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Research Article

Polypropylene versus Polydioxanone Sutures for Mesh Fixation in Open Lichtenstein Inguinal Hernia Repair: A Prospective Comparative Study

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Abstract: ***Introduction:*** Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide. The choice of suture material for mesh fixation may influence postoperative complications, including chronic pain, surgical site infection (SSI), and seroma formation. However, comparative evidence between non-absorbable and absorbable sutures for mesh fixation remains limited. This study aimed to compare polypropylene (non-absorbable) and polydioxanone (PDS; absorbable) sutures in terms of early and late postoperative outcomes. **Methods**: A prospective comparative study was conducted at a tertiary care teaching hospital in Bengaluru, India, between August 2022 and January 2024. A total of 186 patients undergoing open Lichtenstein tension-free inguinal hernia repair were enrolled and allocated into two equal groups (n = 93 each) based on the suture material used for mesh fixation: polypropylene or PDS. The primary outcomes assessed were chronic inguinal pain, SSI, and seroma formation. Patients were followed up at 1, 3, and 6 months postoperatively. Statistical analysis was performed using the chi-square test and Fisher's exact test, with $p < 0.05$ considered statistically significant. **Results**: Among 186 patients, there was no statistically significant difference between the polypropylene and PDS groups in chronic inguinal pain (1.1% vs. 0%; p = 1.000), SSI (4.3% vs. 2.2%; p = 0.692), or seroma formation (2.2% vs. 2.2%; p = 1.000). Overall complication rates were low in both groups. **Conclusion**: Both polypropylene and PDS sutures are safe and effective for mesh fixation in open Lichtenstein inguinal hernia repair, with no significant difference in postoperative complications. The choice of suture material may be guided by surgeon preference, availability, and cost.

Keywords: inguinal hernia; Lichtenstein repair; polypropylene; polydioxanone; mesh fixation; postoperative complications; suture material

INTRODUCTION

Inguinal hernia is defined as the protrusion of a viscus or part thereof through the inguinal canal, either via the deep inguinal ring (indirect) or through Hesselbach's triangle (direct). It is one of the most commonly encountered conditions in general surgical practice. The surgical management of inguinal hernia has evolved considerably, and tension-free mesh repair, as described by Lichtenstein et al., has become the standard of care owing to its low recurrence rates and technical simplicity.[1]

Despite the widespread adoption of the Lichtenstein technique, postoperative complications such as chronic inguinal pain, surgical site infection, and seroma formation continue to affect patient outcomes and quality of life. Chronic inguinal pain, reported in up to 10–30% of patients following hernia repair, represents a significant cause of long-term morbidity.[1–3]

The choice of suture material for mesh fixation is an important yet often overlooked factor that may influence postoperative recovery. Polypropylene is a non-absorbable, monofilament suture widely used for mesh fixation owing to its high tensile strength and durability. However, its permanent presence in tissue has been associated with chronic inflammatory reactions, foreign body sensation, and persistent pain.[4,5] Polydioxanone (PDS) is a synthetic, absorbable, monofilament suture that provides prolonged tensile strength with gradual absorption by hydrolysis, and may reduce the long-term foreign body burden and potentially mitigate chronic pain.[4,5]

Although several studies have compared absorbable and non-absorbable sutures for mesh fixation, comparative data specifically between polypropylene and polydioxanone in tertiary care settings remain sparse. Therefore, this study was designed to compare postoperative outcomes—specifically chronic inguinal pain, surgical site infection, and seroma formation—between polypropylene and polydioxanone sutures for mesh fixation during open Lichtenstein inguinal hernia repair.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective, non-randomized, comparative study conducted in the Department of General Surgery at ESIC Medical College, PGIMSR and Model Hospital, Rajajinagar, Bengaluru, between August 2022 and January 2024.

Participants

A total of 186 consecutive patients diagnosed with uncomplicated inguinal hernia and scheduled for elective open Lichtenstein tension-free repair were enrolled.

Inclusion Criteria

Patients aged 16–80 years with a clinical diagnosis of reducible inguinal hernia who were willing to undergo surgical repair and provide written informed consent were included.

Exclusion Criteria

Patients with obstructed, strangulated, or incarcerated hernias; those deemed unfit for surgery based on anaesthetic assessment; and those who refused to provide informed consent were excluded from the study.

Group Allocation and Intervention

Patients were allocated into two groups based on the suture material used for mesh fixation: Group A (polypropylene; n = 93) and Group B (polydioxanone/PDS; n = 93). Allocation was based on the operating surgeon's preference and intraoperative decision-making; formal randomization was not performed. All patients underwent a standard open Lichtenstein tension-free mesh repair using a polypropylene mesh prosthesis. The mesh was secured to the conjoint tendon, inguinal ligament, and internal oblique aponeurosis using the assigned suture material.

