

Original Research Article

A comparative study of mesh fixation with polypropylene sutures (prolene) versus polyglactin sutures (vicryl) sutures in assessing inguinodynia in open inguinal hernia repair

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ABSTRACT

Background: Inguinal hernia, the most frequently occurring type of hernia globally, Chronic groin pain could be related to nerve mangling while operating. Mesh repair can lead to an inflammatory reaction over a period of time, though it still needs ground work to find out exact cause of pain. So this study aims to compare the effectiveness of polyglactin versus prolene sutures in reducing the post-operative pain in inguinal hernia repair.

Methods: A one year hospital prospective study in KLE hospital. A total of 60 adult patients were divided into two groups of 30 each. Mesh fixation with polyglactin sutures was group A (30) and mesh fixation with polypropylene sutures was group B (30) and then post-operative pain, was assessed. Follow-up was for 3 months. Collected data was analyzed using chi-square tests, Mann-Whitney U tests.

Results: Our analysis showed that the incidence of postoperative groin pain with mean severity scores of 1.37 ± 0.49 versus 1.43 ± 0.50 ; 1.40 ± 0.50 versus 1.57 ± 0.73 ; 1.03 ± 0.61 versus 1.50 ± 0.057 ; 0.77 ± 0.63 versus 1.30 ± 0.79 ; at post-operative day 1, 3 in both groups were similar and statistically not significant whereas the 1 week and 3 months follow up in group A and B respectively, were significant ($p < 0.05$).

Conclusions: The post-op chronic groin pain is significantly low, hence routine usage of polyglactin sutures to fix a mesh is a safe and effective alternative to polypropylene sutures in Lichtenstein hernia repair.

Keywords: Chronic groin pain, Inguinal hernia, Lichtenstein hernia repair, Polyglactin (vicryl) sutures, polypropylene (prolene) sutures

INTRODUCTION

Inguinal hernia, the most frequently occurring type of hernia globally, with an approximate of 75% of all hernias of abdominal wall.¹⁻³ Inguinal hernia repair accounts for 10 to 15% of all surgeries, the 2nd most frequently done surgical procedure.^{2,4,5}

Inguinodynia (chronic groin pain) post hernioplasty can be defined as pain lasting for >3 months post-surgery.⁶

Pain could be related to nerve mangling while operating. Mesh repair can lead to an inflammatory reaction over a

period of time, though it still needs ground work to find out exact cause of pain.⁸

The mesh is usually secured to the surrounding tissue by non-absorbable or absorbable sutures. The possible influence of different suture materials on chronic groin pain after inguinal hernia repair has not been studied in depth.⁹

It has been evaluated that worldwide around 20 million inguinal hernia repairs are done each year.⁵ Hernias can be defined as a "protrusion of a viscus or part of the viscus through an abnormal opening in the walls of its

containing cavity”.⁶ Inguinal hernias can be congenital or acquired, and the latter is common.

We hypothesize that the use of polyglactin for mesh fixation lessens the severity and decrease the rate of chronic pain compared to the polypropylene suture in patients undergoing inguinal repair.

METHODS

Study design

We did a prospective study to compare polyglactin sutures with polypropylene sutures to fix the mesh in patients undergoing Lichtenstein’s repair. Our study was conducted in the Department of General Surgery, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum over one year period, from January 2019 to December 2019. Following departmental research committee and institutional ethical board approval, each patient signed an informed consent form.

Study population

A total of 60 patients divided into two groups of 30 each were studied.

Inclusion criteria

Age group between 18-70 years, unilateral/bilateral inguinal hernia, primary inguinal hernia, uncomplicated hernia.

Exclusion criteria

Irreducible hernias, patients with bleeding disorders, patients on anticoagulant treatment, pregnancy, patients needing emergency repair, HIV and HbsAg positive patients.

The patients were divided into two groups of 30 each as follows: patients undergoing mesh fixation with polyglactin as suture material in Lichtenstein mesh repair formed group A (study group). Patients undergoing mesh fixation with polypropylene suture material in Lichtenstein mesh repair formed group B (control group).

Intervention

We allocated the patients into 2 groups. The mesh fixation done with polyglactin sutures were in group A and the patients where mesh fixation was done with prolene sutures were in group B.

