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Original Research Article

Comparative Study of Mesh Fixation with Non-Absorbable versus Delayed Absorbable Monofilament Suture in Lichtenstein Tension-Free Hernioplasty with Respect to Chronic Postoperative Pain

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Abstract: *Inguinal hernia repair is among the most frequently performed surgical procedures globally. The Lichtenstein tension-free mesh technique remains the gold standard; however, chronic postoperative groin pain continues to impact patients' quality of life. The influence of suture absorbability on long-term postoperative pain remains inadequately explored.* ***Objective:*** *Inguinal hernia repair is common worldwide. The Lichtenstein tension-free mesh technique is standard, but chronic postoperative groin pain affects quality of life. Evidence on the impact of suture absorbability on long-term pain is limited. This study compared postoperative pain after mesh fixation with absorbable Vicryl versus non-absorbable Prolene sutures.* ***Methods:*** *In a prospective, non-randomized cohort study at Civil Hospital Karachi, 300 adults undergoing elective, unilateral, primary Lichtenstein hernia repair were alternately assigned to Vicryl (Group A, n=150) or Prolene (Group B, n=150). Pain was measured using the Visual Analog Scale (VAS; 0–10) preoperatively, 24 hours, 7 days, 1, 3, and 6 months postoperatively. Chronic pain was defined as pain ≥3 months; VAS <3 At six months, clinical efficacy was predefined. Statistical analyses used Mann–Whitney U and Chi-square tests.* ***Results:*** *Baseline characteristics were comparable. Early postoperative pain at 24 hours and 7 days did not differ (p>0.05). At 1, 3, and 6 months, Group A had significantly lower pain scores than Group B (p<0.001). At six months, 97.3% of Vicryl patients were pain-free (VAS <3) versus 79.3% of Prolene patients (p<0.001).* ***Conclusion:*** *Absorbable Vicryl sutures in Lichtenstein hernia repair reduce intermediate- and long-term postoperative pain compared to non-absorbable Prolene, without affecting operative time. Use of absorbable sutures may improve patient comfort and reduce healthcare burden.*

Keywords: Hernia, Inguinal/surgery, Herniorrhaphy/methods, Sutures, Absorbable, Sutures, Nonabsorbable, Postoperative Pain/etiology

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Introduction

Inguinal hernia repair represents the most frequently performed procedure in general surgery, with an estimated 20 million such operations carried out per annum (1). Each year, approximately 80,000 to 100,000 operations are carried out in the United Kingdom and France, respectively, while in the United States alone, the Figure is up to 700,000 (2). Owing to its high incidence and morbidity, this condition places a considerable burden on both the healthcare systems and economic resources.

The Lichtenstein tension-free mesh technique is considered the Gold standard for open inguinal hernia repair, attributed to its simplicity, reproducibility, and low recurrence rates, along with consistently favorable surgical outcomes (3). Despite these advantages, chronic postoperative groin pain continues to significantly affect patients by reducing functional capacity, lowering satisfaction levels, and increasing the demand for healthcare services. Despite advances in surgical techniques, the occurrence of long-lasting pain after inguinal hernia repair remains considerable and warrants close attention. A recent meta-analysis that evaluated 18 studies with a combined cohort of 29,466 patients reported a pooled prevalence of chronic pain of approximately 17% (4). Unlike prior studies that primarily compared different types of mesh or suturing techniques, our study uniquely focuses on suture absorbability used in wound closure and its impact on the pain trajectory following Lichtenstein hernia repair.

Given the limited evidence on suture type for mesh fixation, particularly in resource-limited, high-volume public-sector hospitals in our region, there is a pressing need to investigate this factor systematically. Chronic pain not only burdens the patient but also places strain on overburdened public health systems through repeated consultations, analgesic use, and lost productivity. This study aims to systematically evaluate postoperative pain outcomes associated with Vicryl (absorbable) versus Prolene (nonabsorbable) sutures in open inguinal hernia repair, using Visual Analog Scale (VAS) pain scores both preoperatively and postoperatively for up to six months. By isolating suture material as the only variable, the study seeks to provide practical, evidence-based recommendations for reducing chronic groin pain in routine surgical practice.

