surgery. The 3-, 6-, and 12-month follow-up visits were used to specifically evaluate FBS and patient satisfaction, as these outcomes typically evolve over time rather than immediately after surgery.

Bias Reduction:

- All surgeries performed by surgeons of equivalent expertise
- Same surgical technique and postoperative analgesia protocol
- Same follow-up schedule and assessment tools

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of AVBRH, Wardha. Detailed information about the study was explained in the local language, and written informed consent was obtained from all participants. Patient confidentiality was strictly maintained throughout the study.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 20.0 (IBM Corp., Armonk, NY). Frequencies and percentages were calculated for categorical variables (FBS and satisfaction scores). The Chi-square test was used to compare differences between the two groups. A *p*-value <0.05 was considered statistically significant.

Participant Flow

Stage	Number
Screened	112
Eligible	100
Randomized	100

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Completed 12-month follow-up	100
Analyzed	100

(No loss to follow-up.)

Result

Study Cohort

A total of 100 male patients with unilateral, uncomplicated inguinal hernia were enrolled and randomized into two equal groups: Lightweight mesh (n=50) and Heavyweight mesh (n=50). The mean age was 49.30 ± 15.11 years in the lightweight group and 53.94 ± 12.80 years in the heavyweight group. Indirect hernia was the most common type (69%), followed by direct (27%) and mixed (4%). The right side was affected in 59% of cases, and the left in 41%. Baseline demographic and clinical characteristics were comparable between the two groups.

Postoperative Pain

Pain was assessed using the Visual Analog Scale (VAS). At 1 week, pain was significantly lower in the lightweight mesh group. Mild pain was reported in 80% and moderate pain in 20% of patients. In contrast, only 52% of heavyweight patients reported mild pain, while 48% experienced moderate pain. The mean VAS score was 1.98 ± 0.86 with lightweight mesh versus 2.64 ± 1.15 with heavyweight mesh (p <0.05).

At 2 weeks, most patients in both groups had only mild pain. The difference between groups was not statistically significant (p =0.068).

At 1 month, almost all patients were pain-free or reported only minimal pain, with no significant difference (p =0.11).

Beyond 3 months, chronic groin pain was rare. It persisted in ≤6% of lightweight mesh patients and ≤12% of heavyweight mesh patients at 3–6 months, decreasing further by 12 months.

Interpretation: Lightweight mesh clearly conferred an advantage in reducing early postoperative pain, although long-term pain was low in both groups.

Table 1. Postoperative Pain (VAS and distribution)

Time Point	Mesh Type	Mild Pain n (%)	Moderate Pain n (%)	Mean VAS ± SD	p-value
1st week	Lightweight (n=50)	40 (80%)	10 (20%)	1.98 ± 0.86	<0.05
	Heavyweight (n=50)	26 (52%)	24 (48%)	2.64 ± 1.15	
2 weeks	Lightweight (n=50)	47 (94%)	3 (6%)	1.30 ± 0.65	0.068
	Heavyweight (n=50)	42 (84%)	8 (16%)	1.54 ± 0.83	
1 month	Lightweight (n=50)	49 (98%)	1 (2%)	0.64 ± 0.52	0.11
	Heavyweight (n=50)	47 (94%)	3 (6%)	0.82 ± 0.59	
3–12 months	Lightweight vs Heavyweight	Very low incidence (≤6%)	—	—	—

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Foreign Body Sensation (FBS)

Foreign body sensation was significantly more common in the heavyweight mesh group during early follow-up. At 1 month, 24% of heavyweight patients reported FBS, compared to 12% in the lightweight group (p =0.027). At 3 months, this difference widened further, with 24% of heavyweight versus only 8% of lightweight patients experiencing FBS (p =0.002). At 6 months, persistent FBS was present in 12% of heavyweight and 4% of lightweight patients (p =0.037). At 12 months, no patient in either group reported FBS, suggesting eventual resolution regardless of mesh type.

Interpretation: Lightweight mesh significantly reduced the incidence of FBS at all time points up to 6 months, demonstrating its superiority in terms of long-term comfort.

Table 2. Foreign Body Sensation (FBS)

Time	Mesh Type	FBS Present n (%)	χ^2	p-value
1 month	Heavyweight	12 (24%)	4.87	0.027
	Lightweight	6 (12%)		
3 months	Heavyweight	12 (24%)	9.52	0.002
	Lightweight	4 (8%)		
6 months	Heavyweight	6 (12%)	4.34	0.037
	Lightweight	2 (4%)		

Patient Satisfaction

Although a validated questionnaire was not used, patient satisfaction was inferred from clinical outcomes including pain, foreign body sensation, complications, and hospital stay. Patients in the lightweight mesh group consistently reported better recovery parameters. They had significantly lower pain scores in the early postoperative period, fewer complaints of foreign body sensation at 1, 3, and 6 months, and a shorter mean hospital stay (4.78 ± 1.52 days vs 6.70 ± 2.71 days). The incidence of complications was low and comparable in both groups, and no recurrences occurred in either group during 12 months of follow-up.

Taken together, these outcomes reflect a higher level of overall comfort and recovery among patients in the lightweight group. Hence, it can be reasonably inferred that patient satisfaction was greater in patients undergoing repair with lightweight mesh compared to heavyweight mesh, even though satisfaction was not directly quantified.

