



Fibrin Glue versus Sutures for Mesh Fixation in open Repair of Uncomplicated Inguinal Hernia

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Abstract: Abdominal wall hernias are common, with a prevalence of 1.7% for all ages and 4% for those aged over 45 years. Inguinal hernias account for 75% of abdominal wall hernia. The increasing use of mesh procedures in inguinal hernia surgery has led to a substantial decrease in the incidence of hernia recurrence. The Lichtenstein technique is a standard procedure for open tension-free inguinal hernia repair performed using prosthetic meshes to strengthen the inguinal canal posterior wall. Sutures and staples may strangulate muscle fibers, compress regional nerves, or give rise to a lesion, leading to incapacitating pain or dysesthesia. Because of the complications associated with sutured mesh fixation following open groin hernia repair have prompted surgeons to evaluate methods of atraumatic fixation, such as the use of human fibrin glue. Fibrin glue is a biodegradable adhesive combining human-derived fibrinogen and thrombin that replicates the last step of the coagulation cascade. It has been used in a variety of surgical fields for its effectiveness, excellent local tolerability, and relative lack of adverse effects and contraindications. In this study, forty (40) patients suffering from uncomplicated inguinal hernia were repaired by tension free hernioplasty (Lichtenstien), was done in Bolak Aldakror General Hospital, Ahmed Maher teaching hospital and hospital, they randomly assigned into 2 groups: group (A): with fibrin glue fixation and group (B): with suture fixation, the main aim of the study was to compare between sutures and fibrin glue for mesh fixation in open inguinal hernioplasty with evaluation of operative time, post-operative pain, hospital stay and return to normal life activity. The presented results show that the mesh fixation with fibrin glue in open, tension free repair by Lichtenstein is simple, safe and effective. This method of fixation show distinct advantages over suture fixation, with slight possibility of chronic pain, and complications. During polypropylene mesh fixation with fibrin glue minimal retraction is required. Greater retraction, as in suture methods, leads to increased tissue contusion and short-term pain. Therefore, consistent with our results, a small contusion of soft tissues associated with minimal postoperative pain is what makes this method more advanced.

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1. Introduction

Abdominal wall hernias are common, with a prevalence of 1.7% for all ages and 4% for those aged over 45 years. Inguinal hernias account for 75% of abdominal wall hernias, with a lifetime risk of 27% in men and 3% in women. (Kingsnorth et al., 2003).

In 2001-2002 about 70 000 inguinal hernia repairs (62 969 primary, 4939 recurrent) were done in England, requiring more than 100 000 hospital bed days. Ninety five per cent of patients presenting to primary care are male, and in men the incidence rises from 11 per 10 000 person years aged 16-24 years to 200 per 10 000 person years aged 75 years or above. (Chow et al., 2007).

The increasing use of mesh procedures in inguinal hernia surgery has led to a substantial decrease in the incidence of hernia recurrence. As a

result, surgeons (and, increasingly, their patients) are now focused on other measures reflecting the success of hernia repair. The prevalence of postoperative pain syndromes after open and laparoscopic procedures has been reported to be as high as 30 %. (Bay-Nielsen et al., 2001).

The Lichtenstein technique is a standard procedure for open tension-free inguinal hernia repair performed using prosthetic meshes to strengthen the inguinal canal posterior wall (Amid, 2004).

Sutures and staples may strangulate muscle fibers, compress regional nerves, or give rise to a lesion, leading to incapacitating pain or dysesthesia. Because of the complications associated with sutured mesh fixation following open groin hernia repair have prompted surgeons to evaluate methods of atraumatic

fixation, such as the use of human fibrin glue (Alfieri et al., 2007).

Fibrin glue is a biodegradable adhesive combining human-derived fibrinogen and thrombin that replicates the last step of the coagulation cascade. It has been used in a variety of surgical fields for its effectiveness, excellent local tolerability, and relative lack of adverse effects and contraindications. Its adhesive and hemostatic properties have been demonstrated in a number of experimental studies and clinical trials (Canonico, 2003).

Aim of the Work

The aim of this work is to compare between sutures and fibrin glue for mesh fixation in open inguinal hernioplasty with evaluation of operative time, post-operative pain, hospital stay, cost, return to normal life activity and recurrence.