Methodology

This prospective, non-randomized comparative cohort study was conducted in the Surgical Unit of Civil Hospital Karachi, a tertiary care government teaching hospital, over a period of 6 months from 1st August 2024 till 31st January 2025 in order to evaluate postoperative pain outcomes in patients undergoing inguinal hernia repair using either Vicryl or Prolene sutures for mesh fixation. After taking informed consent and approval from the ethical review board, a total of 300 patients were enrolled using consecutive non-probability sampling. Patients were alternately allocated into group A and B, i.e., mesh fixation with Vicryl and Prolene sutures (n = 150 each), respectively. This alternate allocation method ensured balance between the two groups without formal randomization. Patients between the ages of 18 and 80 years, undergoing elective, unilateral, primary open inguinal hernia repair were included in the study. Patients who were undergoing surgery for bilateral or recurrent hernias, emergency hernia surgery, or having chronic pain syndromes or long-term opioid use were excluded. All patients underwent Lichtenstein tension-free mesh hernioplasty under standardized protocols. The only variable between groups was the suture material used for mesh fixation. All procedures were performed by an experienced surgical team using identical mesh and operative technique. Pain was assessed using the VAS (0 = no pain, 10 = worst pain) preoperatively, 24 hours, 7 days, 1, 3, and 6 months. Pain

assessments were conducted during routine follow-up visits by a trained clinician blinded to the suture type. A VAS score of <3 At 6 months, it was predefined as the threshold for clinical efficacy in long-term pain reduction. For this study, chronic postoperative pain was defined as pain persisting for ≥3 months after surgery, in accordance with the International Association for the Study of Pain (IASP) definition (5).

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 26. Continuous variables were summarized as mean ± standard deviation (SD) and/or median [interquartile range] depending on distribution. Intergroup comparisons were made using the Mann–Whitney U test for non-parametric data. Categorical variables were compared using the Chi-square test. A *p*-value <0.05 was considered statistically significant.

Results

The study included 300 patients undergoing elective Lichtenstein inguinal hernia repair, with 150 patients in each group. The mean age of patients in group A and group B was 48.20 ± 10.90 years and 47.90 ± 11.00 years (p = 0.813). The majority of participants were male (n= 281; 93.66%), consistent with the known male predominance of inguinal hernia. The mean operative time between the two groups was not statistically significant (p 0.246), indicating that suture type did not influence operative duration (Table 1). Pain scores measured on the VAS are summarized in Table 2 and Figure 2. Preoperatively, there was no difference in the pain scores between the two groups. At 24 hours and 7 days, there was no significant difference between groups (p = 0.217 and p = 0.227, respectively). However, at 1 month, 3 months, and 6 months, Group A had significantly lower pain scores than Group B, with all comparisons reaching high statistical significance (p< 0.001). Postoperative pain trends are depicted using a line chart in Figure 1, showing a notable divergence after 1 month, favoring the Vicryl group. Efficacy, defined as VAS <3 At 6 months, the target was achieved in 97.3% of Vicryl patients versus 79.3% in the Prolene group (p < 0.001), indicating superior long-term pain outcomes with Vicryl sutures (Table 3).

Table 1: Age at presentation and operative time

Variables	Group A; n= 150 (Mean ± SD)	Group B; n= 150 (Mean ± SD)	p-value
Age (years)	48.20 ± 10.90	47.9 ± 11.00	0.813
Operative time (minutes)	40.82 ± 5.89	39.96 ± 6.89	0.246

*SD: Standard Deviation

Table 2: Comparison of VAS pain scores

Time	Group A; n= 150 Median [IQR]	Group A; n= 150 (Mean ± SD)	Group B; n= 150 Median [IQR]	Group B; n= 150 (Mean ± SD)	p-value
Preoperative	3.0 [3.0–4.0]	3.10 ± 0.80	3.0 [3.0–4.0]	3.09 ± 0.81	0.936
24 hours	5.0 [5.0–6.0]	5.12 ± 0.88	5.0 [5.0–6.0]	5.17 ± 0.83	0.217
7 days	2.0 [2.0–3.0]	2.21 ± 0.74	2.0 [2.0–3.0]	2.30 ± 0.77	0.227
1 month	1.0 [1.0–1.0]	1.12 ± 0.33	2.0 [1.0–2.0]	1.58 ± 0.68	<0.001
3 months	0.0 [0.0–1.0]	0.45 ± 0.65	1.0 [0.0–1.0]	1.07 ± 0.81	<0.001
6 months	0.0 [0.0–0.0]	0.16 ± 0.50	1.0 [0.0–1.0]	0.73 ± 0.96	<0.001

