Fibrin glue versus sutures for mesh fixation in open repair of inguinal hernia

Original Article

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ABSTRACT

Background: A hernia is characterized as a vesicle or portion of a vesicle protruding through an irregular gap in the walls of the cavity it is contained in. Of all the hernia types, inguinal hernias are the most prevalent.

Aim & Objectives: To evaluate the duration of the procedure, discomfort after the procedure, length of hospital stay following the procedure, return to normal life, and recurrence of the hernia, two polypropylene mesh fixation techniques for inguinal hernia repair, as described by Lichtenstein, are being compared: fibrin glue and suture fixation.

Patients and Methods: This prospective study was carried out in the Department of Surgery, El-Zhraa University Hospital, Al-Azhar University, from April 2021 to May 2023, on 80 patients who were divided into two groups: group A (40 cases used fibrin glue mesh fixation in open inguinal hernia repair) and group B (40 cases used suture mesh fixation in open inguinal hernia repair).

Results: Regarding hospital stays and operating times, there was a notable distinction between the two groups: the prolene suture group's operating time was longer than the fibrin glue group's. When comparing the speed of return to normal life between the groups receiving fibrin glue and prolene suture, there was a statistically significant difference. Patients receiving fibrin glue returned to normal life more quickly than those receiving prolene suture.

Conclusion: Fibrin glue is a safer and more acceptable option for mesh fixation than prolene suture in Liechtenstein hernioplasty procedures, but it comes at a hefty price.

Key Words: Fibrin glue, inguinal hernia, prolene suture.

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INTRODUCTION

A hernia is characterized as a vesicle or portion of a vesicle protruding through an irregular gap in the walls of the cavity it is contained in[1]. Of all the hernia types, inguinal hernias are the most prevalent. Surgery is the only effective treatment for inguinal hernias. If hernias are not operated on, the rates of morbidity and death will rise[2]. Inguinal hernia surgeries are frequently carried out, making up around one-third of all operations[3].

The most widely used method for open repair of inguinal hernias is Lichtenstein hernioplasty, which was initially reported in 1984. Its advantages include safety, effectiveness, low recurrence rates, and a short learning curve that leads to very satisfactory outcomes[4].

Complications include chronic groin pain, recurrence, the formation of adhesions, erosions into intraperitoneal organs, and migration of mesh. Such complications usually lead to abscess formation, fistulas, and intestinal obstruction[5].

The most popular hernia surgery is Lichtenstein's tension-free hernioplasty since it has been shown to be better than the other open methods in a number of ways[6].

Fibrin glue has been widely employed in tissue engineering, medication administration, hemostatic agents, tissue adhesive materials, and tissue sealants in all surgical specialties[7].

To lessen the chronic difficulties that follow surgery for hernia repair, tissue adhesives have been suggested as an alternative to permanent fixation devices. The adhesives fall into three basic categories: synthetic glues (like cyanoacrylate-based glues), biologic products (like fibrin), and genetically modified polymer protein glues[8].

To repair inguinal hernias, this study compared two methods of polypropylene mesh fixation, according to Lichtenstein, using fibrin glue and suture fixation. Operative time, postoperative pain, postoperative hospital stay, return to normal life, and hernia recurrence were all evaluated.

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The main goal to achieve this is to evaluate the use of glue as an effective method for mesh fixation and minimize the intraoperative time for fixation, and minimize the use of antibiotics and pain killers for postoperative infection prophylaxis and pain control, respectively. By doing this we will minimize postoperative complication, hospital stays, and the return to normal physical activities very soon and decreasing the coast[9].

PATIENTS AND METHODS:

Eighty patients were enrolled in this prospective study and divided into two groups: group A (40 cases of open inguinal hernia repair using fibrin glue mesh fixation) and group B (40 cases of open inguinal hernia repair using suture mesh fixation). Following clearance from the college's local ethics council, this study was conducted at the surgery department of EL-Zhraa HRAA University Hospital, Al-Azhar University, from April 2021 to May 2023. Every patient was seen during the first year of the study and subsequently throughout the second year.

Inclusion criteria:

Adults with unilateral or bilateral inguinal hernia suitable for elective open mesh repair were involved in this study and gave informed consent.

Exclusion criteria:

Recurrent hernias, emergency room visits, long-term steroid therapy, coagulation issues, continuous chemotherapy, connective tissue diseases, and mental or medical conditions that may impair one's capacity to perceive and express pain.

Methods

All patients were being submitted to the following: History and clinical examination and investigations

Surgical technique: The majority of patients, group A (36 in the glue group) and group B (34 in the suture group), underwent spinal anesthesia during their operations, however, group A (four in the glue group) and group B (six in the suture group) underwent general anesthesia because they were difficult to take spinal anesthesia due to lumbar disks, lumbar fixation history, or complete refusal.