2. Patients and method.

This study including forty (40) patients suffering from uncomplicated inguinal hernia were repaired by tension free hernioplasty (Lichtenstein), was done in Bolak Aldakror General Hospital, Ahmed Maher teaching hospital, In the period between September 2017 till September 2018. Patients were randomly divided into 2 groups: group (A) mesh was fixed by fibrin glue included (20) patients and another group (B) mesh was fixed by polypropylene suture included (20) patients.

Patients:

Including criteria:

All patients with inguinal hernia and need to hernioplasty.

Excluding criteria:

1. Chronic systemic disease (chest infection with chronic cough as bronchial asthma, liver disease, ascites and renal failure).
2. Recurrent hernia.
3. Complicated inguinal hernia.
4. Femoral hernia.
5. Immunocompromised patient as well as malignancies.

Methods

Table (1): Comparison between suture group and fibrin glue mesh fixation group regarding risk factors

Group	Fibrin Glue		Suture		χ^2 Test	P Value
	No	%	No	%		
DM	0/20	0	1/20	5	0.411	0.68
HTN	2/20	10	4/20	20	5.04	1.14
Smoker	12/20	60	14/20	70	0.87	0.38

3. Operative Time:

Operative time was statistically highly significant comparing both group: as mean operative

Pre-operative assessment:

1. Full clinical history and clinical examination (general and local) including chest infection, chronic cough, constipation and BPH.

2. Routine pre-operative blood tests (CBC, liver and kidney function tests, RBG and coagulation profile). plain chest x ray, ECG and echocardiography (if indicated).

3. Randomization by used 40 closed envelop opened at time of mesh fixation.

Patient preparation:

- All the patients signed an informed consent.
- Control of any coexisting medical disease.
- Prophylactic antibiotic with induction of anesthesia.

Statistical analysis

All data were statistically analysed by using statistical package for social science (SPSS 20). Data were presented according to type of data obtained from each parameter.

3. Results

1. In this study, forty (40) patients suffering from uncomplicated inguinal hernia were repaired by tension free hernioplasty (Lichtenstien), was done in Bolak Aldakror General Hospital and Ahmed Maher teaching hospital, they randomly assigned into 2 groups: group (A): with fibrin glue fixation and group (B) with suture fixation, the main aim of the study was to compare between sutures and fibrin glue for mesh fixation in open inguinal hernioplasty with evaluation of operative time, post-operative pain, hospital stay and return to normal life activity.

2. Risk factors and P.d factor:

Table (1): shows that, only one patient in the suture group (5%) was diabetic. While six patients were hypertensive, two of them were in FG group (10%) and four were in the suture group (20%); regarding smoking it was found that (60%) of the fibrin glue group were smokers and (70%) of the suture group were smokers.

time in mesh fixation by fibrin glue group (41.5 ± 4.18); (35 -48) min while mean operative time in suture group (48.57 ± 4.3); (42 -56) min.

Table (2): Comparison between suture group and fibrin glue mesh fixation group regarding the operative time

Group	Fibrin Glue	Suture	T Test	P Value
Operative time (min)	35-48	42-56	4.41	0.0001
Mean ±SD	41.5 ± 4.18	48.57 ± 4.3		

4. Postoperative pain:

Table (3) clarifies the comparison between the two studied groups regarding post operative pain according to (Numeric pain rating scales) (NPRS), it was found that (70%) of fibrin glue group cases had mild pain score; (30%) had moderate pain score and no patients had severe pain score. In the suture group (45%) of patients had mild pain score; (55%) of patients had moderate pain score and no patients had severe pain score. There was highly statically significant difference between the two groups

regarding the post operative pain; (57.5%) of the two studied groups had mild pain score. The fibrin glue group patients had less pain.

5. Hospital stay:

Figure (1): Shows none statically significant difference between the two studied groups regarding the hospital stay. In the fibrin glue group; the mean time of the hospital stay ranged between (18:30) hours; in the suture group, the mean time of the hospital stay ranged between (24:36) hours (p value >0.05).

Table (3): Comparison between suture group and fibrin glue mesh fixation group regarding the post operative pain.