* IQR: Interquartile Range; †SD: Standard Deviation; ‡VAS: Visual Analog Scale

Table 3: Pain-free outcome at 6 months

Outcome	Group A n (%)	Group B n (%)	p-value
(VAS <3)	146 (97.3%)	119 (79.3%)	<0.001
(VAS >3)	4 (2.7%)	31 (20.7%)	

*VAS: Visual Analog Scale

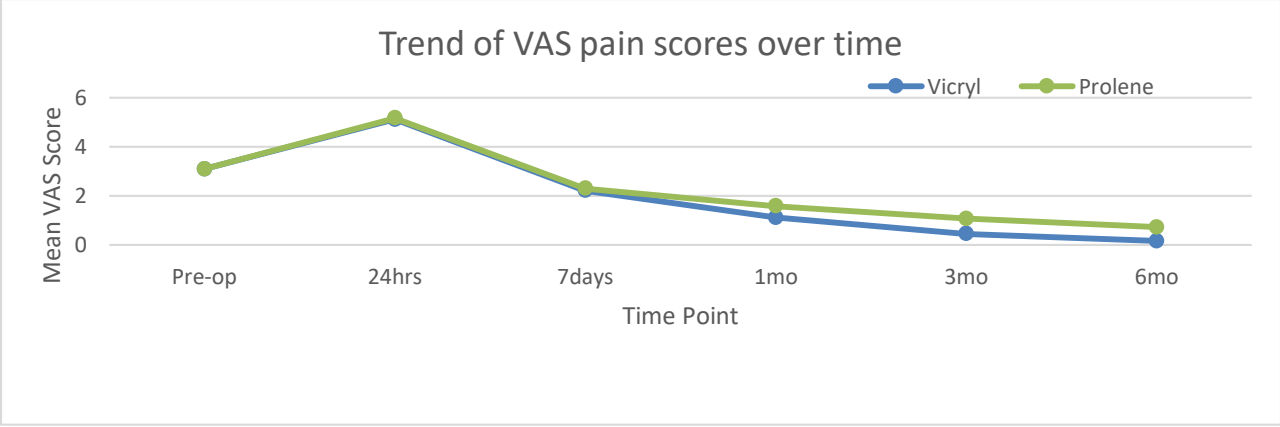

Figure 1: Trend of mean VAS pain scores in Vicryl vs. Prolene groups over time. **VAS: Visual Analog Scale*

Discussion

Postoperative pain control is central to enhanced recovery and quality of life following hernia repair. Several factors influence pain perception, including tissue manipulation, healing dynamics, and foreign body

response. The etiology of chronic inguinodynia is multifactorial, encompassing nerve entrapment, mesh reaction, and, importantly, the material used for mesh fixation (6). Mesh fixation is a critical step in the procedure, and both absorbable and non-absorbable sutures are used. Non-absorbable sutures like Prolene have traditionally been used for their strength and durability. However, they are associated with prolonged foreign-body reactions (7) and potential nerve irritation, which may contribute to chronic groin pain. Absorbable sutures such as Vicryl resorb over time and may reduce the duration of inflammatory response and mechanical irritation. We hypothesize that this reduced inflammatory response may lead to improved pain outcomes over time.

Findings of our study add a novel perspective to the growing body of literature investigating postoperative pain in hernia repair. By isolating suture type as the variable, our study addresses a distinct surgical factor that can influence both intermediate- and long-term postoperative pain, providing insights that complement existing literature on mesh-related outcomes. Our study, involving 300 participants, demonstrates that absorbable Vicryl sutures result in significantly lower postoperative pain compared to non-absorbable Prolene sutures at 1 month, 3 months, and 6 months ($p< 0.001$). At 6 months, 97.3% of Vicryl patients were pain-free (VAS <3) versus 79.3% in the Prolene group, indicating superior long-term outcomes. Additionally, the use of a clearly defined efficacy threshold (VAS <3 at 6 months) provides a clinically meaningful measure of pain control, adding robustness to our conclusions. These findings are consistent with Meena et al., who reported significantly lower VAS scores in the absorbable suture group at 3 ($p= 0.013$) and 6 months ($p\leq 0.001$), with a higher proportion of patients experiencing only mild pain (8). Similarly, Koujalgi et al. found no significant difference in pain during the first few postoperative days. However, at 1 week ($p= 0.015$) and 3 months ($p= 0.003$), patients with Vicryl sutures had a higher proportion of mild or no pain compared to the Prolene group, indicating better intermediate-term pain outcomes (9).

