Polypropylene Suture Fixation versus Fibrin Glue in Lichtenstein Inguinal Hernia Repair: A Prospective Randomized Study

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ABSTRACT

Background: *In inguinal hernia repair, minimizing the intraoperative and postoperative complications and early ambulation are the main goals, however, traditional methods of mesh fixation are associated with several problems including substantial risks of early postoperative and chronic pain. The aim of this study is to evaluate the advantages of fibrin glue over polypropylene suture in mesh fixation in Lichtenstein inguinal hernia repair.* ***Patients and methods****: Fifty-two male patients with inguinal hernia underwent Lichtenstein hernia repair in the Department of General Surgery at Ain Shams University hospitals in the period from June 2013 to July 2015. The patients were prospectively randomized into two groups group A (polypropylene suture group) and group B (fibrin glue group). In group A, polypropylene sutures were used for mesh fixation, and in group B fibrin glue was used for mesh fixation. Ilio-inguinal nerve was dissected and preserved in all cases.* ***Results****: The mean age of patients in group A was 43.5 years and that of group B patients was 41.2 years. There was a significant difference in the duration of surgery, with the mean duration in polypropylene suture group was more that of the fibrin glue group. The mean numeric rating pain scale of postoperative pain at 1, 6, 12, and 24 h was significantly higher in the suture group than in the fibrin glue group (p<0.001). The mean total dose of analgesia in ampoules of pethidine was significantly less in the fibrin glue group (0.80 ampoules) than that in the polypropylene suture group (2.25 ampoules) with p=0.002 while the incidence of chronic pain was higher in the polypropylene suture group than that in the fibrin glue group.* ***Conclusion:*** *this study demonstrates that the use of fibrin glue instead of polypropylene suture in Lichtenstein inguinal hernia repair can help in decreasing the operative time, postoperative pain, hospital stay, and the incidence of chronic groin pain.*

Key words: *Fibrin glue, polypropylene, inguinal hernia, mesh fixation.*

INTRODUCTION

The vast majority of hernias occur in the inguinal region, and the high incidence of this condition means that inguinal hernia repair is one of the most frequently performed surgical procedures.[1]

In the early 1980s, Lichtenstein popularized the tension free repair, supplanting tissue-based repairs with the widespread acceptance of prosthetic materials for inguinal floor reconstruction. This technique was superior to previous tissue-based repair in that mesh could restore the strength of the transversalis fascia, thereby avoiding tension in the defect closure. Superior results were reproducible regardless of hernia size and type, and they were achievable among expert and non-expert hernia surgeons alike.[2]

Prosthetic mesh, which is usually made of polypropylene but may be made of Dacron or Mersilene, has traditionally been secured using sutures, staples, or tacks.[3]

However, a study in which laparoscopic unfixated mesh-based repair of inguinal hernias was associated with less postoperative pain than laparoscopic tack-fixated mesh-based repair has led to the conclusion that inappropriate placement of fixation devices may be a cause of the chronic postoperative pain that is described by many patients.[4]

Pain after inguinal hernia repair is classified into acute or chronic manifestations of three mechanisms: nociceptive (somatic), neuropathic, and visceral pain. Nociceptive pain is the most common of the three. Because it is usually a result of ligamentous or muscular trauma and inflammation, it is reproduced with abdominal muscle contraction. Treatment consists of rest, nonsteroidal anti-inflammatory drugs (NSAIDs), and reassurance, as it resolves spontaneously in most cases. Neuropathic pain occurs as a result of direct ilio-inguinal nerve damage or entrapment.

It may present early or late, and it manifests as a localized, sharp, burning or tearing sensation. It may respond to pharmacologic therapy and to local steroid or anesthetic injections when indicated. Visceral pain refers to pain conveyed through afferent autonomic pain fibers. It is usually poorly localized and may occur during ejaculation as a result of sympathetic plexus injury.[5]

Chronic postoperative pain remains an important measure of clinical outcome that has been reported in as many as 63% of inguinal hernia repair cases.[6]

Studies have also shown that fibrin glue does not increase the risk of these morbidities and may decrease the risk compared with polypropylene fixation method.

Based on above suppositions, we took up the study to make Lichtenstein hernia repair suture-less by using fibrin glue which is more biological.

The aim of this study is to assess the advantages of fibrin glue over polypropylene suture in mesh fixation in open inguinal hernia repair.