Data Collection and Follow-up

Preoperative clinical details (including age, type of hernia, and comorbidities), intraoperative findings, and postoperative outcomes were systematically recorded using a structured proforma. Patients were followed up at 1 month, 3 months, and 6 months after surgery. All patients completed the planned follow-up period and were included in the final analysis.

Outcome Measures

The primary outcomes assessed were: (a) chronic inguinal pain, defined as pain persisting beyond 3 months postoperatively and assessed using the Visual Analogue Scale (VAS); (b) surgical site infection, diagnosed based on clinical criteria (erythema, purulent discharge, or wound dehiscence) in accordance with the Centers for Disease Control and Prevention (CDC) definitions; and (c) seroma formation, identified clinically as a fluctuant, non-tender swelling at the operative site without signs of infection.

Ethical Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki (2013 revision) and was approved by the Institutional Ethics Committee of ESIC Medical College, PGIMSR, Bengaluru. Written informed consent was obtained from all participants prior to enrolment.

Statistical Analysis

Data were entered and analysed using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages and compared between groups using the chi-square test or Fisher's exact test, as appropriate. Relative risk (RR) with 95% confidence intervals (CI) was calculated for each outcome. A two-tailed p-value of < 0.05 was considered statistically significant.

RESULTS

A total of 186 patients fulfilling the inclusion criteria were enrolled in the study and allocated into two groups: Group A, polypropylene (n = 93), and Group B, PDS (n = 93). All patients underwent open Lichtenstein tension-free inguinal hernia repair and completed follow-up at 1, 3, and 6 months. No patients were lost to follow-up, and all were included in the final analysis.

The majority of patients were aged between 21 and 60 years, with 74 patients (39.8%) in the 21–40 years age group and 75 patients (40.3%) in the 41–60 years age group. Thirty-seven patients (19.9%) were aged 61–80 years (Table 1; Figure 1). Indirect inguinal hernia was the more common type, accounting for 104 cases (55.9%), while direct inguinal hernia was observed in 82 cases (44.1%) (Table 2; Figure 2). The distribution of patients was equal between the two suture groups, with 93 patients (50.0%) in each (Table 3).

Table 1. Distribution of patients by age group

Age Group (years)	Frequency (n)	Percentage (%)
21–40	74	39.8
41–60	75	40.3
61–80	37	19.9
Total	186	100.0

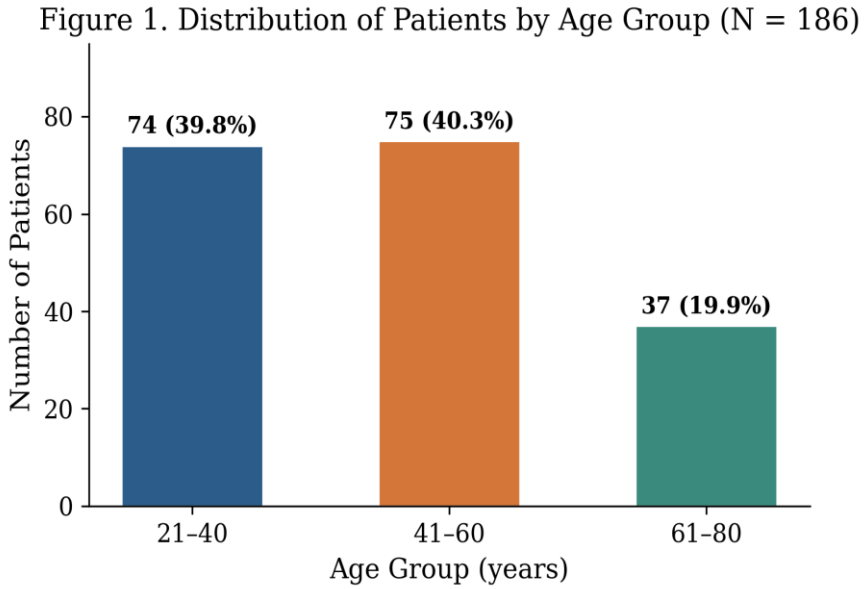


Table 2. Distribution of patients by type of hernia

Type of Hernia	Frequency (n)	Percentage (%)
Direct inguinal hernia	82	44.1
Indirect inguinal hernia	104	55.9
Total	186	100.0