The surgery was performed under spinal anesthesia. The skin and subcutaneous tissue (Camper’s and Scarpa’s fascia) was incised. The external oblique aponeurosis was opened. The cord was identified. The ilioinguinal nerve was identified. The direct inguinal hernial sac was reduced back without opening it. The indirect ones were

divided, transixed and excised. Then behind the cord, a polypropylene mesh was placed over the posterior wall. The mesh was fixed in an interrupted fashion to the conjoint tendon and inguinal ligament with the first stitch being taken 1 cm lateral to the pubic tubercle in order to prevent periostitis. Mesh was fixed using vicryl 2-0 (Figure 1) for one set of patients (group A) and prolene 2-0 (Figure 2) for another set of patients (group B). The external oblique aponeurosis and subcutaneous tissues were approximated by continuous absorbable sutures. Skin closure was done by non-absorbable sutures.



Figure 1: Mesh fixation with polyglactin suture 2-0.



Figure 2: Mesh fixation with polypropylene suture 2-0.

Post operatively patients of both the groups were given the same analgesics that is, Injection paracetamol 1 gm i.v. 12th hourly. Later oral paracetamol 650 mg was given as per requirement.

Outcomes

All the patients were assessed for post-operative on the post-operative day 1, 3, 7 and also after 3 months. To grade the pain we used visual analogue score ranging from 0 to 10 considering 0 as no pain and 10 as severe pain. Chronic pain was defined as a pain persisting

beyond the normal tissue-healing time (assumed to be 3 months) according to the International Association for the Study of Pain.¹³

Sample size calculation:

$$N = \frac{2S^2(Z_{\alpha} + Z_{\beta})^2}{d^2}$$

The mean d_1 and standard deviation S_2 for group 1 was 3.80 and 3.163. The mean d_2 and standard deviation S_2 for the second group was 6.23 and 4.031.

Z_{α} =1.96 at 5% alpha error, Z_{β} =0.842 at 20% beta error, S is average of S_1 and S_2 ; d is the difference between d_1 and d_2 .

N is 31.443 participants in each group, rounded off to 30. Substituting these values in the formula, N=30 and enrolment ratio is 1:1 hence, the sample size estimated were a minimum of 60 patients. Accordingly 30 patients each were included in vicryl repair and 30 in prolene repair.

Statistical analysis

The data obtained was coded and entered in Microsoft Excel Spreadsheet. The categorical data was expressed as rates, ratios and percentages and comparison was carried out with chi-square tests, Mann-Whitney U tests. Continuous data was expressed as mean±standard deviation. A ‘p’ value of less than or equal to 0.05 was considered as statistically significant.

RESULTS

In our study a total of 60 patients admitted with inguinal hernia requiring mesh repair were included, 2 groups were made 30 of each. Group A had patients for whom mesh was fixed with polyglactin in Lichtenstein’s hernia repair. Group B had patients for whom mesh was fixed with polypropylene in Lichtenstein’s hernia repair.

In our study the mean age in group A was 53.87±20.17 years compared to 48.97±19.27 years in group B, the youngest patient being 19 years of age. Majority of the patients were of male gender.

Table 1: Pain on post-operative day 1.

Post op pain at day 1	Group B (prolene group)	%	Group A (vicryl group)	%	Total	%
Mild pain	17	56.67	19	63.33	36	60.00
Moderate pain	13	43.33	11	36.67	24	40.00
Severe pain	0	0.00	0	0.00	0	0.00
Total	30	100.00	30	100.00	60	100.00

Chi-square test=0.2780; p=0.5981.

Table 2: Pain on post-operative day 3.

Post op pain at day 3	Group B (prolene group)	%	Group A (vicryl group)	%	Total	%
No	1	3.33	0	0.00	1	1.67
Mild pain	14	46.67	18	60.00	32	53.33
Moderate pain	12	40.00	12	40.00	24	40.00
Severe pain	3	10.00	0	0.00	3	5.00
Total	30	100.00	30	100.00	60	100.00

Chi-square test= 4.5000 P = 0.2120.

Table 3: Pain on post-operative day 7.

