

Original Research Article

Effectiveness of fibrin glue in comparison to polypropylene suture for mesh fixation in lichtenstein inguinal hernia repair

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ABSTRACT

Background: Hernia is one of the oldest maladies known and suffered by humans. It has been known since ages and will be known for centuries to come as long as human beings prompt to stand and walk. Lichtenstein hernia repair is the most common procedure followed surgery but with some devastating complications such as chronic groin pain (CGP). The search for the most appropriate method to fix mesh and to reduce complications is still on and this study aims for the same.

Methods: A comparative prospective study conducted in Department of General Surgery, Bangalore medical college & Research institute from November-2016 to May-2018. 100 patients falling into inclusion criteria were taken to study with randomization, 50 in each group (prolene vs Fibrin-glue). Postoperatively patient was assessed for complications, recovery time and Data collected was statistically analyzed using appropriate statistical test and $p < 0.05$ was taken significant.

Results: Most common age group presenting with hernia was from 41-50 years (29%) with M: F ration 5.6:1. Laterality being right: left: bilateral:: 58%: 36% :6% respectively. Type of hernia being Indirect: Direct:: 66%: 34% respectively. Duration of surgery, recovery to ADL and postoperative complications like seroma, chronic groin pain, foreign-body sensation was significantly less with fibrin glue compared to prolene group. Postoperative Haematoma, local numbness and recurrence were comparable and the difference in the result was statistically insignificant.

Conclusions: Through our study from the above-mentioned benefits, it can be concluded that use of fibrin Glue in mesh fixation is a safe and acceptable method and can be used as a better alternative for prolene suture for mesh fixation in Lichtenstein's hernioplasty.

Keywords: Chronic groin pain, Fibrin glue, Polypropylene suture, Prolene mesh, Lichtenstein repair, Mesh fixation

INTRODUCTION

Hernia is one of the oldest maladies known and suffered by humans. It has been known since ages and will be known for centuries to come as long as human beings prompt to stand and walk. Abdominal wall hernia is very common; the prevalence in the general population is about 5%.¹ Although the natural course of the disease is relatively slow, it eventually reaches the size that

severely impairs with the patient's ability to perform daily activity.²

Lichtenstein hernioplasty, first described in 1984, is now the most commonly used technique for open repair of inguinal hernia due to its safety, efficacy, and low recurrence rates and it has a short learning curve to obtain highly acceptable results.³ Despite the success of Lichtenstein hernioplasty, there are some drawbacks with the surgery which is inevitable with the current standard

technique of Lichtenstein tension free hernioplasty. One of such drawbacks are chronic groin pain (CGP) also known as inguinodynia.

CGP is defined as pain persisting more than 3 months after operation.⁴

Etiology of CGP is broadly divided into Neuropathic and Non-Neuropathic causes. Neuropathic causes of CGP include direct trauma to the nerves in the inguinal region or nerve entrapment secondary to mesh related fibrosis, suture fixation of the mesh. Non-neuropathic causes of CGP include the periosteal reaction of suture fixation at the pubic tubercle, the displacement of the mesh, an inflammatory reaction to the mesh and potentially the use of heavyweight mesh for hernia repair.⁵

A variety of techniques have been employed to tackle the issue of CGP. Different methods of mesh fixation has been recommended with the uses of fibrin or butyl-2-cyabiacylate glues and have increased in popularity in recent years as it has been postulated that glue mesh fixation may decrease the operating time and reduce postoperative pain compared to suture or tacker fixation of mesh.⁶ Various non-randomized and randomized, controlled trials have been reported with variable incidence of CGP.

Hence this study is undertaken to determine the efficacy of fibrin glue over polypropylene suture in mesh fixation in Lichtenstein hernia repair in terms early and late postoperative morbidity and outcome.

METHODS

This prospective clinical study was conducted in tertiary care centres attached to Bangalore Medical College and Research Institute during the period between November 2016 to May 2018. 100 patients with inguinal hernia reported to general surgery department were selected for the study based on following inclusion and exclusion criteria.

Inclusion criteria

Inclusion criteria were age ≥ 18 years; reducible; willing to give consent.

Exclusion criteria

Exclusion criteria were recurrent; strangulated; collagen/connective tissue disorder.

A detailed relevant clinical history was taken and clinical examination including general, systemic and local examination was done based on standard structured proforma.