GROUP	Fibrin glue		Sutures		Total		χ ² Test	P value
	no	%	no	%	no	%		
Pain								
Mild	14/20	70	9/20	45	23/40	57.5	3.454	0.001
Moderate	6/20	30	11/20	55	17/40	42.5		
Sever	0	0	0	0	0	0		

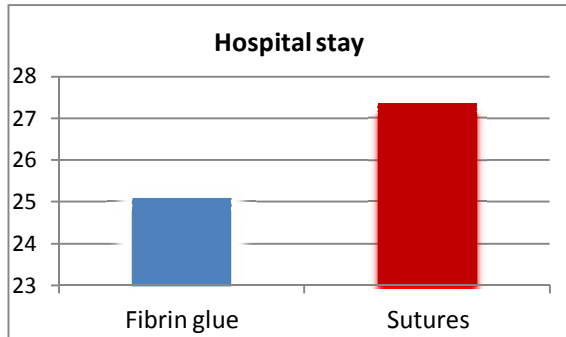


Figure (1): Hospital stay

patients had hermatoma. In the suture group; the majority (60%) of patients had no secondary complications; (20%) had seroma; (15%) had scrotal edema and (5%) of the patients had hermatoma. There was statically significant difference between the two groups regarding the post operative pain. (p value >0.05).

7. Return to normal work:

Comparing between both group (suture & FG) in return to normal work, patients were found in FG group were returned to normal work faster than patient fixation in suture group. As patient with FG returned to their work after (12-14) days with mean duration ±SD (12.7±0.8), while patient in suture group return to their work after (14-21) days with mean duration ±SD (17.7±2.2). Which was statically insignificant.

6. Secondary complications to surgery

Table (4) shows secondary complications to surgery appeared in the first month of the follow up period. In the fibrin glue group; the majority (85%) of patients had no secondary complications; (10%) had seroma; (5%) had scrotal edema and none of the

Table (4): Comparison between suture group and fibrin glue mesh fixation group regarding the secondary complications to surgery

GROUP	Fibrin glue		sutures		total		χ ² Test	P value
	no	%	no	%	No	%		
2Ry Complications								
Hermatoma	0/20	0	1/20	5	1/40	2.5	3.610	0.0003
Seroma	2/20	10	4/20	20	6/40	15		
Scrotal edema	1/20	5	3/20	15	4/20	10		
None	17/20	85	12/20	60	29/40	72.5		
total	20	100	20	100	40	100		

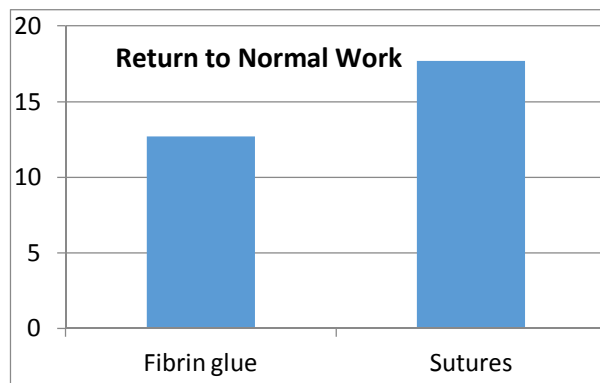


Figure (2): Return to normal work

4. Discussion

Hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity. Inguinal hernias are the most common hernia; they account for 90% of all spontaneous hernias (*Zein Elden et al., 2018*).

Treatment of inguinal hernia is still a challenge for the surgeon. The multitude of surgical techniques attests of the difficulty of choosing the best procedure. The Lichtenstein technique remains the gold standard technique in the treatment of inguinal hernias by open surgery. It is a safe, simple, reproducible procedure with a low recurrence rate (*Samaali et al., 2016*).

Our study included 40 patients with uncomplicated inguinal hernia repaired by tension free hernioplasty (Lichtenstein). The patients were followed up at day 3,7,14 and after 2 month.

Results of the present study shows none statically significant difference between suture group and fibrin glue mesh fixation group regarding age; the mean age in the suture group was (36.7 ± 10.95) while the mean age in fibrin glue group was (36.95 ± 12.3) .

