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A COMPARATIVE STUDY OF MESH FIXATION WITH POLYPROPYLENE (PROLENE) VERSUS POLYGLACTIN (VICRYL) SUTURES IN OPEN INGUINAL HERNIA REPAIR: AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Mesh fixation is central to Lichtenstein tension-free hernioplasty, and the choice of suture material used for fixation, non-absorbable polypropylene (Prolene) versus absorbable polyglactin (Vicryl), may influence postoperative pain and complications.

Aim: This study was intended to compare postoperative complications and pain outcomes between Prolene and Vicryl sutures used for mesh fixation in open inguinal hernia repair.

Methods: It is a hospital-based observational study conducted over a period of 12 months in a tertiary care centre. A total of 106 patients undergoing open (Lichtenstein) inguinal hernia repair were allocated into two equal groups of 53 each according to the suture material used intraoperatively for mesh fixation. Operative time, hospital stay, postoperative pain on the Visual Analog Scale (day 1, 3, 7, and 1, 3, 6 months), and complications including seroma, hematoma, mesh infection, wound gap, urinary retention, foreign body sinus/fistula, and recurrence at 3 and 6 months were compared using independent-samples t-tests and chi-square tests. Statistical significance was set at $p < 0.05$.

Results: The two groups were comparable at baseline for age, sex, BMI, and defect size. Operative time was significantly longer with Prolene (65.89 ± 10.87 min) than Vicryl (59.76 ± 9.80 min; $p = 0.003$). Pain scores were significantly higher with Prolene on postoperative day 1 ($p = 0.020$) and remained higher at 1, 3, and 6 months, most markedly at 6 months (Prolene 1.58 ± 1.13 vs Vicryl 0.70 ± 0.64). Individual complications did not differ significantly between groups, but overall postoperative complication rate was significantly higher with Prolene (28.3%) than Vicryl (11.3%; $p = 0.028$), while short-term recurrence was comparable.

Conclusion: Vicryl sutures were associated with shorter operative time, lower early and long-term postoperative pain, and a lower overall complication burden than Prolene, without compromising short-term recurrence, supporting its consideration as a favourable alternative for mesh fixation in open inguinal hernia repair.

KEYWORDS: Inguinal hernia; Mesh fixation; Polypropylene suture; Polyglactin suture; Lichtenstein hernioplasty;

INTRODUCTION

Inguinal hernia is one of the most common conditions encountered in general surgical practice, accounting for a substantial proportion of elective and emergency surgical procedures worldwide (Garba, 2000) [1]. It is defined as protrusion of abdominal contents through a weakness in the myopectineal orifice, most commonly through the inguinal canal (Williams et al., 2008) [2]. The underlying pathophysiology involves disruption of the transversalis fascia, increased intra-abdominal pressure, and age-related collagen degeneration (Schoots et al., 2001) [3]. Lifetime risk estimates reach up to 27% in men and 3% in women (Negro et al., 2016) [4], and although many hernias remain asymptomatic, the risk of incarceration,

strangulation, and chronic discomfort makes hernioplasty one of the most frequently performed operations globally (Jensen et al., 2017) [5].

Surgical repair has evolved from tension-based tissue techniques described by Bassini, Halsted, and Shouldice (Burcharth, 2014) [6] to the tension-free Lichtenstein mesh repair introduced in the late 1980s, which became the gold standard because of its simplicity, reproducibility, low recurrence, and favourable outcomes (Amid, 2013) [7]. Despite its widespread acceptance, aspects of mesh fixation — including suture type and placement technique — continue to be investigated to optimise outcomes and reduce complications (Paajanen et al., 2011) [8].