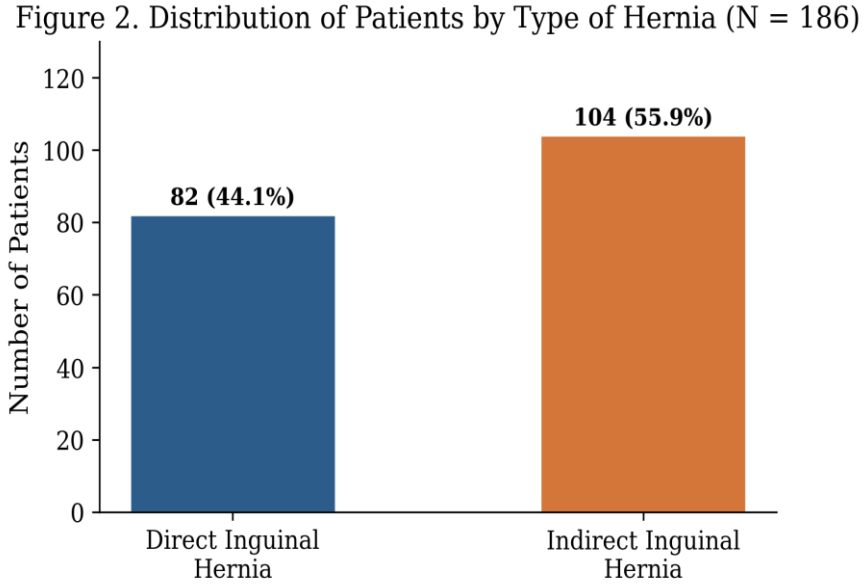


Table 3. Distribution of patients by suture material

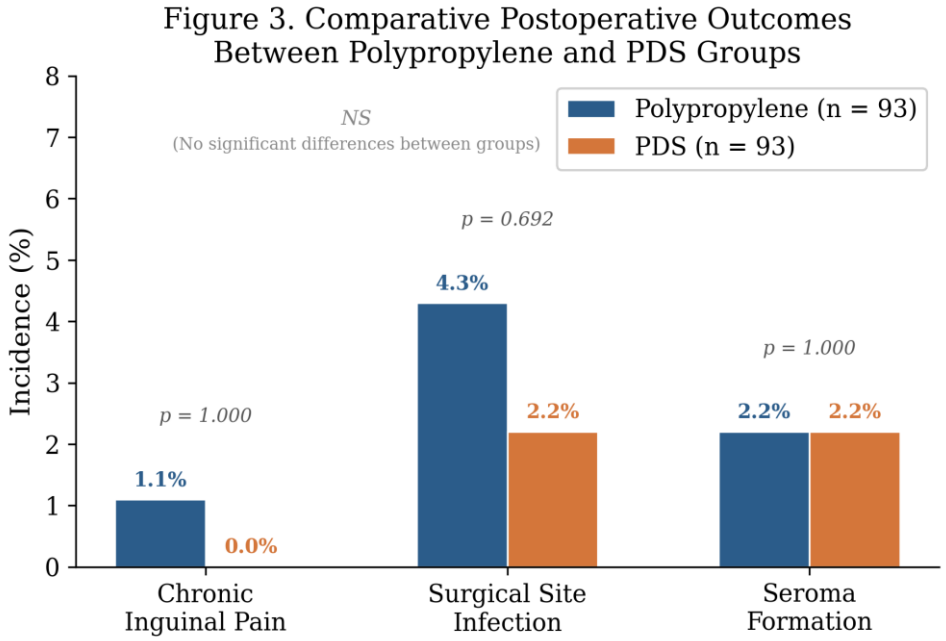
Suture Material	Frequency (n)	Percentage (%)
Polypropylene	93	50.0
Polydioxanone (PDS)	93	50.0
Total	186	100.0

The comparative postoperative outcomes are summarised in Table 4 and Figure 3. Chronic inguinal pain was reported in only one patient (1.1%) in the polypropylene group and in none (0%) in the PDS group; this difference was not statistically significant (RR = 3.00; 95% CI: 0.12–72.50; p = 1.000, Fisher's exact test). Surgical site infection occurred in four patients (4.3%) in the polypropylene group and two patients (2.2%) in the PDS group, with no statistically significant difference (RR = 1.93; 95% CI: 0.36–10.20; p = 0.692). Seroma formation was observed in two patients (2.2%) in each group (RR = 1.00; 95% CI: 0.14–6.94; p = 1.000).