In *Jeyakumar et al., (2018)* study, the majority of the patients (17 in the glue group and 19 in the suture group) were from the age group between 31-60 years indicating that the patients in the study were predominantly middle aged.

In *Odobasic et al., (2014)* study, the average age was 51.3 years (range 19-72 years). Glue group had an average age of 52.3 years and the suture group of 50.3 years. *Karigoudar et al., (2016)* found that, of 64 patients, the mean age of patients in the fibrin glue group was 44.5 years and that in the suture group was 44.2 years.

In our study, only one patient in the suture group (5%) was diabetic; while (10%) of the fibrin group patients were hypertensive and (20%) in the suture group were hypertensive; regarding smoking it was found that (60%) of the fibrin glue group were

smokers and (70%) of the suture group were smokers.

Maghsoodi and Paarvand, (2005) had 100% men in their study. Most of their patients had risk factors for the development of hernia, the most common being smoking (76.6%).

Results of the current study shows that the mean operative time in fibrin glue group was (41.5 ± 4.18) min; while the mean operative time in the suture group was (48.57 ± 4.3) . There was highly statically significant difference between the two groups regarding the operative time.

This agrees with *Karigoudar et al., (2016)*, there was a significant difference in the duration of surgery, with the mean duration in the fibrin glue group being 30.6 min and that in the suture group being 43.3 min. *Sanders and Waydia, (2014)* also showed that there was a significant reduction in operative time, ranging from 6 to 17.9 min with non-suture fixation, in five of the studies.

Hoyuela et al., (2017) study, revealed that the operation was significantly quicker using glue (mean (s.d.) $35.3(8.7)$ min versus $39.9(11.1)$ min for sutures; $P < 0.001$). *Paajanen et al., (2011)* found that the mean (s.d.) duration of operation was $34(12)$ min in the glue group and $36(13)$ min in the suture group ($P = 0.113$).

Testini et al., (2010) also found that the mean duration of surgery was 54.5 (SD 11.44) minutes in the suture group, 56.2 (SD 8.87) minutes in the fibrin glue group.

Two meta-analyses compared glue fixation to suture fixation, and concluded that glue fixation was superior to suture fixation, especially regarding its short operative time (*Colvin et al., 2013; Ladwa et al., 2013*).

Following Lichtenstein hernia repair, up to 25% of patients experience prolonged postoperative and chronic pain as well as discomfort in the groin. One of the underlying causes of these complaints is the nerves compression or irritation by the sutures used to fixate the mesh (*Kim-Fuchs et al., 2012*).

One of the most crucial criteria for successful modern inguinal hernia repair is short recovery time combined with postoperative pain as minor as possible (*Dabrowiecki et al., 2012*).

In the present study, (70%) of fibrin glue group cases had mild pain score; (30%) had moderate pain score and no patients had severe pain score. In the suture group (45%) of patients had mild pain score; (55%) of patients had moderate pain score and no patients had severe pain score. There was highly statically significant difference between the two groups regarding the post operative pain. The fibrin glue group patients had less pain.

Our results agree with *Campanelli et al., (2012)*,

they found less pain in the fibrin group than in the sutures group at 1 and 6 months, as reflected by a lower proportion of patients using analgesics in the fibrin group over the study duration (65.2% vs 79.7%).

Glue fixation of mesh for open inguinal hernioplasty is superior in many outcomes including the reduction of chronic groin pain. Glue fixation was not associated with an increased risk of hernia recurrence (*Colvin et al., 2013*).

The study conducted by *Negro et al., (2010)* showed that there is a significant difference in the pain experienced in the immediate postoperative period between the tissue glue group and the suture group, with the suture group experiencing a higher pain. They also stated that the difference in pain between both the groups disappears after 1 month. However, they observed complications like hematoma formation and ecchymoses in the glue group.

Tebala, (2015) had found that the pain from 48 hours to 1 month (immediate post-operative pain) post-surgery is lower in the glue group as compared to suture. However, no significant difference could be appreciated between the 2 methods in terms of chronic pain.

Matikainen et al., (2016) also concluded from their study that there is no difference in the chronic pain experienced by both the groups, although the immediate postoperative pain with glue is significantly less.