Post op pain after 1 week	Group B (prolene group)	%	Group A (vicryl group)	%	Total	%
No	1	3.33	5	16.67	6	10.00
Mild pain	13	43.33	19	63.33	32	53.33
Moderate pain	16	53.33	6	20.00	22	36.67
Severe pain	0	0.00	0	0.00	0	0.00
Total	30	100.00	30	100.00	60	100.00

Chi-square test=8.3372; p=0.0150*.

In the present study, out of total of 30 patients in each group, in which, 56.67% have mild pain and 43.33%

have moderate pain in post op pain at day 1 in prolene group as compared to 63.33% have mild pain and 36.67%

have moderate pain in post op pain at day 1 in vicryl group (Table 1). The difference or association is found as statistically not significant at 5% level of significance.

In the present study, out of total of 30 patients in each group, in which, 46.67% have mild pain and 40.00% have moderate pain in post op pain at day 3 in prolene group as compared to 60.00% have mild pain and 40.00% have moderate pain in post op pain at day 3 in vicryl group (Table 2). The difference or association was found as statistically not significant at 5% level of significance.

In the present study, out of total of 30 patients in each group, in which, 43.33% have mild pain, 53.33% have moderate pain, but 3.33% have no pain after 1 week in prolene group as compared to 63.33% have mild pain,

20.00% have moderate pain, but 16.67% have no pain after 1 week in vicryl group (Table 3). The difference or association is found as statistically significant at 5% level of significance.

In the present study, out of total of 30 patients in each group, in which, 30.00% have mild pain, 50.00% have moderate pain, but 20.00% have no pain after 3 months in prolene group as compared to 56.67% have mild pain, 10.00% have moderate pain, but 33.33% have no pain after 3 month in vicryl group (Table 4). The difference or association is found as statistically significant at 5% level of significance.

Table 4: Pain after 3 months post operatively.

Post op pain after 3 months	Group B (prolene group)	%	Group A (vicryl group)	%	Total	%
No	6	20.00	10	33.33	16	26.67
Mild pain	9	30.00	17	56.67	26	43.33
Moderate pain	15	50.00	3	10.00	18	30.00
Severe pain	0	0.00	0	0.00	0	0.00
Total	30	100.00	30	100.00	60	100.00

Chi-square test= 11.4620 P = 0.00300*.

From Table 4, a significant difference in pain scores was not seen in both groups (prolene versus vicryl) on day 1 and day 3 postoperatively. A significant difference in pain scores was observed between two groups with respect to pain scores at 1st week (p<0.05) and at 3rd month (p<0.05) at 5% level of significance.

DISCUSSION

Chronic pain in the groin is a notable problem post lichtenstien’s repair, even though the pain is usually mild, studies have revealed that irrespective of the severity, chronic pain may considerably hamper day to day activity.¹⁰ Chronic pain is the principle issue linked with the Lichtenstein technique with a conclusive rate between 15% and 40%.^{7,11,12}

Routine usage of absorbable sutures to fix mesh in Lichtenstien’s repair have resulted in reduce post-operative chronic pain, yet controversies persist. So we took up this study to appraise post-operative groin pain in the patients where polyglactin sutures were used to fix the mesh (group A) versus polypropylene sutures in doing the same (group B) in Lichtenstein inguinal hernia repair.

There have been many theories regarding the causes for the groin pain and one plausible theory is pain after surgery persists for a long period due to is inflammatory changes, fibrosis, subsequently entrapment of nerve,

induced either by mesh or suture material, that’s in proximity of ilioinguinal nerve.^{13,14} Apart from this untimely mangling to nerve at the time of dissection may contribute as well to this.

Vicryl (polyglactin) is a synthetic, absorbable, braided suture which can sustain its tensile strength for nearly 3 to 4 weeks in tissues. It’s entirely absorbed by hydrolysis within 60 days.^{15,16}

In our study there was a significantly lesser scores of pain in group A compared to other group. The mean pain scores in group A during first and 3rd day showed no significant difference all though the percentage of people experiencing pain on these two points on the timeline was more in polypropylene than polyglactin group (Table 5). However in the third and fourth follow up the pain scores were significantly less compared to group B and the mean reduction in pain score from first follow up to fourth follow up was significantly higher in group A (0.77±0.63) compared to group B (1.30±0.79) (p=0.0101).