Table 4. Comparative postoperative outcomes between polypropylene and PDS groups

Outcome	Polypropylene (n = 93)	PDS (n = 93)	Relative Risk	95% CI	p-value
Chronic inguinal pain	1 (1.1%)	0 (0%)	3.00	0.12–72.50	1.000*
Surgical site infection	4 (4.3%)	2 (2.2%)	1.93	0.36–10.20	0.692
Seroma formation	2 (2.2%)	2 (2.2%)	1.00	0.14–6.94	1.000

Fisher's exact test. CI, confidence interval; PDS, polydioxanone.



DISCUSSION

This prospective comparative study evaluated the postoperative outcomes of polypropylene versus polydioxanone sutures for mesh fixation during open Lichtenstein inguinal hernia repair. The principal finding was that there was no statistically significant difference between the two suture materials in terms of chronic inguinal pain, surgical site infection, or seroma formation. These results suggest that both materials may be used interchangeably for mesh fixation with comparable safety profiles.

The low incidence of chronic inguinal pain in this study (1.1% in the polypropylene group and 0% in the PDS group) is noteworthy and compares favourably with rates reported in the literature, which range from 10% to 30% following open inguinal hernia repair.2,3 Jeroukhimov et al.,1 in a single-blind randomised clinical trial, demonstrated reduced chronic pain with absorbable sutures compared with non-absorbable sutures, although other postoperative complications were comparable between groups. The notably lower rates of chronic pain in the present study may reflect meticulous operative technique, careful handling of the ilioinguinal and iliohypogastric nerves, or the relatively short follow-up period of six months.

The rates of surgical site infection (4.3% vs. 2.2%) and seroma formation (2.2% vs. 2.2%) were low and comparable between the two groups. These findings are consistent with previous studies that have reported no significant differences in wound-related complications between absorbable and non-absorbable sutures for mesh fixation.1,7–9 Paajanen et al.10 similarly reported no significant differences in postoperative complications between suture groups in a randomised clinical trial.

Kiran6 also reported comparable infection and seroma rates in a comparative study of suture materials for hernia repair.

The absence of statistically significant differences across all outcome measures suggests clinical equivalence between polypropylene and PDS sutures for mesh fixation in this setting. From a biological standpoint, the gradual absorption of PDS may theoretically reduce the long-term foreign body burden and the associated chronic inflammatory response; however, the present study did not demonstrate a measurable clinical advantage in terms of pain reduction or wound complications. It is plausible that the suture material contributes only modestly to the overall complication profile, relative to other factors such as mesh characteristics, operative technique, and patient-related variables.

The wide confidence intervals observed for relative risk estimates, particularly for chronic inguinal pain (95% CI: 0.12–72.50), reflect the low event rates and the limited statistical power to detect clinically meaningful differences between groups. It should also be noted that the relative risk for chronic pain was computed with a zero-event cell in the PDS group, and thus should be interpreted with caution. Future studies with larger sample sizes and extended follow-up would be required to confirm or refute these findings.

Strengths and Limitations

The strengths of this study include its prospective design, standardised surgical technique (Lichtenstein repair), complete follow-up of all enrolled patients, and the use of predefined outcome measures with established definitions. The study also provides valuable comparative data from a tertiary care teaching hospital in India, a setting underrepresented in the existing literature.

However, several limitations must be acknowledged. First, this was a non-randomised study, and group allocation was based on the operating surgeon's preference, which may introduce selection bias. Second, the follow-up period was limited to six months, which may be insufficient to capture long-term outcomes such as hernia recurrence or delayed chronic pain. Third, the sample size, while adequate for detecting large differences, may have been underpowered to detect small but clinically relevant differences in complication rates. Fourth, a formal sample size calculation was not performed a priori. Finally, the single-centre design limits the generalisability of the findings.

CONCLUSION

Both polypropylene and polydioxanone sutures are safe and effective for mesh fixation in open Lichtenstein inguinal hernia repair, with no statistically significant differences in chronic inguinal pain, surgical site infection, or seroma formation. The choice of suture material may therefore be guided by surgeon preference, institutional availability, and cost considerations. Larger, multicentre, randomised controlled trials with longer follow-up are warranted to further elucidate any potential differences between these suture materials.

DECLARATIONS

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Conflicts of Interest: The authors declare no conflicts of interest.

Ethical Approval: This study was conducted in accordance with the Declaration of Helsinki (2013 revision) and was approved by the Institutional Ethics Committee of ESIC Medical College, PGIMSR, Bengaluru. Written informed consent was obtained from all participants prior to enrolment.

Author Contributions: [To be completed by the authors prior to submission. Suggested format: Conceptualisation, data collection, statistical analysis, manuscript drafting, critical review, and final approval of the manuscript.]

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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