After routine relevant investigations, informed consent was taken, and patients prepared for surgery, Equal numbers of cases were subjected to include 50 cases in each group. Randomization was done by allotting random numbers to the patients coming with inguinal hernia fitting to inclusion criteria and alternate subjects were treated with fibrin glue for mesh fixation (test group) and remaining patients were treated with polypropylene suture for mesh fixation.

Group 1/Control group

Patients undergoing surgery using a conventional method of Lichtenstein hernia repair using polypropylene suture mesh fixation.

Group 2/Test group

Patients undergoing surgery using the modified method by Lichtenstein polypropylene mesh fixation with fibrin glue. The mesh was placed in position and fixed with Fibrin glue on the pubic tubercle, along the inguinal ligament and the conjoined area. Glue was avoided on the nerves as much as possible. Only one vial of fibrin glue was used for each patient. All the Nerves were tried to preserve in either group. All operations were performed with subarachnoid block and no postoperative analgesic device was used.

Postoperatively patients were monitored for duration of operation (minutes), Hematoma/seroma. Wound/mesh infection, Postoperative Recovery time to daily activities (walking, driving, manual work) (days), Persistent numbness: numbness in the groin or testicle persisting beyond three months postoperatively, Chronic Groin pain: pain persisting for or beyond three months postoperatively etc. Pain was assessed using visual analogue scale (VAS)

Statistical analysis was done using Microsoft excel and analyzed using SPSS version 24.0 with appropriate statistical tests. $P < 0.05$ was taken as significant.

RESULTS

Demographic profile

This study included 100 patients with uncomplicated inguinal hernia out of which 85 (85%) were males and 15(15%) were females. Male:female ratio was found to be 5.6 :1 (Table 1). Mean age of the patients in prolene group is 47.78 years with standard deviation of 14.85 and Mean age of the patients in fibrin glue group is 50.78 years with standard deviation of 15.18. most common age group being 41-50 years (Figure 1).

Table 1: Sex distribution.

Study groups	Prolene group	Fibrin glue group
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Male	44	41
Female	6	9
Total	50	50

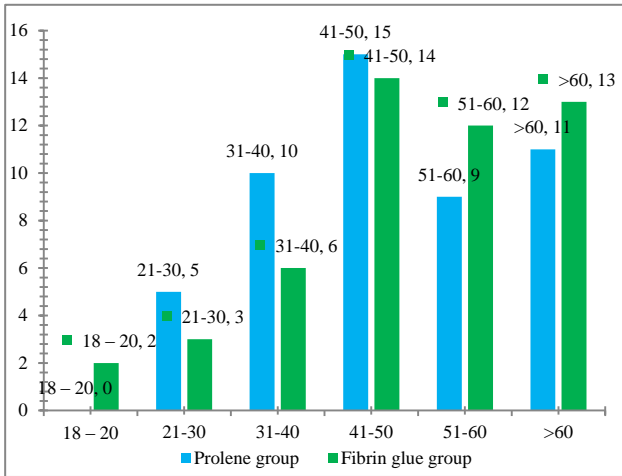


Figure 1: Graph depicting age distribution.

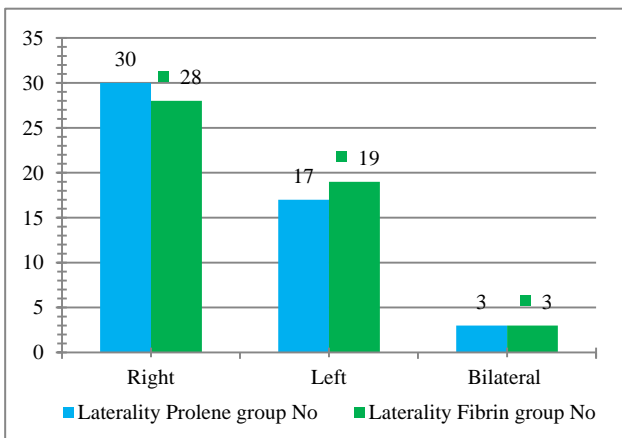


Figure 2: Graph depicting laterality of hernia.

Laterality- 58% patients out of total patients had right sided inguinal hernia, 36% patients had left sides inguinal hernia and 6% had bilateral hernia (Figure 2).

