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Post Operative Chronic Pain after Mesh Fixation by Absorbable and Non Absorbable Suture in Lichtenstein Meshplasty

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Currently, Lichtenstein hernioplasty (tension-free mesh repair) is the gold standard surgical management for inguinal hernias with significantly low recurrence rate of <5%. However the reported incidence of chronic post-operative groin pain is 10-30% owing to tissue scarring, inflammatory reactions to the mesh, or irritation of inguinal nerves due to the mesh or sutures used for fixation. This study compares the effects of mesh fixation using absorbable versus non-absorbable sutures on post-surgery outcomes.

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Objective: To evaluate post-operative groin pain, recurrence rates, seroma formation, foreign body sensation, and surgical site infection in patients undergoing Lichtenstein meshplasty using either absorbable or non-absorbable sutures.
Methods: A prospective, single-center, non-randomised, observational study was conducted at Government Medical College and Hospital, Chandigarh, involving 54 male patients with uncomplicated inguinal hernias. Two groups of 27 patients each underwent mesh fixation using either absorbable polyglactin or non-absorbable polypropylene sutures. Pain was assessed using the Visual Analogue Scale (VAS) and DN4 questionnaire, and patients were followed-up 3 months post-surgery.
Results: There was no statistically significant difference in chronic pain at 3 months between the two groups (p=0.21). Other complications like seroma formation, foreign body sensation, and recurrence were also similar in both groups. No surgical site infections or hernia recurrences were observed during follow-up.
Conclusion: Absorbable sutures offer a comparable alternative to non-absorbable sutures for mesh fixation in hernia repair, with similar outcomes in pain and complication rates. Further studies with larger sample sizes and longer follow-up are recommended to confirm these findings.

Keywords: Lichtenstein hernioplasty; mesh fixation; chronic postoperative groin pain.

1. INTRODUCTION

Inguinal hernias accounts for 75% of abdominal hernias [1]. Surgery is the only definitive treatment for symptomatic hernias, with around 20 million repairs performed annually [2]. Nowadays, Lichtenstein hernioplasty (tension-free mesh repair is preferred technique for hernia surgery to prevent recurrence [1,3].

Mesh fixation, a crucial step for hernioplasty, is achieved by using non-absorbable sutures, absorbable sutures, glues, or tacks. Non absorbable sutures like polypropylene maintain 90% of their strength for six months, while absorbable sutures like polyglactin degrade within 60 days [4,5].

Reported complications after hernioplasty are surgical site infections (deep incisional SSI ranges from 0.3 to 6%, while superficial incisional SSI falls between 0% and 14.4%), seromas (<7%), foreign body sensation (11-18%), mesh migration or shrinkage leading to recurrence (<5%) and chronic groin pain (10-30%) [6-11]. Chronic groin pain, persisting for more than three months post-surgery, can vary from mild to severe, affecting daily activities [12,13]. It may be neuropathic, caused by nerve irritation or entrapment, or nociceptive, due to tissue injury or inflammation [8,10,14-17].

The Visual Analogue Scale (VAS) is a widely used tool for self-assessing pain, known for its simplicity, reliability, and validity. It has been employed in many randomized trials, which are often regarded as the "gold standard" of evidence [13]. In contrast, the DN4 (Douleur Neuropathique 4) questionnaire is specifically designed to diagnose neuropathic pain [18].

1.1 Objective

The objective of the present study was to evaluate mesh fixation by absorbable sutures and non-absorbable sutures in Lichtenstein mesh hernioplasty in terms of chronic postoperative groin pain. Additionally, recurrence of hernia, seroma formation, foreign body sensation and surgical site infections were also observed. Chronic groin pain was assessed using visual analogue scale (VAS) score and DN4 (Douleur Neuropathique 4) questionnaire.