Mesh fixation traditionally relies on sutures, broadly classified as absorbable or non-absorbable, each with distinct mechanical properties and tissue interactions (Pillai et al., 2010) [9]. Non-absorbable polypropylene (Prolene) is favoured for its tensile strength, monofilament structure, and minimal tissue reactivity, providing durable long-term fixation (Nappi, 2025) [10], but its permanence can be associated with chronic inflammatory response, foreign-body sensation, and nerve irritation where sutures lie close to neural structures (Hirko et al., 2018) [11]. These concerns have prompted interest in absorbable alternatives. Polyglactin 910 (Vicryl), a widely used braided absorbable suture, undergoes predictable hydrolytic degradation with significant loss of tensile strength within weeks and complete absorption over 60–90 days (Kehlet et al., 2010) [12], allowing early tissue integration around the mesh while potentially reducing long-term foreign-body load and associated chronic pain (Kehlet et al., 2010) [12]. Concerns remain, however, that premature loss of tensile strength could theoretically compromise early fixation or increase recurrence, though evidence on this point remains limited (Johner et al., 2011) [13].

Chronic postoperative groin pain (inguinodynia) is among the most clinically significant complications of hernia repair, with reported incidence of 15–40% (Hokkam, 2009) [14]. It may be neuropathic — from entrapment, traction, or injury to the ilioinguinal, iliohypogastric, or genital branch of the genitofemoral nerve — or nociceptive, from inflammation or foreign-body reaction at the site of mesh or suture placement (Ferzli et al., 2007) [15]. Suture-related contributors include excessive tension, proximity to neural structures, and prolonged inflammatory response to non-absorbable material (Alfieri et al., 2011) [16], underscoring the relevance of suture choice to postoperative pain.

Other complications — seroma, hematoma, infection, and recurrence — may also be influenced by fixation material properties. Seroma results from tissue dissection and inflammatory response, and may be exacerbated by tissue reactivity to certain sutures (Andercou et al., 2019) [17]. Although recurrence after Lichtenstein repair is low overall (1–4%), concern persists that early loss of tensile strength with absorbable sutures could theoretically compromise mesh stability before adequate fibrosis occurs, though clinical evidence remains mixed (ALKAN, 2020) [18]. Alternative fixation methods such as fibrin glue and self-gripping meshes have shown reduced early pain with comparable recurrence (Kharadi et al., 2016) [19], but sutures remain the most widely used fixation method globally owing to reliability, cost-effectiveness, and surgeon familiarity.

Comparative evidence on polypropylene versus polyglactin sutures for mesh fixation remains limited: some studies suggest absorbable sutures reduce chronic groin pain without materially affecting recurrence, while others favour non-absorbable sutures for durability (Sanders et al., 2014) [20], and many available studies are limited by small sample size, technique variability, and short follow-up. The biological interaction of each material with surrounding tissue and the resulting inflammatory response and fibrosis have direct implications for mesh integration and postoperative recovery, making comparative evaluation clinically relevant (Alfieri et al., 2011) [16]. As recurrence rates have declined and patient-reported outcomes have become central to evaluating surgical success, a deeper understanding of how suture material contributes to postoperative discomfort is needed to optimise one of the most common operations performed worldwide (Andercou et al., 2019) [17].

By comparing polypropylene and polyglactin sutures for mesh fixation in open inguinal hernia repair, this study aims to clarify their relative merits and guide surgeons toward the suture material offering the best balance of clinical outcome, patient comfort, and long-term safety.

METHODOLOGY

Study Design, Setting, Duration: This was an observational, non-randomized comparative study conducted in the Department of General Surgery, SRM Medical College Hospital and Research Centre, over a period of 12 months, during which eligible patients undergoing open (Lichtenstein) inguinal hernia repair were consecutively enrolled and followed up postoperatively to assess pain and complications.

Participants Inclusion and Exclusion Criteria: Patients aged over 18 years admitted with unilateral inguinal hernia were included. Patients with BMI > 30 kg/m², hernia requiring emergency repair, complicated or recurrent hernia, prior lower abdominal surgery, pelvic trauma or radiation exposure, and those unwilling to participate were excluded.