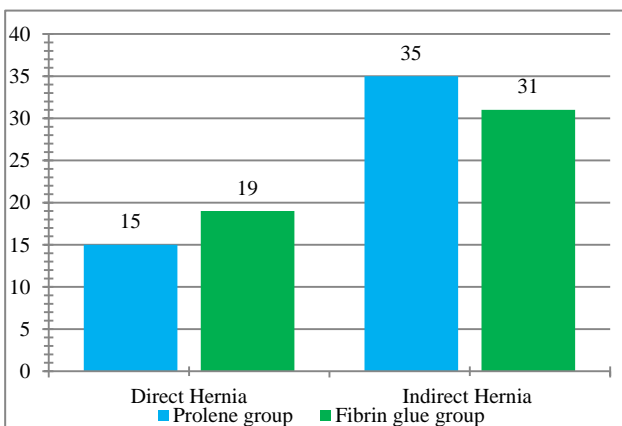


Figure 3: Graph depicting types of inguinal hernia.

Type of hernia- 34 patients out of total patients had direct hernia, 66 patients had indirect inguinal hernia. Out of this 30% was direct and 70% was indirect hernia in prolene group and 38% direct and 62% indirect in fibrin glue group (Figure 3).

Intraoperative findings

Our study showed a mean time of 51.8±7.07 mins among prolene group and 43.74±4.53 minutes in fibrin glue group to complete the surgery (p<0.05) as shown in Table 2. Mean duration of mesh fixation was 11.36±2.32 mins among prolene group and 7.64±1.52 minutes in fibrin glue group (p<0.05) as shown in Table 3.

Table 2: Mean duration of surgery.

Length of surgery in minutes			
	Prolene	Fibrin glue	P value
Mean	51.8	43.74	<0.0001
SD	6.81	4.67	

Table 3: Mean duration of mesh fixation.

Length of mesh fixation in minutes			
	Prolene	Glue	P value
Mean	11.36	7.64	<0.0001
SD	2.35	1.50	

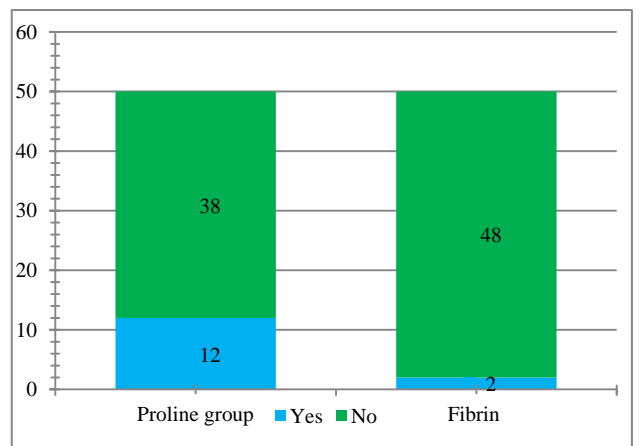


Figure 4: Graph depicting seroma formation.

Postoperative observations

Postoperatively 12 patients among prolene group and 2 patients in fibrin glue group had developed seroma (p<0.05) (Figure 4). 7 patients among prolene group and 3 patients in fibrin glue group had developed haematoma in early post-operative period (p>0.05) (Figure 5). 5 patients among prolene group and 1 patient in fibrin glue group had developed local numbness in post-operative period because of nerve damage during surgery (p>0.05) (Figure 6). The incidence of wound infection in prolene group was 4 patients out of 50 and the result was similar with fibrin glue (p>0.05) (Figure 7). 4 patients among

prolene group and 3 patients in fibrin glue group had developed urinary retention in early post-operative period ($p>0.05$) (Figure 8).

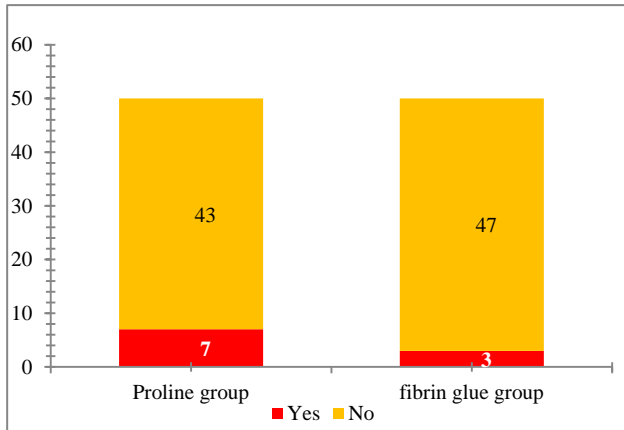


Figure 5: Graph depicting percentage of patients with haematoma formation.