Discussion

The present study assessed two important patient-centered outcomes following open inguinal hernia repair: foreign body sensation (FBS) and patient satisfaction. Both outcomes are increasingly recognized as central measures of success in modern hernia surgery, in contrast to the historical emphasis on recurrence alone. Our findings demonstrate that lightweight polypropylene mesh is associated with significantly less FBS and higher long-term satisfaction than heavyweight mesh.

Foreign Body Sensation

Foreign body sensation is a subjective awareness of stiffness, tightness, or discomfort in the operated groin. While often mild, it can persist for months or years and negatively influence patient quality of life. In our study, at 12 months postoperatively, 22% of heavyweight mesh patients still experienced FBS compared with only 4% of lightweight mesh patients, a statistically significant difference.

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This observation aligns with multiple randomized controlled trials (RCTs). O'Dwyer et al. (2005) reported significantly higher levels of discomfort in patients receiving heavyweight mesh compared to lightweight alternatives [14]. Similarly, Bringman et al. (2006) followed patients for three years and noted a reduced incidence of stiffness and mesh awareness in the lightweight group [15]. In a meta-analysis of 11 RCTs involving more than 3,000 patients, Zhong et al. (2013) confirmed that lightweight mesh significantly reduces chronic groin pain and foreign body sensation without increasing recurrence [16].

The pathophysiological explanation lies in the physical properties of the mesh. Heavyweight meshes are dense (>80 g/m²) with small pore sizes (<1 mm). They provoke an intense foreign body reaction, leading to fibroblastic overgrowth, scar plate formation, and reduced abdominal wall compliance [17]. This tissue remodeling translates clinically into stiffness and persistent awareness of the mesh. Lightweight meshes, by contrast, have reduced density (<50 g/m²) and larger pores (>2 mm). These features promote more physiological tissue integration, minimize fibrosis, and preserve mobility of the abdominal wall [18]. Klosterhalfen and Klinge (2013) analyzed 623 explanted meshes and demonstrated that tissue response was strongly related to mesh density and pore size, with lightweight meshes producing less scarring and contracture [19].

Thus, the lower incidence of FBS observed in our lightweight mesh group is consistent both with clinical evidence and with experimental histopathological findings.

Patient Satisfaction

Although a validated questionnaire such as the Carolinas Comfort Scale or SF-36 was not employed in the present study, patient satisfaction can be reasonably inferred from the clinical outcomes recorded. In hernia surgery, satisfaction is closely tied to functional recovery and long-term comfort rather than recurrence rates alone. Several studies have highlighted that persistent groin pain and mesh-related foreign body sensation are the strongest predictors of dissatisfaction after Lichtenstein repair [6,7].

In this study, patients in the lightweight mesh group experienced significantly less pain in the early postoperative period, which translated into a smoother initial recovery. Furthermore, complaints of foreign body sensation were markedly lower with lightweight mesh at 1, 3, and 6 months. This finding is important because mesh awareness and stiffness have been shown to negatively affect mobility, daily activities, and overall quality of life [20]. The shorter hospital stay observed with lightweight mesh (mean 4.78 days vs 6.70 days with heavyweight) also suggests faster recovery and earlier return to normal routines, which are key determinants of patient-perceived satisfaction [21].

Previous randomized controlled trials support this interpretation. Patients with lightweight mesh reported improved comfort and higher satisfaction over long-term follow-up compared with those with heavyweight mesh [15]. Similarly, Nienhuijs et al., in a systematic review, concluded that chronic discomfort and mesh awareness were major contributors to dissatisfaction, even in cases where recurrence rates were negligible [7].

Therefore, although direct satisfaction scoring was not performed in the present study, the combination of lower pain, fewer foreign body complaints, minimal complications, and shorter hospitalization strongly indicates that patients receiving lightweight mesh would have reported higher satisfaction levels than those with heavyweight mesh. The findings indicate that lightweight mesh results in reduced postoperative discomfort and improved patient-perceived recovery. These results are generalizable to adult male patients undergoing open Lichtenstein hernia repair in similar tertiary care surgical settings. Applicability may be limited for female patients or laparoscopic approaches. This inference aligns with international evidence and highlights the importance of incorporating patient-centered parameters into the evaluation of hernia repair techniques.

Conclusion

This prospective study demonstrated that the use of lightweight polypropylene mesh in Lichtenstein inguinal hernia repair provides superior patient-centered outcomes compared to heavyweight mesh. Lightweight polypropylene mesh provides better patient-centered outcomes compared to heavyweight mesh, without compromising recurrence prevention. These findings are consistent with international evidence that links chronic pain and mesh awareness to dissatisfaction after hernia repair. In conclusion, lightweight polypropylene mesh offers clear advantag over heavyweight polypropylene mesh in reducing long-term discomfort and enhancing patient-perceived satisfaction, without

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compromising recurrence prevention. Its preferential use should be considered, particularly in younger and working-age patients where postoperative comfort and quality of life are critical.

Recommendation

Lightweight mesh should be adopted as the preferred choice for primary inguinal hernia repair in working-age individuals to maximize comfort, mobility, and satisfaction.

Acknowledgment

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List of Abbreviations

AVBRH – Acharya Vinoba Bhave Rural Hospital
FBS – Foreign Body Sensation
VAS – Visual Analog Scale

Funding

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

- Study conception & design: TP, KM
- Data collection: YN, SJ
- Data analysis: TP, KM
- Manuscript preparation: YN, TP
- Final approval: All authors

Data Availability

Data available from the corresponding author upon reasonable request.

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