Study Sampling: All eligible patients meeting the inclusion and exclusion criteria who underwent open inguinal hernia repair during the study period were enrolled. Allocation was based solely on the suture material actually used intraoperatively for mesh fixation, reflecting real-world clinical practice without randomization.

Study Sample Size: The sample size was calculated for a two-proportion hypothesis test with 80% power and 5% significance level, assuming proportions of 53.33% and 27% in the two groups, yielding a total of 106 patients, with 53 patients allocated to each group.
Study Groups: The participants were categorised into two groups, namely Group A (mesh fixation with polypropylene/Prolene sutures) and Group B (mesh fixation with polyglactin/Vicryl sutures).
Study Parameters: The parameters compared between the two groups were operative time; postoperative pain on the Visual Analog Scale at postoperative day 1, day 3, day 7, and at 1, 3, and 6 months; duration of hospital stay; and postoperative complications, including seroma, hematoma, mesh infection, wound gap, urinary retention, foreign body sinus or fistula, and recurrence at 3 and 6 months.
Study Procedure: All patients underwent standard Lichtenstein tension-free mesh hernioplasty. Group A patients had the mesh secured with polypropylene (Prolene) sutures, and Group B patients had the mesh secured with polyglactin (Vicryl) sutures, according to the material used intraoperatively. For every patient, operative time was recorded, postoperative pain scores were recorded on the specified postoperative days and months using the Visual Analog Scale, and duration of hospital stay was documented. Patients were monitored during the postoperative period and follow-up visits for:
1) Seroma, hematoma, mesh infection, wound gap, and urinary retention
2) Foreign body sinus or fistula formation
3) Recurrence at the end of the third and sixth months
Study Data Collection: Data were recorded on a structured proforma covering demographic details, presenting complaints, relevant history, investigation findings, operative details, postoperative pain scores, hospital stay, and postoperative complications, and were tabulated for both groups.
Data Analysis: Continuous variables (age, BMI, defect size, operative time, hospital stay, VAS pain scores) were compared between groups using the independent-samples t-test, and categorical variables (sex, complication rates, recurrence) were compared using the chi-square test. A p value < 0.05 was considered statistically significant.
Ethical Considerations: Ethical clearance was obtained from the Institutional Ethics Committee of SRM Medical College Hospital and Research Centre. All participants were included after obtaining written informed consent. Patient confidentiality was maintained throughout, and participants were free to withdraw from the study at any time without affecting their medical care or legal rights.

RESULTS

A total of 106 patients undergoing Lichtenstein open inguinal hernia repair were enrolled and allocated into two equal groups of 53 each according to the suture material used for mesh fixation (Prolene or Vicryl).
Baseline Demographic and Clinical Characteristics of Study Participants: The two groups were similar in terms of baseline demographic and clinical characteristics, which suggests sufficient homogeneity and reduces the likelihood of confounding effects on postoperative outcomes (Table 1). Age distribution did not differ significantly between groups ($\chi^2 = 0.831$, $p = 0.842$), and mean age was comparable (Prolene 45.21 ± 11.04 years vs Vicryl 44.81 ± 9.50 years; $t = 0.198$, $p = 0.843$). Sex distribution was similar, with males predominating in both arms ($\chi^2 = 0.541$, $p = 0.462$). Mean BMI ($t = 0.393$, $p = 0.695$) and mean hernial defect size ($p = 0.661$) also did not differ significantly between groups.

Table 1. Baseline characteristics of the Prolene and Vicryl groups (N = 106)

Variable	Prolene (n = 53)	Vicryl (n = 53)	Statistic	p value
Age, years (mean ± SD)	45.21 ± 11.04	44.81 ± 9.50	t = 0.198	0.843
Sex, male, n (%)	48 (90.6)	50 (94.3)	$\chi^2 = 0.541$	0.462
BMI, kg/m² (mean ± SD)	24.11 ± 2.47	23.92 ± 2.62	t = 0.393	0.695
Hernial defect size, cm (mean ± SD)	3.32 ± 0.58	3.26 ± 0.77	—	0.661

Comparison of Operative Time and Hospital Stay Between Study Groups: Operative time was significantly longer in the Prolene group than the Vicryl group, indicating that mesh fixation with Prolene required more intraoperative time (Table 2). Mean hospital stay did not differ significantly between groups.