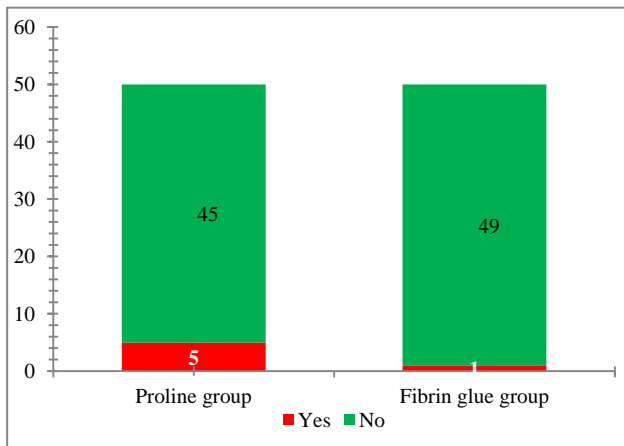


Figure 6: Graph depicting patients with local numbness.

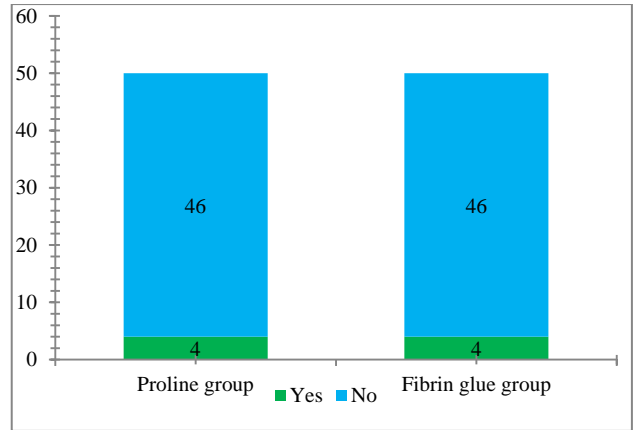


Figure 7: Graph depicting percentage of patients with wound infection.

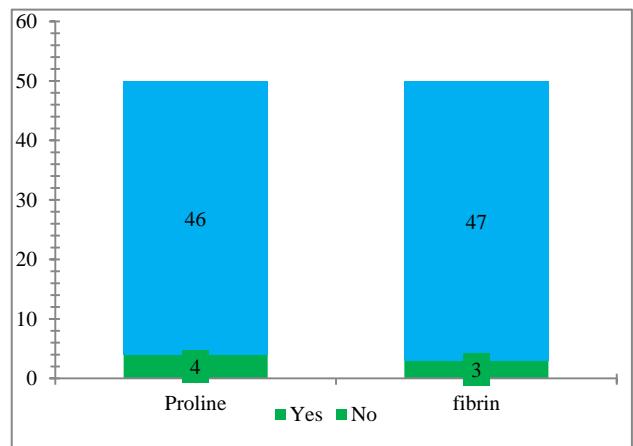


Figure 8: Graph depicting number of patients with urinary retention.

Table 4: Post operative pain assessment with visual analogue scale.

Study group	Visual analogue scale						
	prolene			fibrin			P value
	Mean	SD	Median	Mean	SD	Median	
VAS D0	0	0	0	0	0	0	1
VAS D 1	5.12	0.96	5	4.52	0.886	4	0.0016
VAS D 3	4	0.76	4	3.24	0.72	3	<0.0001
VAS D7	2	0.61	2	1.64	0.63	2	0.0044
VAS M1	0.52	0.67	0	0.22	0.58	0	0.0549
VAS M3	0.32	0.68	0	0	0	0	0.0241
VAS M 6	0.38	0.72	0	0	0	0	0.0229

Table 5: Comparison of percentage of patients with chronic groin pain with previous studies.