Operation: Using polypropylene mesh as the prosthetic material, the same surgical approach (Lichtenstein) was used on each patient. Except how the mesh was fixed, the two groups underwent identical surgical procedures. The external oblique aponeurosis was made visible through an inguinal incision. To provide a gap for the mesh to be placed later, the upper and lower leaflets of the external oblique muscle separated from the underlying tissues. Identification and preservation of the ilio-inguinal, ilio-hypogastric, and vaginal branches of the genito-femoral nerve were given special attention in all groups. After that, the spermatic cord was cut and the posterior wall was split. The muscle of the cremaster was cut lengthwise. When an indirect oblique hernia occurred, the sac was excised, detached from the cord, and sutured shut using absorbable material. The transversal fascia were plicationed to decrease the sac in the instance of a direct hernia. A 6 ×11 cm polypropylene mesh was positioned to cover the joint tendon and shelving portion of the inguinal ligament, as well as the floor of the inguinal canal that extends from the pubic tubercle to behind the spermatic cord above the internal inguinal ring.

Group A: Fibrin glue was used to secure the mesh using a specially designed syringe. A little amount of glue (0.5–2 ml) was administered to cover the entire mesh surface; drips of glue were applied at irregular spots over the conjoint tendon, inguinal ligament, and pubic tubercle. One polypropylene stitch was used to attach the upper and lower mesh sections, which were flipped over each other lateral to the spermatic cord. The mesh was squeezed against the inguinal floor for approximately 2 mn, after which the skin and subcutaneous fat were closed and the two edges of the external oblique aponeurosis were sutured with vicyrl 2/0 by interpreted sutures.

Group B: Mesh fixation with sutures: A No 3–0 prolene suture was used to attach the mesh's apex to the pubic tubercle. After making an incision in its lower edge to allow for the spermatic cord, the lower border of the mesh was stitched to the free edge of the inguinal ligament. A 1.5 cm length of suture was pushed up behind the cord. The mesh was secured to the conjoined tendon using sutures. The upper and lower flaps of the mesh were sewn together lateral to the spermatic cord using a single polypropylene stitch. The two edges of the external oblique aponeurosis were closed with subcutaneous fat and skin using vicryl 2/0 interpretive sutures.

Postoperative follow-up: All patients are follow-up postoperative in the word as regards to vital data, color and amount of drain if present, post-operative pain, and giving simple analgesia on need. Postoperative pain was monitored using the visual analogue scoring (VAS) scale that is ranged from 0 to 10 in which zero means no pain, 1–3 means mild pain, 4–6 means moderate pain, 7–10 means severe pain, this scale used to the assessment of pain early postoperative and after discharge by serial follow-up in the outpatient clinic after 1, 3, 6 months and 1 year postoperative, postoperative urine retention in a patient with spinal anesthesia. Some patients were discharged from the hospital 24 h postoperative, the others were discharged 48 h post-operative and serially followed up in an outpatient clinic after 1, 3, 6 months, and 1 year for postoperative chronic pain, returning to normal life and recurrence.

RESULTS:

All patients in both groups were males. There was no significant difference with regard to age between the fibrin glue group and the prolene suture group (Table 1).

There was a significant difference with regard to operative time between the two groups the operative time in the fibrin glue group was less than the operative time in the prolene suture group (Table 2).

Table 1: Demographic data

			Chi-square	
	Group A (fibrin glue) (*N*=40) [*n* (%)]	Group B (prolene suture) (*N*=40) [*n* (%)]	T	*P* value
Male	40 (100)	40 (100)		
Female	0	0		
Total	40 (100)	40 (100)	1	0.999
20-30 years	5 (12.5)	7 (17.5		
30–50 years	18 (45)	13 (32.5)		
51–70 years	17 (42.5)	20 (50)	1	0.558
Total	40 (100)	40 (100)		

Table 2: Operative time of the study

	Group A (fibrin glue) (*N*=40)	Group B (prolene suture) (*N*=40)	Chi-square	
	Mean±SD	Mean±SD	t	*P* value
Operative time (min)	47.14±4.839	58.32±6.048	3	0.0412

In terms of discomfort, there was a notable reduction in the first 24–48 h following surgery, 1 month later, 3 months later, and 6 months later, with the suture group experiencing more pain than the fibrin glue group. Additionally, after a year of follow-up, we discovered that there was a substantial difference in pain between the two groups (Table 3).