Table 2. Operative time and hospital stay

Variable	Prolene (n = 53)	Vicryl (n = 53)	Statistic	p value
Operative time, min (mean ± SD)	65.89 ± 10.87	59.76 ± 9.80	t = 3.05	0.003
Hospital stay, days (mean ± SD)	1.68 ± 0.64	1.85 ± 0.57	t = −1.44	0.153

Comparison of Postoperative Pain Scores (VAS) Between Groups: Pain scores were significantly higher in the Prolene group on postoperative day 1, converging thereafter with no significant difference at day 3 or day 7. From 1 month onward, the Vicryl group consistently showed lower mean VAS scores, with the gap widening progressively and becoming most pronounced at 6 months, indicating that patients were more comfortable during recovery with Vicryl fixation (Table 3).

Table 3. Postoperative VAS pain scores at each follow-up timepoint

Timepoint	Prolene (mean ± SD)	Vicryl (mean ± SD)
Day 1	5.66 ± 1.57	4.92 ± 1.64 (p = 0.020)
Day 3	3.92 ± 1.30	4.06 ± 1.17
Day 7	2.87 ± 1.09	2.94 ± 0.99
1 month	2.02 ± 0.99	1.68 ± 0.87
3 months	1.64 ± 1.02	1.21 ± 0.74
6 months	1.58 ± 1.13	0.70 ± 0.64

Comparison of Postoperative Complications Between Study Groups: Individual complications were infrequent and did not differ significantly between groups: seroma (Prolene 6/53, 11.3% vs Vicryl 1/53, 1.9%; $\chi^2 = 3.824$, p = 0.051, borderline), hematoma (3/53, 5.7% vs 4/53, 7.5%; $\chi^2 = 0.153$, p = 0.696), mesh infection (2/53, 3.8% vs 1/53, 1.9%; $\chi^2 = 0.343$, p = 0.558), wound gap (2/53, 3.8% vs 0/53, 0%; $\chi^2 = 2.038$, p = 0.153), and urinary retention (2/53, 3.8% vs 1/53, 1.9%; $\chi^2 = 0.343$, p = 0.558). No case of foreign body sinus or fistula occurred in either group. However, the composite outcome of any postoperative complication was significantly more frequent in the Prolene group than the Vicryl group, indicating a higher overall postoperative morbidity burden with non-absorbable fixation (Table 4).

Table 4. Postoperative complications by suture group

Complication	Prolene, n (%)	Vicryl, n (%)	χ^2	p value
Seroma	6 (11.3)	1 (1.9)	3.824	0.051
Hematoma	3 (5.7)	4 (7.5)	0.153	0.696
Mesh infection	2 (3.8)	1 (1.9)	0.343	0.558
Wound gap	2 (3.8)	0 (0)	2.038	0.153
Urinary retention	2 (3.8)	1 (1.9)	0.343	0.558
Foreign body sinus/fistula	0 (0)	0 (0)	—	—
Any complication (composite)	15 (28.3)	6 (11.3)	4.810	0.028

Incidence of Recurrence in Study Groups: Recurrence at 3 months occurred only in the Prolene group, while recurrence at 6 months was equal and rare in both groups, indicating that absorbable fixation did not compromise short-term repair integrity (Table 5).

Table 5: Recurrence at 3 and 6 months

Timepoint	Prolene, n (%)	Vicryl, n (%)	χ^2	p value
Recurrence at 3 months	2 (3.8)	0 (0)	2.038	0.153
Recurrence at 6 months	1 (1.9)	1 (1.9)	0.000	1.000

DISCUSSION

This study compared mesh fixation using polypropylene sutures (Prolene) and polyglactin sutures (Vicryl) in patients undergoing open Lichtenstein inguinal hernia repair, focusing on operative parameters, postoperative pain, complications, and short-term recurrence. Since mesh fixation is central to this technique, the suture material used may plausibly influence tissue reaction, operative ease, and postoperative comfort — Prolene providing permanent fixation, and Vicryl potentially limiting prolonged foreign-body irritation once fibrosis has secured the mesh.