Chronic groin pain	Our study 2018 (p=0.0308)		Liu et al ²⁰ (p<0.0001)		Testini et al ¹⁵ (p=0.01)	
	Prolene	Fibrin glue	Prolene	Fibrin glue	Prolene	Fibrin glue

No (%)	42 (84)	49 (98)	1902 (95.1)	1965 (98.25)	52 (88)	105 (99)
Yes (%)	8 (16)	1 (2)	98 (4.9)	35 (1.75)	7 (12)	1 (1)

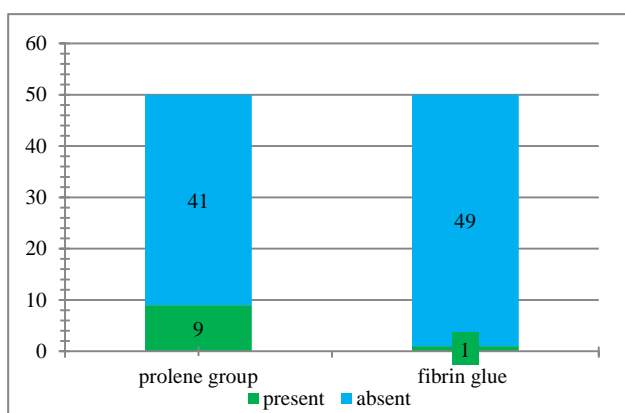


Figure 9: Graph depicting patients with chronic groin pain.

Visual analogue scale was used to assess postoperative pain on day1, 3, 7, 1st month, 3rd month and 6th month. It showed that post operative pain in fibrin glue group was much lesser than pain in prolene group. This difference was statistically significant with $p < 0.05$ as shown in Table 4. The incidence of Chronic Groin Pain in prolene group of 9 patients out of 50 and 1 out of 50 patients with fibrin glue ($p < 0.05$) (Figure 9).

DISCUSSION

Lichtenstein's tension free hernioplasty is the most widely practiced hernia surgery as it has been found to be superior in several ways to the other open techniques.⁷

Conventionally, the Prolene suture is used to fix the mesh which is a tedious, time-consuming, and invasive method. It can also increase the amount of postoperative pain and can lead to other long-term complications like chronic groin pain.⁸ the incidence of chronic groin pain depends on various factors like the method of mesh fixation, type of mesh used and even the subjective threshold of pain.⁹ Pain can be experienced due to nerve resection, nerve compression from sutures, foreign body reaction caused by the mesh or tension on muscle fibers.¹⁰ Fibrin glue by reducing these above mentioned aspects has lately shown to have significant impact on modern hernia surgery by giving a promising result in preventing chronic groin pain.

In this study we have taken prolene group as control group and fibrin glue group as study group and have compared the data and outcomes of both groups. In this study patients were aged between 18 to 73 years in prolene group with maximum incidence of inguinal hernia in 41-50 age group (30%) with mean age being 47.78 years. Patients were aged between 18 to 78 years in

glue group with maximum incidence in 41-50 age group (28%) with mean age being 50.78 years. Similar results were obtained in other studies like the one conducted by Basu et al in which the age distribution across all age groups can be compared with our study with high prevalence being between 41- 50 years.¹¹

The mean±SD of patients Age in our study was 47.85 ± 14.85 in control group and 50.78 ± 15.18 in study group. This is in comparison with previous studies like Arslani et al.¹² Conducted in year 2010 with a mean age of 52.3 ± 13.9 , Paajanen et al.¹³ Conducted in year 2011 with a mean age of 53 ± 15 . Thus, the present study corroborates with all the above studies.

Our study showed that 85% of study population is male patients and 15% is female with a Male: female ration near to 5.6:1. This was similar to other studies like AmerOdobasic et al and Testini et al, suggesting that inguinal hernias are predominant in male population.^{14,15}

The observations of Girish et al were 56% of the total inguinal hernias were right sided, 38% were left sided.¹⁶ Paajanen et al evaluated inguinal hernias and found that 54.3% were right sided, 45.7% were left sided.¹³ Right sided inguinal hernias are more than left sided inguinal hernias in all the above studies. Thus, the present study corroborates with all the above studies.

It shows in this study that 34 patients out of total patients had direct hernia, 66 patients had indirect hernia. Out of this 30% was direct and 70% was indirect hernia in prolene group and 38% direct and 62% indirect in fibrin glue group. This was similar to observations made by Testini et al, Alam et al and Paajanen et al.^{13,15,18} Indirect inguinal hernias are more than direct inguinal hernias in all the above studies. Thus, the present study corroborates with all the above studies.