In a single-blind randomized clinical trial comparing absorbable (ABS) with non-absorbable (NAMS) suture material in 200 patients undergoing tension-free inguinal hernia repair study by Igor Jeroukhimov et al in 2008, it was found that the incidence of severe pain after 1 week of surgery was more in the NAMS group as compared with ABS group (14 versus 5 patients, p=0.026).⁹

Table 5: Comparison of prolene group and vicryl group with pain scores at different time points by Mann-Whitney U test.

Time points	Group B (prolene group)			Group A (vicryl group)			U value	Z value	P value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Day 1	1.43	0.50	31.50	1.37	0.49	29.50	420.00	-0.4435	0.6574
Day 3	1.57	0.73	32.30	1.40	0.50	28.70	396.00	-0.7984	0.4247
1 week	1.50	0.57	36.27	1.03	0.61	24.73	277.00	-2.5577	0.0105*
3 months	1.30	0.79	36.30	0.77	0.63	24.70	276.00	-2.5725	0.0101*
Day 1 to Day 3	-0.13	0.82	28.40	-0.03	0.18	32.60	387.00	-0.9314	0.3516
Day 1 to 1 week	-0.07	0.74	25.57	0.33	0.55	35.43	302.00	-2.1881	0.0287*
Day 1 to 3 months	0.13	0.78	25.53	0.60	0.56	35.47	301.00	-2.2029	0.0276*
Day 3 to 1 week	0.07	0.58	26.73	0.37	0.49	34.27	337.00	-1.6706	0.0948
Day 3 to 3 months	0.27	0.78	26.40	0.63	0.49	34.60	327.00	-1.8185	0.0690
1 week to 3 months	0.20	0.48	29.63	0.27	0.45	31.37	424.00	-0.3844	0.7007

*p<0.05.

A study by Kharadi et al in 2014, 100 male patients underwent Lichtenstein tension free inguinal hernioplasty, comparing absorbable sutures against delayed absorbable sutures to fix the showed that there wasn't any statistical significant difference was found between two groups except for the appearance of the post-operative pain after 1 month (12 versus 4, p=0.02).¹⁷

Paajanen study demonstrated that in 168 patients who underwent Lichtenstein hernia repair with a two year follow-up, absorbable sutures (Dexon 2.0) were used to fix the mesh in 84 of them.¹⁸ They deduced that there wasn't any difference in incidence of chronic groin pain when using these sutures.

Thus our study has shown the presence of chronic pain in the groin is quite less in group A (fixing the mesh with polyglactin sutures) compared to group B (fixing the mesh with polypropylene sutures) and statistically significant (p<0.05).

Based on the findings of our study it may be concluded that, using polyglactin suture material to fix mesh is a safe, simple as well as an effective alternative to the conventional usage of polypropylene sutures for fixing the mesh in Lichtenstein hernia repair. The post-operative pain on day 1 and day 3 is similar with both vicryl and prolene sutures but on the day 7 and after 3 months it is significantly less.

The limitation of the study is our sample size and duration of follow up is considerably less, the requirement for a bigger sample size and extensive period of follow up is desired to draw out better conclusions.

Despite this polyglactin sutures can be recommended to fix the mesh in lichtenstien's hernioplasty. So, routine usage of polyglactin (vicryl) sutures for mesh fixation in a lichtenstien's hernioplasty is a reasonable option.

CONCLUSION

Based on the findings of the present study it may be concluded that, using polyglactin suture material to fix mesh is a safe, simple as well as an effective alternative to the conventional usage of polypropylene sutures for fixing the mesh in Lichtenstein hernia repair. The post-operative pain on day 1 and day 3 is similar with both vicryl and prolene sutures but on the day 7 and after 3 months it is significantly less.

Hence our study helps use to understand the benefits of using polyglactin sutures and also enables us to recommend its application to fix the mesh in Lichtenstien's hernioplasty. So, routine usage of polyglactin (vicryl) sutures for mesh fixation in a Lichtenstien's hernioplasty is safe and simple and thus a reasonable option.

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