There was a statistically significant difference between the two groups as regards postoperative hospital stays (Table 4).

Table 3: The results of postoperative pain in group fibrin glue compared with group prolene suture

	Group	24 h	48 h	1 month	3 month	6 month	1 year
No Pain	Group glue	7	15	18	16	22	27
	Group Suture	4	9	12	15	17	13
	P Value	S	S	S	S	S	S
Mild Pain	Group glue	5	9	13	15	16	10
	Group suture	2	5	8	9	13	18
	P Value	S	S	S	S	S	S
moderate Pain	Group glue	4	6	8	9	11	3
	Group Suture	2	3	5	6	7	9
	P Value	S	S	S	S	S	S

Table 4: Postoperative hospital stays data distribution in this study

			Chi-square	
	Group A (fibrin glue) (*N*=40) [*N* (%)]	Group B (prolene suture) (*N*=40) [*N* (%)]	t	*P* value
24 h	35 (87.5)	26 (65)	1	0.5
48 h	5 (12.5)	14 (35)		

12 patients among prolene group and two patients in the fibrin glue group had developed postoperative complications such as seroma, hematoma and infection in post-operative period and this finding was statistically significant (Table 5).

Table 5: The results of complications in group fibrin glue compared with group prolene suture

	Group A (glue group) (*N*=40) [*N* (%)]	Group B (suture group) (*N*=40) [*N* (%)]
Seroma	0	2 (5)
Hematoma	1 (2.5)	3 (7.5)
Infection	1 (2.5)	1 (2.5)
None	38 (95)	1 (85)

There was a statistically significant difference in rapid return to normal life in the group fibrin glue compared with group prolene suture as patients in the fibrin glue returned to normal life after a short period while patients in prolene suture group needed a longer time (Table 6).

Table 6: Return to normal life data distribution in this study

			Chi-square	
	Group A (fibrin glue) (*N*=40) [*N* (%)]	Group B (prolene suture) (*N*=40) [*N* (%)]	t	*P* value
3 months	20 (50)	4 (10)	1	0.61
6 months	15 (37.5)	20 (50)		
1 year	5 (12.5)	16 (40)		

There was no recurrence has been observed in fibrin glue group with 1 case recurrent in the suture group with no significant difference between two groups as regards to recurrence (Table 7).

Table 7: The results of recurrence rate in group fibrin glue compared with group prolene

Recurrence	Group A (fibrin glue) (*N*=40) [*N* (%)]	Group B (prolene suture) (*N*=40) [*N* (%)]
	0	1 (4)

DISCUSSION

There was a 100% male ratio in our survey. While inguinal hernias can affect people of any sex, Burcharth *et al*.'s study[10] revealed that men are more often than women to experience the condition, with a male-to-female ratio of 9 : 1. According to our research, the fibrin glue group had a shorter operating time. The fibrin glue group took roughly 40–50 min, while the suture group took between 55–65 min. The *P value of 0.001* indicated statistical significance. Similar to our findings, Girish *et al*.[11], showed that using adhesive instead of sutures resulted in a noticeably shorter operating time. Jeyakumar *et al*.[12], found that the operative time is shorter with glue if compared with the suture mesh fixation method.

In terms of discomfort, our study revealed a considerable reduction in the first 24–48 h following surgery, as well as in pain after 1, 3, and 6 months. In contrast, the suture group experienced more pain than the fibrin glue group. After a year of follow-up, we also discovered that there was a substantial difference in pain between the two groups. According to Negro *et al*.'s study[13], there is a discernible difference between the tissue glue group and the suture group's pain levels during the initial postoperative phase, with the suture group feeling more discomfort. Negro *et al*.[13], added that after a month, there was no longer any difference in discomfort between the two groups.

Tebala *et al*.[14] discovered that the glue group experienced less pain than the suture group from 48 h to one month following surgery. After the first month, there was no discernible difference between the two approaches in terms of chronic pain. Twelve patients in the prolene group and two patients in the fibrin glue group were found to have experienced post-operative problems, including seroma, hematoma, and infection. This result was statistically significant.

According to Girish *et al*.[11], fibrin glue fixation techniques result in much fewer post-operative problems than suture fixation techniques.

Colvin *et al*.[15], conducted a comprehensive review and meta-analysis in 2013, they showed that using glue for mesh fixation reduces immediate postoperative discomfort, hematoma, and the amount of time it takes to return to regular activities. According to our research, patients in the fibrin glue group returned to their normal lives quickly, whereas patients in the prolene suture group required more time. This outcome is comparable to that of Colvin *et al*.[15], and Akshaya and Ragupathy[16], and is explained by a decrease in inflammatory responses as well as chronic pain and

discomfort following the use of fibrin glue for mesh fixation.