Our study showed a mean time of 51.8 ± 7.07 mins among prolene group and 43.74 ± 4.53 minutes in fibrin glue group to complete the surgery. This finding was statistically significant with a $p < 0.05$. Similar to our study Testini et al in 2009 showed that mean duration of surgery in prolene group was 45.3 ± 11 minutes and 29.7 ± 5 minutes in fibrin glue group with a significant reduction in duration of surgery ($p \leq 0.001$).¹⁵ Thus, the present study corroborates with all the above studies.

Our study showed a mean time of 11.36 ± 2.32 mins among prolene group and 7.64 ± 1.52 minutes in fibrin glue group to complete the surgery. This finding was statistically significant with a $p < 0.05$ which shows that the decrease in time duration of mesh fixation by fibrin glue significantly changes the overall time of surgery.

It was observed 12 patients among prolene group and 2 patients in fibrin glue group had developed seroma in post-operative period and this finding was statistically significant with a $p < 0.05$. This finding was comparable with other studies like Amerodobasic et al with 30% of control group with seroma and 3.3% of study group with seroma which was statistically significant.¹⁴ Similar study was of Girish et al.¹⁸ All the above studies are in correlation with our study suggest that seroma type of complication is significantly less present in fibrin glue fixation methods compared to conventional suture fixation method.

Study conducted by Amerodobasic et al showed to hematoma formation in both study and control group, similarly another study conducted by Girish et al in 2016 showed that 7% patients in control group and 4% patients in study group developed haematoma, which was statistically not significant.^{14,16} Our study showed that 7 patients among prolene group and 3 patients in fibrin glue group had developed haematoma in early post-operative period and this finding was statistically in-significant with a $p > 0.05$, suggesting that haematoma formation is seen in both types of mesh fixation.

Similarly, 5 patients among control group and 1 patient in study group had developed local numbness in post-operative period because of nerve damage during surgery, This finding was statistically insignificant with a $p > 0.05$. This suggest that there might be local numbness/parasthesia secondary to nerve injury in both methods with a little high incidence in prolene mesh fixation, but not statistically significant.

Study conducted by Paajanen et al in 2011 showed that 1.4% patients of control group and 3.4% of study group developed wound infection.¹³ In contrast to this observation our study showed that the incidence of wound infection in control group was 4 patients out of 50 and the result was similar with study group with $p > 0.05$, showing there is no correlation with the type of mesh fixation and the incidence of wound infection with no statistically significance.

Study conducted by Testini et al did not reveal the presence of any occurrence of urinary problems in either of these groups.¹⁵ Similarly, our study showed that the incidence of urinary retention in control group was 3 patients out of 50 and the result was similar with study group with $p > 0.05$, showing there is no correlation and no significant difference with the type of mesh fixation and the incidence of postoperative urinary retention and incidence of urine problems in the two groups.

The meta-analysis by Liu et al, showed that there was a lower incidence of chronic pain ($p < 0.0001$) in the fibrin glue group.²⁰ Similarly, another study by Testini et al showed a significant reduction in chronic groin pain in fibrin glue group ($p = 0.01$).¹⁵ Our study showed that the incidence of chronic groin Pain in prolene group was

18% and 2% with fibrin glue (p -value < 0.05), showing it to be statistically significant. Thus, the present study corroborates with all the above studies (Table 5).

CONCLUSION

The use of prolene suture for mesh fixation in Lichtenstein's hernia repair is associated with many complications like longer duration of surgery, increased tissue damage, nerve entrapment causing significant postoperative pain, seroma and higher incidence of chronic groin pain. In our study mesh fixation by fibrin glue showed benefits like decreased mean duration of surgery due to its ease in application, decreased incidence of seroma formation, chronic groin pain, foreign body sensation compared to fixation of mesh with prolene suture due to decrease in the trauma to the underlying tissue which was caused by bites taken by prolene suture, and nerve entrapments associated with the use of suture. Through our study from the above-mentioned benefits, it can be concluded that use of fibrin Glue in mesh fixation is a safe and acceptable method and can be used as a better alternative for prolene suture for mesh fixation in Liechtenstein's hernioplasty.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Bangalore Medical College And Research Institute, Bengaluru

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