Quyn et al., (2012) had also found a significantly lower acute and chronic pain with glue use in their study.

Sun et al., (2017) also described similar results—lower acute and chronic post-operative pain with glue.

In *Odobasic et al., (2014)* study, after a one-month assessment, patients from the fibrin group reported significantly less pain, paresthesia, and discomfort, as compared to patients from suture group. A study by *Fortelny et al., (2014)* showed that less postoperative pain was reported in the fibrin group compared to the suture group at 6 weeks ($p=0.035$), 6 months ($p=0.023$), and 1 year ($p=0.011$) postoperatively.

Our results show none statically significant difference between the two studied groups regarding the hospital stay. In the fibrin glue group; the mean time of the hospital stay ranged between (18:30) hours; in the suture group, the mean time of the hospital stay ranged between (24:36) hours.

Our results agree with *Eldabe Mikhail et al., (2012)* study, the post-operative stay was 14.7h for the glue group, and 19.1h in the suture group ($P<.0001$). *Testini et al., (2010)* found none significant difference between the groups in terms of mean postoperative

stay (32.6 h in the suture group v. 30.8 h in the fibrin glue group. Also, *Sanders and Waydia, (2014)* showed that there were no significant differences in length of hospital stay or quality of life between the two methods.

In the current study, secondary complications to surgery were appeared in the first month of the follow up period. In the fibrin glue group; the majority (85%) of patients had no secondary complications; (10%) had seroma; (5%) had scrotal edema and none of the patients had hermatoma. In the suture group; the majority (60%) of patients had no secondary complications; (20%) had seroma; (15%) had scrotal edema and (5%) of the patients had hermatoma. There was statically significant difference between the two groups regarding the post operative pain.

Jeyakumar et al., (2018) found no complications in the form of seroma, wound infection, hematoma, ecchymoses have occurred in their study in either of the groups.

As regards early postoperative complications in using glue, *Elkhateeb et al., (2019)* reported that 5.6% of cases had hematoma, 3.7% of cases reported infection, and 7.4% of cases have reported postoperative seroma.

The use of fibrin glue for fixation in inguinal hernia repair achieved excellent results, with significantly fewer side effects as compared to the suture fixation. In *Odobasic et al., (2014)* study, results showed that patients in fibrin group rarely experienced early local “hemorrhagic” complications (hematoma, ecchymosis...) as compared to suture group. There was a lower incidence of hematoma (1.7 vs. 8.2%) and ecchymosis (8.6 vs. 15.2%) in patients treated with fibrin glue, as compared to patients in the suture group (both $p = 0.001$).

Hoyuela et al., (2017) study, revealed no significant differences between the groups in terms of postoperative complications.

Results of the current study shows none statically significant difference between the two studied groups regarding return to normal work. In the fibrin glue group; patients returned to normal work after (12-14) days with mean duration (12.7±0.8) days, while in the suture group patients return to normal work after (14-21) days with mean duration (17.7±2.2) days.

Testini et al., (2010) also found none significant difference between the groups in terms of mean time to return to work (20.4 d in the suture group v. 20.3 d in the fibrin glue group).

Elkhateeb et al., (2019) stated that the ‘glue’ technique was considered easier and quicker with regard to its method of application and reduction of the whole surgical procedure. At postoperative follow-up, it was significant that most patients showed

satisfactory results in terms of less pain and quicker return to their normal activities.

Lichtenstein repair for inguinal hernia using glue mesh fixation compared with sutures was faster and time to return to daily activities was shorter (*de Goede et al., 2013*).

Conclusion

The presented results show that the mesh fixation with fibrin glue in open, tension-free repair by Lichtenstein is simple, safe and effective. This method of fixation show distinct advantages over suture fixation, with slight possibility of chronic pain, and complications.

During polypropylene mesh fixation with fibrin glue minimal retraction is required. Greater retraction, as in suture methods, leads to increased tissue contusion and short-term pain. Therefore, consistent with our results, a small contusion of soft tissues associated with minimal postoperative pain is what makes this method more advanced. For this approach, to become widespread it will need further evaluation in multicenter with controlled trials for longer time.

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