There was no recurrence in the fibrin glue group in this trial, and there was only one case of recurrence in the suture group due to the uncooperation of the patient as he returned early to carrying heavy objects in his work. There was no discernible difference in recurrence between the two groups. In a 2013 comprehensive review and meta-analysis, Colvin *et al*.[15]. showed that there were no differences in the risk of hernia recurrence between mesh fixed with sutures and mesh fixed with glue. In 2014, Sanders and colleagues conducted a comprehensive evaluation of 12 randomized control trials that included 1,992 primary inguinal hernia surgeries and evaluated mesh fixation. Sanders and Waydia,[17]. Regarding rates of recurrence or postoperative infection, there was no discernible difference between the fixation techniques. Recurrences in the glue group significantly increased.

CONCLUSION

Prolene suture mesh fixation in Lichtenstein's hernia repair is linked to several problems, including longer surgical times, more tissue damage, nerve entrapment that results in severe postoperative pain, seroma, and a higher risk of persistent groin pain. In comparison to mesh fixation with prolene suture, which resulted in less trauma to the underlying tissue from bites taken by the suture, and nerve entrapments linked to the use of suture, mesh fixation with fibrin glue showed benefits like decreased mean duration of surgery due to its ease of application, decreased incidence of seroma formation, chronic groin pain, and foreign body sensation. Our analysis of the aforementioned advantages leads us to the conclusion that, although fibrin glue is more expensive than prolene suture, it is a safe and acceptable form of mesh fixation for Liechtenstein hernioplasty (Fig. 1).