The two groups did not differ significantly in age ($\chi^2 = 0.831$, p = 0.842; t = 0.198, p = 0.843), sex distribution ($\chi^2 = 0.541$, p = 0.462), BMI (t = 0.393, p = 0.695), or hernial defect size (p = 0.661), consistent with previous comparative studies that also reported well-matched baseline profiles before evaluating pain and complication outcomes (Meena et al., 2018) [21] (Jeroukhimov et al., 2014) [22]. This baseline equivalence strengthens the interpretation that postoperative differences observed in the present study are more plausibly related to suture material than to demographic or anatomical imbalance. Notably, Jeroukhimov et al. also reported that each additional year of age was independently associated with a 2.2% lower risk of chronic pain (OR = 0.978; 95% CI, 0.961–0.995; p = 0.013) (Jeroukhimov et al., 2014) [22], underscoring the importance of the age-matching observed here.

Operative time was significantly longer with Prolene than Vicryl (65.89 ± 10.87 vs 59.76 ± 9.80 min; p = 0.003), and procedures exceeding 70 minutes were more common with Prolene, although this categorical trend did not reach significance ($\chi^2 = 4.87$, p = 0.088). This contrasts with Singh et al., who reported no significant difference in operative time between groups (p = 0.92) (Singh et al., 2025) [23], a discrepancy that may reflect differences in surgeon experience, knotting technique, or case mix rather than an inherent property of the suture. Hospital stay did not differ significantly between groups (1.68 ± 0.64 vs 1.85 ± 0.57 days; p = 0.153), in contrast to Singh et al., who found a significantly longer stay with Vicryl (Singh et al., 2025) [23]; this difference likely reflects institutional discharge policy rather than the fixation material itself.

Pain scores were significantly higher with Prolene on postoperative day 1 (5.66 ± 1.57 vs 4.92 ± 1.64; p = 0.020), consistent with Singh et al., who also reported a significant Vicryl advantage on day 1 and day 3 (Singh et al., 2025) [23], although in

the present study this early difference had converged by day 3 and day 7. Nikhil et al. similarly found comparable early pain scores between groups (Nikhil, 2021) [24]. From 1 month onward, the Vicryl group showed consistently lower VAS scores, with the difference most pronounced at 6 months (1.58 ± 1.13 vs 0.70 ± 0.64). This pattern closely mirrors several prior reports: Meena et al. found significantly lower pain with absorbable sutures at 3 months ($p = 0.013$) and 6 months ($p \leq 0.001$) (Meena et al., 2018) [21]; Patel et al. reported significantly higher chronic groin pain with non-absorbable sutures at 3 months ($p < 0.05$) (Patel et al., 2019) [25]; and Nikhil M et al. and Rout et al. both reported significantly lower pain with polyglactin at 3 months (Nikhil, 2021) [24] (Rout et al., 2024) [26]. A minority of studies, such as Agarwal et al., found no significant difference in chronic pain at 6 months (Agarwal et al., 2023) [27], but the present findings align with most comparative literature favoring absorbable fixation for long-term pain reduction, likely reflecting persistent foreign-body irritation with non-absorbable material versus early tissue fixation without lasting foreign-body burden with polyglactin (Kehlet et al., 2010) [12].