2. METHODS

A prospective, single-center, non-randomised, observational study was conducted at Government Medical College and Hospital, Chandigarh, from March 1, 2023, to December 31, 2023, involving 54 male patients >18 years of age with diagnosis of uncomplicated inguinal hernia planned for Lichtenstein tension-free mesh hernioplasty. Each patient's detailed history, including age, symptoms, duration, chronic conditions (e.g., cough, constipation, urinary issues), surgical history, and family and occupational background, was recorded and basic lab investigations were done. The written informed consent was taken after explaining the study and treatment methods in the patients' native languages.

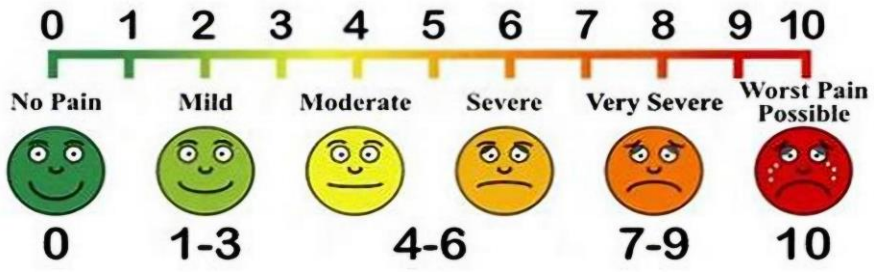

Fig. 1. Visual Analogue Scale (VAS)

Patients were divided in two cohorts of 27 patients each. Cohort A including first 27 patients and Cohort B including the next 27 patients. In Cohort A, mesh fixation was done with absorbable polyglactin (vicryl 2-0) sutures (n=27), while Cohort B used non-absorbable polypropylene (prolene 2-0) sutures (n=27). Patients were discharged on the second or third day after surgery, following a check of SSI, discharge and hematoma. Skin sutures were removed on the 10th postoperative day.

Follow-up examinations were conducted at 3 months post-surgery. Patients were asked about pain levels, use of pain medication, restrictions on daily activities, and whether they consulted a physician for inguinal pain. Pain was measured using the Visual Analogue Scale (VAS), ranging from 0 (no pain) to 10 (worst pain imaginable), and the DN4 questionnaire was done only in patients with VAS>1 after a follow-up period of 3 months, with a score of 4 or higher (out of 10) suggesting the presence of neuropathic pain. Seroma formation, surgical site infections, foreign body sensation and recurrence was also looked for. Data analysis was carried out using SPSS 26.0 software.

3. RESULTS

The mean and median age of the study participants in Cohort A was 51.30 + 14.70 years and 56 (41-61) years respectively. The mean and median age of the study participants in Cohort B was 54.78 + 13.30 years and 59 (51-62) years respectively. Maximum study participants belonged to the age group 51-60 years in both the cohorts (37.0%). Among the 54 patients, 70.4% had right-sided inguinal hernias, and 61.1% had indirect inguinal hernias. The mean hospital stay for Cohort A was 3.04 ± 1.05 days, with a median of 3 (2-3) days, while in Cohort B, the mean operative time was 2.56 ± 0.70 days with a median of 2 (2-3) days. The length of hospital stay was similar in both groups.

There was no significant association between VAS scores at 3 months and the type of suture used for mesh fixation (p = 0.21). The DN4 assessment was performed only in patients with VAS scores of ≥1 at 3 months, with no observed association between neuropathy and suture type (p = 1.00).

Table 1. Comparison of VAS score at 3 months between the two cohorts

VAS score at 3 months	Cohort A (n=27)	Cohort B (n=27)	Total
≥1	5 (18.5%)	9 (33.3%)	14 (25.9%)
0	22 (81.5%)	18 (66.7%)	40 (74.1%)
p-value: 0.21			

Table 2. Comparison of neuropathic pain (using DN4 questionnaire) between two cohorts

Neuropathic pain	Cohort A (n=27) [VAS ≥1 = 5]	Cohort B (n=27) [VAS ≥1 = 9]	Total
Yes	1 (20.0%)	2 (22.2%)	3 (21.4%)
No	4 (80.0%)	7 (77.8%)	11 (78.6%)
p-value : 1.00			