Agarwal et al. conducted a study on 110 patients, and at 6-month intervals, 16 patients from the Prolene group and 11 from the Vicryl group complained of pain; however, no statistically significant difference between the two groups was established ($p = 0.502$) (10). Unlike our study, they found a statistically significant difference between the mean operative times in the Prolene and Vicryl groups (44.38±9.024 and 51.96±13.839; $p= 0.001$).

In a single-blind RCT with 100 patients per group, chronic pain was more frequent in the non-absorbable suture group (37 vs. 26; $p = 0.056$), and pain resolution took longer (115.3 vs. 77.4 days; $p = 0.038$). Use of non-absorbable sutures was associated with a 94.9% higher risk of chronic pain (OR = 1.949; p 0.038), highlighting the benefit of absorbable sutures for long-term pain reduction.[11] Rout et al. demonstrated that between the first and the final follow-up at 3 months, the mean pain score decreased substantially more in the Vicryl group compared to the Prolene group ($p= 0.0023$), reinforcing the trend of better intermediate-term pain control with absorbable sutures (12). Collectively, these studies indicate a common trend: absorbable sutures may not significantly affect early postoperative pain but consistently provide better intermediate- and long-term pain outcomes.

The use of absorbable sutures may reduce long-term postoperative pain by limiting foreign body reactions and chronic inflammation. Chronic discomfort can arise from tissue-penetrating mesh fixation, which may injure nerves, or from tension caused by non-absorbable sutures. In some cases, removal of permanent fixation material can relieve symptoms (13, 14). While non-absorbable sutures like Prolene offer high tensile strength and durability, they may act as chronic irritants, contributing to persistent pain. In contrast, Vicryl gradually degrades over time, potentially lowering nociceptive stimulation, which has driven interest in absorbable sutures as alternatives.

Evidence indicates that using long-term absorbable sutures for mesh fixation does not increase the risk of hernia recurrence (15). In fact, according to a Swedish registry, there was no significant difference in the risk of reoperation between standard non-absorbable sutures (RR = 1) and long-term absorbable sutures (RR = 1 vs. 1.12; 95% CI, 0.81–1.55; p 0.49) (14). These findings suggest that absorbable sutures could be a safe option, allowing surgeons to consider them for mesh fixation without compromising long-term hernia outcomes, while potentially reducing chronic pain associated with non-absorbable materials.

The strengths of our study include a relatively large cohort compared to previous smaller studies, multiple postoperative follow-up assessments up to six months, and the use of objective pain scoring with a clearly defined efficacy threshold, providing robust and clinically meaningful evidence in a high-volume, resource-limited setting. The limitations of our study include its non-randomized design and single-center setting, which may limit generalizability. Additionally, important postoperative outcomes such as analgesic use, functional recovery, and quality-of-life measures were not assessed. Future multicenter trials with standardized techniques, patient-reported outcome measures (PROMs), analgesic tracking, and longer follow-up are needed to validate these findings.

Conclusion

In Lichtenstein inguinal hernia repair, mesh fixation with absorbable Vicryl sutures is associated with significantly lower intermediate- and long-term postoperative pain compared to non-absorbable Prolene sutures, without increasing operative time. By reducing chronic groin pain, Vicryl sutures can enhance patient comfort, improve functional recovery, and potentially decrease the burden on healthcare resources. These findings support the preferential use of absorbable sutures for mesh fixation in routine clinical practice, particularly in high-volume, resource-limited settings, and provide evidence-based guidance for optimizing long-term outcomes after hernia repair.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

ST (Postgraduate Trainee), MJ (Postgraduate Trainee), VD (Medical Officer)

Review of Literature, Data entry, Data analysis, and drafting an article. Manuscript drafting, Study Design,

SN (Assistant Professor), SJ (Postgraduate Trainee), KS (Postgraduate Trainee)

Study Design, manuscript review, and critical input.

Conception of Study, Development of Research Methodology Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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