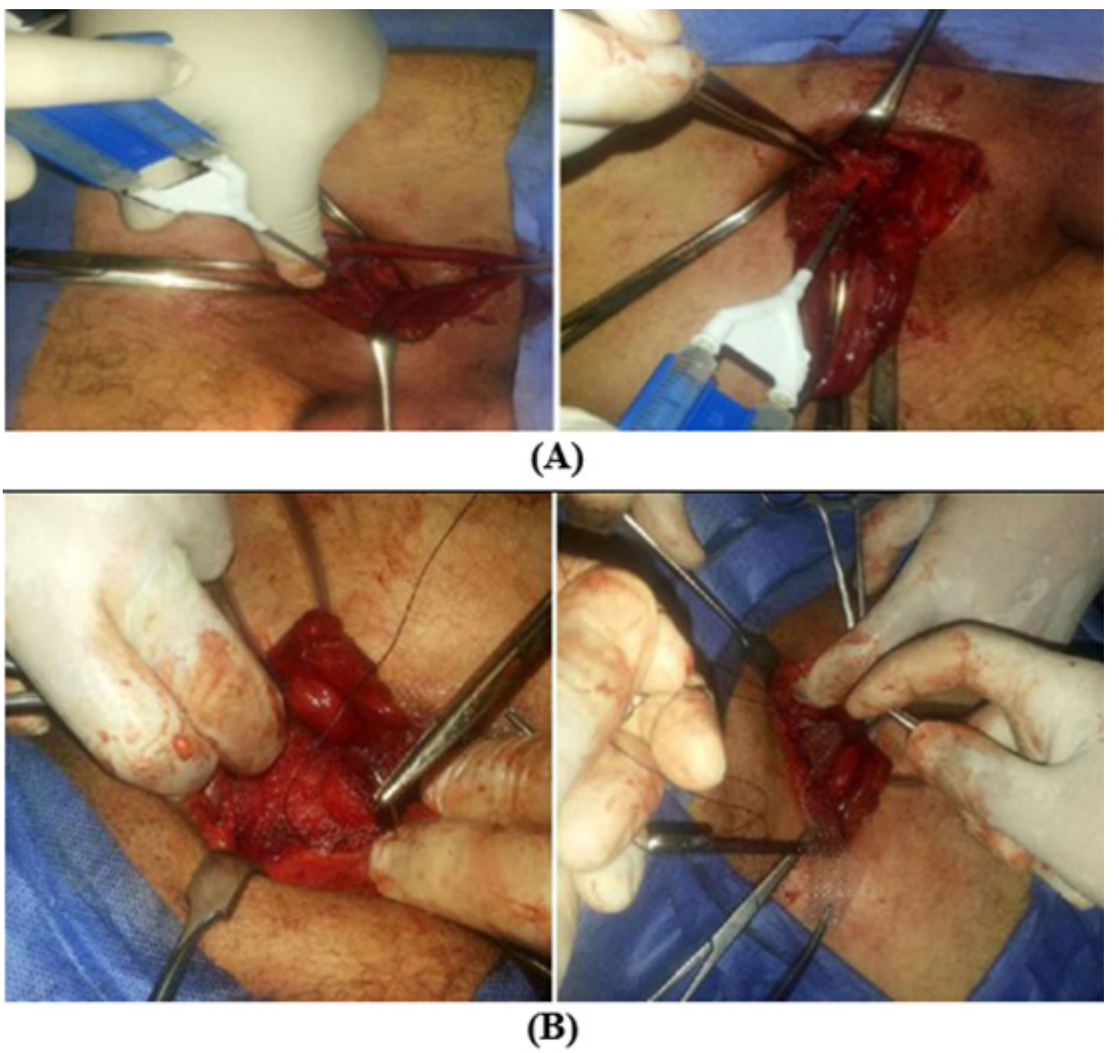

Fig. 1(a): Shows the application of the fibrin glue in mesh fixation using specific applicator with double syringes ended with one open; one syringe has fibrinogen and the second one has thrombin in group A, (b) Showing the sutures mesh fixation using prolene in group B.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Zeineldin AA, El, Tatawy AG, Frig AN. Mesh repair in complicated inguinal hernia. Menoufia Med J 2018; 31:1159.

2. North KA, Bennett DH. Hernia, umbilicus and abdominal wall. Bailey and Love's short practice of Surgery. 25th ed. London: Edward Arnold Publishers; 2015:1143-1162.

3. Kahla SM, Gaber A, , Al-Rahawy MM. The role of antibiotic prophylaxis in the prevention of surgical-site infection after hernioplasty in Menoufia University Hospital. Menoufia Med J 2019; 32:1137.

4. Amid PK. Groin hernia repair: open techniques. World J Surg 2005; 29:1046–1051.

5. Agrawal A, , Avill R. Mesh migration following repair of inguinal hernia: a case report and review of literature. Hernia 2006; 10:79-–782.

6. Jeyakumar S, Chitrambalam TG, Chandrasekaran S. Glue versus suture for mesh fixation in open inguinal hernia repair. Int Surg J 2018; 5:1443–1448.

7. Liu H, , Zheng X, , Gu Y, , Guo S. A meta-analysis examining the use of fibrin glue mesh fixation versus suture mesh fixation in open inguinal hernia repair. Dig Surg 2015; 31:444–451.

8. Odobasic A, Krdzalic G, Hodzic M, Hasukic S, Sehanovic A, Odobasic A. The role of fibrin glue polypropylene mesh fixation in open inguinal hernia repair. Med Arch 2014; 68:90.

9. Helmy AHI. Lichtenstein repair of inguinal hernia: new modalities for mesh fixation; the use of tissue adhesive glue (histoacryl; n butyl 2 cynoacrylate) to fix the mesh. Egypt J Surg 2000; 19:3.

10. Burcharth J, Pedersen M, Bisgaard T, Pedersen C, Rosenberg J. Nationwide prevalence of groin hernia repair. PloS one 2013; 8:e54367.

11. Girish TU, Yetigadda DR. A Comparative Study of Fibrin Glue versus Sutured Mesh Fixation for Lichtenstein Inguinal Hernia Repair. Int J Med Health Res 2016; 2:15–20.

12. Jeyakumar S, Chitrambalam TG, Chandrasekaran S. Glue versus suture for mesh fixation in open inguinal hernia repair. International Surgery Journal 2018; 5:1443–1448.

13. Negro P, Basile F, Brescia A, , Buonanno GM, , Campanelli G, , Canonico S, *et al*. Open tension-free Lichtenstein repair of inguinal hernia: use of fibrin glue versus sutures for mesh fixation. Hernia 2011; 15:7–14.

14. Tebala GD, Tognoni V, Tristram Z, Macciocchi F, Innocenti P. Cyanoacrylate glue versus suture fixation of mesh in inguinal hernia open repair: a randomized controlled clinical trial. Gastroenterol Hepatol Open Access 2015; 2:00054.

15. Colvin HS, , Rao A, , Cavali M, , Campanelli G, , Amin AI. Glue versus suture fixation of mesh during open repair of inguinal hernias: a systematic review and meta-analysis. World journal of surgery 2013; 37:2282–2292.

16. Akshaya G, Ragupathy T, . A Prospective Study on Fibrin Glue versus Prolene Sutures for Mesh Fixation in Inguinal Hernias at SBMCH,. J Res Med Dent Sci, 2022; 10:35–38.

17. Sanders DL, Waydia S. A systematic review of randomised control trials assessing mesh fixation in open inguinal hernia repair. Hernia 2014; 18:165–176.