Individual complications—seroma, hematoma, mesh infection, wound gap, and urinary retention—did not differ significantly between groups, consistent with Sarkar et al. and Singh et al., who similarly reported no significant intergroup differences in these individual events (Sarkar, 2022) [28] (Singh et al., 2025) [23]. Seroma showed a borderline numerical excess with Prolene (11.3% vs 1.9%; $p = 0.051$), a trend not consistently reported elsewhere but plausibly related to greater local tissue reactivity around a permanent monofilament suture. No case of foreign body sinus or fistula occurred in either group. Importantly, when postoperative morbidity was assessed as a composite outcome, the overall complication rate was significantly higher with Prolene (28.3%) than Vicryl (11.3%; $\chi^2 = 4.810$, $p = 0.028$). This composite finding is clinically informative because it demonstrates that even when individual complications are each too infrequent to reach significance in isolation, their cumulative burden can differ meaningfully between fixation materials—an observation with direct relevance to patient counselling and postoperative recovery expectations.

Recurrence at 3 months occurred only in the Prolene group (2 cases; $\chi^2 = 2.038$, $p = 0.153$), and recurrence at 6 months was equal and rare in both groups (1 case each; $p = 1.000$). These low, statistically comparable recurrence rates are consistent with Redha et al., who concluded that delayed-absorbable sutures were a safe alternative to non-absorbable sutures with no increase in recurrence risk (Redha et al., 2021) [29], and support the interpretation that absorbable fixation can maintain adequate short-term mesh stability despite its more limited tensile persistence.

Taken together, these findings suggest that Vicryl mesh fixation offers practical advantages over Prolene—shorter operative time, lower early and long-term postoperative pain, and a lower overall complication burden—without compromising short-term recurrence. This challenges the assumption that permanent fixation is necessarily preferable for mesh security, and supports incorporating patient-reported outcomes, not recurrence alone, into decisions about fixation material.

Strengths include equal group allocation, well-matched baseline characteristics, and serial pain assessment from the immediate postoperative period through 6 months. Limitations include the observational (non-randomized) design, a sample size likely underpowered for rarer individual complications, a 6-month follow-up that may not capture later recurrence, the single-institution setting, and the lack of data on analgesic consumption, return to work, or surgeon-specific variability.

Larger, multicentric randomized trials with follow-up beyond 1 year, adequately powered for infrequent complications and recurrence, and incorporating patient-centred outcomes such as chronic inguinodynia and quality of life, would further clarify which patients benefit most from absorbable mesh fixation.

CONCLUSION

This study compared mesh fixation using polypropylene (Prolene) and polyglactin (Vicryl) sutures in open inguinal hernia repair. The two groups were well matched at baseline for age, sex, BMI, and defect size. Vicryl was associated with significantly shorter operative time, significantly lower postoperative pain on day 1, and a consistently lower pain trend through 6 months, most pronounced at the final follow-up. Individual complications—seroma, hematoma, mesh infection, wound gap, and urinary retention—did not differ significantly between groups, but the overall composite complication rate was significantly higher with Prolene. Recurrence at 3 and 6 months was low and statistically comparable between groups, indicating that absorbable fixation did not compromise short-term repair integrity. These findings support Vicryl as a favourable alternative to Prolene for mesh fixation in open inguinal hernia repair, particularly where minimizing postoperative pain and complication burden is a clinical priority. Given the observational design, moderate sample size, and 6-month follow-up, larger multicentric randomized trials with extended follow-up are recommended to confirm these findings and to adequately power comparisons of infrequent complications and long-term recurrence.

DECLARATIONS

Ethics approval and consent to participate

Ethical approval was obtained from the Institutional Ethics Committee of SRM Medical College Hospital and Research Centre (Approval No: [Approval Number]). Written informed consent was obtained from all participants prior to inclusion in the study.

Human ethics

Written informed consent was obtained from all participants prior to inclusion in the study.

Consent for publication
Written informed consent for publication of their clinical details was obtained from the patients.

Availability of supporting data
All data supporting the findings of this study are included in the article.

Competing interests
The authors declare that they have no competing interests.

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Authors' contributions
Analysis and interpretation: all authors, writing original draft: all authors, review & editing: all authors, final approval of the article: all authors.

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