PATIENTS AND METHODS

This prospective randomized study involved 52 male patients with inguinal hernias, who underwent Lichtenstein hernia repair in the department of General Surgery at Ain Shams University hospitals in the period from June 2013 to July 2015. Patients were randomly allocated to either group A (polypropylene suture group with 26 patients) and group B (fibrin glue group with 26 patients) by the coin flip technique. In group A, polypropylene suture was used for mesh fixation, and in group B, fibrin glue was used. Recurrent, obstructed, and strangulated hernias were excluded from the study population as well as patients unfit for surgery. All surgeries were done under general anesthesia. The patients were educated preoperatively regarding the use of numeric rating pain scale. A written informed consent was taken from all the candidates.

Before introduction of anesthesia, patients were randomized prospectively into group A and group B. The Lichtenstein tension-free repair was performed. Preservation of the ilio-inguinal nerve was performed. The operative time, postoperative pain, hospital stay, and chronic groin pain were recorded.

During the postoperative period, all patients were prescribed intravenous pethidine (50 mg) for analgesia if required. The time of the first postoperative analgesic dose as well as the total requirement of postoperative analgesic was recorded for each patient. The degree of postoperative pain was assessed by means of numeric rating pain scale at 1, 6, 12, and 24 h postoperatively. The inferences were drawn with the use of appropriate tests of significance.

Statistical Methodology:

Data were coded and entered using the statistical package SPSS (Statistical Package for the Social Science) version 23. Data was summarized using mean, minimum and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data.

RESULTS

52 patients with inguinal hernias were included in study, the mean age of patients in the polypropylene suture group was 43.5 years and that in the fibrin glue group was 41.2 years. There was a significant difference in the duration of surgery, with the mean duration in the polypropylene suture group being 45.3±11 min and that in the fibrin glue group being 29.7±5 min (Table 1).

Table (1): Comparison between duration of surgery in both groups.

Group	No.	Duration of surgery (min.±SD)	P value
Polypropylene suture	26	45.3±11	<0.001
Fibrin glue	26	29.7±5	

The mean numeric rating pain scale of postoperative pain at 1, 8, 16, and 24 h was significantly lower in the fibrin glue group than in the suture glue group (Table 2).

Table (2): Comparison between numeric pain scale in both groups.

	Mean Numeric Pain Scale		**P value**
	Polypropylene suture group	**Fibrin glue group**	
At 1 hr.	7.4	5.3	<0.001
At 8 hrs.	6.5	3.9	
At 16 hrs.	5.5	3.5	
At 24 hrs.	6.2	4.6	

The first dose of analgesia required was significantly earlier in the polypropylene suture group than in the fibrin glue group ($p<0.001$) (Table 3). The mean total dose of analgesia in ampoules of pethidine was significantly high in the polypropylene suture group (2.25±1.20 ampoules) than that in the fibrin glue group (0.80±0.30 ampoules) with a $p<0.001$.
The mean duration of hospital stay was the same in both the groups.

Table (3): Comparison between time of first dose analgesia required in both groups.

Time of first dose analgesia required	**No. of patients**		**P value**
	Polypropylene suture group	**Fibrin glue group**	
30 min.	5	0	<0.001
45 min.	3	0	
60 min.	5	0	
75 min.	6	3	
90 min.	3	7	
105 min.	2	8	
120 min.	2	8	

At the end of the first week, 14 patients (53.84%) of the polypropylene suture group and 3 patients (11.53%) of the fibrin glue group presented with mild to moderate degree of groin pain at the end of the first week (P value=0.001).
At the end of the first month, 6 patients (23.07%) of the polypropylene suture group presented with mild groin pain (P value= 0.0048). At the end of the second and third months, 4 patients (15.38%) (P value=0.0108) and two patients (7.69%) (P value=0.1132) respectively presented with mild groin pain in the polypropylene suture group (Table 4). There was no groin pain in the fibrin group at the end of the first, second, and third month.

Table (4): Comparison between number of patients with postoperative groin pain in both groups.