Table 3. Comparison of other complications between the two cohorts

Complications	Cohort A (N)	Cohort A (%)	Cohort B (N)	Cohort B (%)	P-value
Seroma	2	7.4	1	3.7	1.0
Foreign body sensation	3	11.1	4	14.8	1.0
SSI	0	-	0	-	-
Recurrence (At 3 months)	0	-	0	-	-

Seroma formation occurred in 7.4% of patients in Cohort A and 3.7% in Cohort B, with no significant difference between the two (p = 1.00). Foreign body sensation was reported by 11.1% of patients in Cohort A and 14.8% in Cohort B, with no association between this sensation and suture type (p = 1.00). No surgical site infections or hernia recurrences were observed during the 3-month follow-up in either cohort.

4. DISCUSSION

The ideal hernia repair should be tension-free, avoid damage to vital structures, and reduce the chances of long-term pain, complications, and recurrence [19]. Lichtenstein hernioplasty has significantly lowered the recurrence rates to below 5% [10]. However, chronic postoperative groin pain affects 10% to 30% of hernioplasty patients [14]. This pain may result from tissue scarring, inflammatory reactions to the mesh, or irritation of inguinal nerves due to the mesh or sutures used for fixation. While various suture materials are available for mesh fixation, only few studies have compared absorbable and non-absorbable sutures in relation to chronic groin pain.

Our study aims to compare postoperative groin pain in Lichtenstein hernioplasty, using absorbable (Polyglactin) or non-absorbable (Polypropylene) sutures in two cohorts of 27 patients. Polyglactin (Vicryl), a synthetic braided suture, fully dissolves within 60 days and maintains strength for 3–4 weeks.

Polypropylene (Prolene), a non-absorbable monofilament, retains 90% of its strength after 6 months. Patients were observed during their hospital stay, at discharge, and during follow-ups on postoperative day 7, at 1 month, and 3 months to assess pain, seroma formation, infection, foreign body sensation, and recurrence. The results of our study were compared with various other studies done in this field.

In our study, the mean and median ages of participants in Cohort A were 51.30 ± 14.70 years and 56 years (range: 41–61), while in Cohort B, they were 54.78 ± 13.30 years and 59 years (range: 51–62). The majority of participants (37%) in both cohorts were aged between 51 and 60, and the age distribution was similar (p = 0.73). Comparable findings were reported in previous studies. Paajanen H [8] found mean ages of 50 ± 13 years in the absorbable group and 52 ± 14 years in the non-absorbable group (p = 0.75), with no significant difference. Jeroukhimov et al [15] reported mean ages of 46 ± 17 years and 47 ± 19 years in the absorbable and non-absorbable groups, respectively, also without statistical significance (p = 0.765). Kharadi et al [20] found similar results with mean ages of 52 ± 14 years in the absorbable group and 54 ± 15.75 years in the non-absorbable group (p = 0.765). Other studies echoed these findings. Sarkar S [2] reported that most patients were aged 41–50, and Meena et al [14] found mean ages of 46.5 years in the absorbable group and 45.4 years in the non-absorbable group. Patel et al [19] reported mean ages of 48.31 ± 16.44 years in the absorbable group and 49.13 ± 17.29 years in the non-absorbable group (p = 0.83). Redha et al [21]. also observed no significant difference. The only study to report a significant difference was Agarwal et al [22], with mean ages of 48.16 ± 14.73 years and 40.20 ± 15.996 years in the absorbable and non-absorbable groups, respectively. Overall, the age distribution in our study aligns with these findings.

In our study, overall right-side hernia was more common. In Cohort A, 66.7% of the study participants had right sided hernia whereas in Cohort B, it was present in 74.1%. Overall, 70.4% of the study participants had right sided inguinal hernia. Other studies by Sarkar S [2] and Redha et al [21]. also reported more incidence of right sided hernia in both the groups. On the contrary, in the study by Paajanen H [8], left sided inguinal hernia was more commonly seen.

Table 4. Comparison of chronic groin pain between various studies

	Follow up, months	Fixation material used (A: Absorbable, NA : Non- Absorbable)	No. of patients/group	Chronic Pain (%)	p-value
Paajanen H, 2002	24	A	81	26	NS
		NA	81	24	
Jeroukhimov et al, 2013	12	A	100	26	0.056
		NA	100	37	
Kharadi et al, 2016	12	A	50	4	0.23
		NA	50	10	
Meena et al, 2018	6	A	155	43.9	<0.001
		NA	155	66.5	
Patel et al, 2019	3	A	76	4	0.048
		NA	76	12	
Shinde et al, 2020	6	A	70	5.7	NS
		NA	70	22.8	
Redha et al, 2020	12	A	79	6.3	0.0723
		NA	79	15.2	
Sarkar S, 2022	12	A	80	8.75	0.042
		NA	80	20	
Agarwal et al, 2023	6	A	55	20	0.502
		NA	55	29.1	
Present Study	3	COHORT A	27	18.5	0.21
		COHORT B	27	33.3	

Table 5. Comparison of other complications between various studies

	Fixation material used (A: Absorbable, NA : Non-Absorbable)	Seroma Formation, n	p-value	Surgical Site Infection, n	p-value	Foreign Body Sensation, n	p-value
Paajanen H, 2002	A	-	-	1	-	-	-
	NA	-		0		-	
Jeroukhimov et al, 2013	A	3	0.47	2	0.561	-	-
	NA	5		1		-	
Kharadi et al, 2016	A	5	0.73	0	-	-	-
	NA	4		0		-	
Patel et al, 2019	A	12	0.69	8	0.67	-	-
	NA	8		4		-	
Shinde et al, 2020	A	4	-	2	-	2	-
	NA	9		10		8	
Redha et al, 2020	A	10	0.293	5	0.549	-	-
	NA	6		7		-	
Sarkar S, 2022	A	6	0.313	4	0.339	-	-
	NA	8		3		-	
Present Study	COHORT A	2	1	0	-	3	1
	COHORT B	1		0		4	

Table 6. Comparison of recurrence between various studies

	Follow up, months	No. of patients/group	Fixation material used (A: Absorbable, NA: Non-Absorbable)	Number of Recurrences, n	p-value
Paajanen H, 2002	24	81	A	1	-
		81	NA	1	
Jeroukhimov et al, 2013	12	100	A	6	0.149
		100	NA	2	
Kharadi et al, 2016	12	50	A	1	0.56
		50	NA	2	
Patel et al, 2019	3	76	A	0	-
		76	NA	0	
Shinde et al, 2020	6	70	A	1	-
		70	NA	1	
Redha et al, 2020	12	79	A	0	-
		79	NA	0	
Sarkar S, 2022	12	80	A	0	-
		80	NA	0	
Present Study	3	27	COHORT A	0	-
		27	COHORT B	0	

In our study, 61.1% of the cases of inguinal hernia were of indirect type. In Cohort A, direct hernia, indirect hernia and pantaloon hernia (both direct and indirect hernia) was seen in 11 (40.7%), 15(55.6%) and 1(3.7%) patient respectively. In Cohort B, direct hernia, indirect hernia and pantaloon hernia (both direct and indirect hernia) was seen in 5(18.5%), 18(66.7%) and 4(14.8%) patients respectively. In studies by Paajanen H [8], Sarkar S [2] and Redha et al [21] also, the indirect inguinal hernia was most seen.

In our study, while there was a notable difference in the proportion of individuals experiencing chronic pain after three months (18.5% in Cohort A vs. 33.3% in Cohort B), the p-value of 0.21 indicated no statistical significance. Paajanen H [8], in a study of 168 patients who underwent Lichtenstein hernia repair, also found no significant difference in groin pain between those using absorbable and non-absorbable sutures. Similarly, Jeroukhimov et al [15] conducted a trial that showed higher rates and longer durations of groin pain with non-absorbable sutures, but the results were not statistically significant ($p = 0.056$). Agarwal et al [22] also reported no significant difference in pain incidence after six months ($p = 0.502$).