	At 1 week			**At 1 month**			**At 2 months**			**At 3 months**		
	No pain	**Mild pain**	**Moderate pain**	**No pain**	**Mild pain**	**Moderate pain**	**No pain**	**Mild pain**	**Moderate pain**	**No pain**	**Mild pain**	**Moderate pain**
Polypropylene suture group	12	9	5	20	6	0	22	4	0	24	2	0
Fibrin glue group	23	2	1	26	0	0	26	0	0	26	0	0
P value	**0.0010**			**0.0048**			**0.0108**			**0.1132**		

DISCUSSION

Post-herniorrhaphy inguinodynia is a debilitating complication caused by a combination of nociceptive, neuropathic, and visceral elements. Its incidence is independent of the method of hernia repair.[7]

In Egypt, Lichtenstein tension-free method of hernia repair is the most commonly used approach for open inguinal hernia repair.

Conventionally, the polypropylene suture is used to fix the mesh. Fixing mesh with suture can increase the incidence of postoperative and chronic pain due to nerve entrapment and this can lead to longer duration of hospital stay.

For Lichtenstein's inguinal hernia repair, we should aim for hernia repair, tension-free mesh fixation, early ambulation, decreased duration of hospital stay, and reduce postoperative and chronic pain.

To achieve our goal, we have conducted a prospective randomized study using fibrin glue for mesh fixation in the Lichtenstein method of open inguinal hernia repair. Fibrin glue is a two-component material consisting of fibrinogen and thrombin. In the presence of small amounts of calcium and factor XIII, the thrombin converts fibrinogen into insoluble fibrin, the final stable form of the agent Fibrin sealant now has over a century of development and use. The Food and Drug Administration (FDA) approved liquid fibrin sealant in 1998 as well as a fibrin sealant patch in 2010.[8]

Our prospective study has confirmed that the use of fibrin glue for mesh fixation significantly decreases postoperative pain as evidenced by the marked difference in the mean numeric rating pain scale of our two groups. The pain perceptions were significantly lower in the fibrin glue group as compared to the suture group (p value <0.001).

Negro et al.,2011 showed that the mean pain score was significantly lower in the fibrin glue group than the polypropylene suture group (2.5 vs. 3.2) and fibrin glue group patients also experienced less intense pain (0.6 vs. 1.2).

Fortelny et al.,2014 whose results were correspondence to our results, showed that less postoperative pain was reported in the fibrin glue group compared to the suture group at 6 weeks (p=0.035), 6 months (p=0.023), and 1 year (p=0.011) postoperatively. In addition, fibrin glue group showed a faster surgical procedure, and a shorter hospital stay.

In our study, the perception of postoperative groin pain was significantly high at the end of the first week and after the first month and the second month (p=0.0048) in the polypropylene suture group, but was statistically not significant at the end of the third month (p=0.1132).

Liu et al., 2014 also showed that there was a lower incidence of chronic pain in the fibrin glue group.

This study also showed that the time at which the first dose of analgesia was given was much earlier in those in the polypropylene suture group when compared to those in the fibrin glue group (p<0.001). The total dose of analgesia requirement was also significantly higher in the suture group as compared to the fibrin glue group (p<0.001).

The duration of surgery was significantly shorter in the fibrin glue group as compared to the suture group (p<0.001), thus making fibrin glue the safe and suitable alternative.

A systematic review of randomized control trials assessing mesh fixation in open inguinal hernia repair in by Sanders et al., 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. Although infrequently measured, there were no significant differences in length of hospital stay or quality of life between fixation methods.

From the meta-analysis done by N. Ladwa et al., 2013 on nine trials on the use of fibrin glue for the open inguinal hernia repair, it was concluded that the use of fibrin glue reduced the risk of developing postoperative groin pain. It was equivalent to suture mesh fixation in terms of operation time and urinary problems. The use of glue to fix mesh during the open tension-free hernioplasty has come across another important issue, cost-benefit analysis. Only one of the included studies reported a cost-benefit analysis. Although the glue is more expensive than the sutures, the total costs of the two procedures did not change significantly. The cost of glue may be balanced against a shorter operating time, shorter time to return to daily activities and potentially reduced convalescence owing to less early postoperative pain. Further studies, dealing with the cost effectiveness of different fixation techniques, are needed to investigate this issue.

In conclusion, our results showed that fibrin glue mesh fixation resulted in less surgery duration, less risk of developing postoperative groin pain, less analgesia required and the risk of developing inguinal pain was decreased. However, more trials with high-quality and long-term follow-up observation are needed to ensure this conclusion.

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