Some studies, however, reported significant findings. Sarkar S [2] observed more pain at 3, 6, and 12 months in patients with non-absorbable sutures, with a significant difference at 6 months ($p = 0.042$). Patel et al [19] and Meena et al [14] also found significant differences ($p = 0.048$ and $p = 0.013$, respectively), suggesting that absorbable sutures led to less chronic pain. Redha et al [21] found more pain with non-absorbable sutures, though it was not statistically significant ($p = 0.0723$), while Kharadi et al [20]. also reported no significant difference in pain between the groups ($p = 0.23$).

In our study, seroma formation occurred in 2 cases in Cohort A (n=27) and 1 case in Cohort B (n=27), with a p-value of 1.0, indicating no significant difference. Similarly, Kharadi et al [20] found 5 cases in the absorbable group and 4 in the non-absorbable group (p=0.73), also showing no statistical significance. Patel et al [19] reported a 12% incidence in the absorbable group (n=76) and 8% in the non-absorbable group (n=76), with a p-value of 0.69, again statistically insignificant. Other studies by Jeroukhimov [15], Redha [21], and Sarkar [2] echoed these findings. In Shinde et al [1]'s study, no seroma formation was observed in either group. Our findings are consistent with these studies. Foreign body sensation was reported in 4 cases in Cohort B and 3 in Cohort A, but this was not statistically significant (p=1.0). Paajanen's [8] randomized trial and Shinde et al [1]'s study also found no significant difference in foreign body sensation between absorbable and non-absorbable sutures.

No cases of surgical site infection (SSI) were seen in either cohort in our study, aligning with Kharadi et al [20], who also reported no SSIs. Patel et al [19]. noted 6 infections in the absorbable group and 3 in the non-absorbable group (p=0.67), showing no significant difference. Jeroukhimov et al [15] and Meena et al [14] also found more SSIs in the absorbable group, but without statistical significance. Only Redha et al [21] reported more SSIs in the non-absorbable group, but the difference was also insignificant (p=0.549).

In our study, no recurrences were observed in either Cohort A or Cohort B during the 3-month follow-up. Jeroukhimov et al [15] reported a tendency for higher inguinal hernia recurrence with absorbable sutures over a 12-month follow-up, while Kharadi et al [20] found 1 recurrence in the absorbable group and 2 in the non-absorbable group, a difference that was not statistically significant. Paajanen's [8] randomized trial showed similar recurrence rates between absorbable and non-absorbable sutures. Studies by Redha [21] and Sarkar [2] found no recurrences in either group, supporting the use of delayed absorbable sutures as an alternative to non-absorbable sutures in open hernioplasty.

Early hernia recurrence is often linked to surgical factors such as tissue tension, suture material, handling of the hernia sac, the type of repair, infections, or complications like hematoma or seroma, as well as the surgeon's experience. Later recurrences are usually due to patient-related factors, including collagen defects, ongoing weakness in the inguinal floor, age, and other medical conditions.

5. CONCLUSION

Absorbable sutures can be a viable alternative to non-absorbable sutures for mesh fixation in Lichtenstein hernioplasty. In our study, patients in Cohort A, who had absorbable sutures, reported less chronic groin pain compared to those in Cohort B, using non-absorbable sutures,

although the difference was not statistically significant. No recurrences were observed in either cohort during the three-month follow-up. The reduced incidence of chronic pain with absorbable sutures may be linked to decreased nerve compression or entrapment. However, larger multi-center studies with more participants and longer follow-up are needed to establish robust evidence. Additionally, research into the mechanisms behind chronic groin pain and the interaction between mesh materials and host tissue could enhance our understanding of postoperative outcomes.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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