

## Mesh Fixation Using Fibrin Glue Sealant in Laparoscopic Inguinal Hernia Repair (TAPP and TEP): A Prospective Randomized Study

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### Abstract

To evaluate the efficacy and safety of mesh fixation by means of fibrin sealant during laparoscopic inguinal hernia repair (TAPP and TEP). Because of its haemostatic and adhesive properties, fibrin sealant has been used in many areas of surgical treatment in recent years. In groin hernia repairs fibrin glue has become increasingly established as an alternative method for mesh fixation. Clinically, fixation with fibrin sealant shows a reduced postoperative complication rate compared to fixation with staples and sutures. 60 Inguinal hernia patients with age more than 18 years were included in the study and were divided into two groups of thirty patients each, for their laparoscopic repair of groin hernia. One group underwent TAPP repair and the other group underwent TEP repair. In both the groups mesh was fixed with fibrin sealant using a 3mm catheter (Duplotip: Baxter Healthcare), which fits the Tisseel syringe. The use of fibrin sealant has a distinct advantage in laparoscopic inguinal hernias repairs. The use of fibrin sealant to anchor the mesh was found to be easy and less expensive than stapling. No fibrin sealant related adverse effects were found. Mesh fixation with fibrin glue is preferable as it meets the requirements for both efficiency and security of fixation.

### Keywords

Fibrin sealant, Laparoscopic Inguinal Herniorrhaphy, Laparoscopy, Mesh Fixation, TAPP, TEP

### Introduction

Inguinal hernias are repaired surgically by open as well as by laparoscopic methods. All methods of repairs use mesh prosthesis. Presently, the laparoscopic inguinal hernia repair is accomplished by two approaches: Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) repair with mesh prosthesis. The prosthetic material used is secured by either using a conventional suture, or with staples or tacks. Despite the “tension-free” nature of these hernioplasties, sutures may cause strangulation of muscle fibres, or compression of the regional nerves, leading to invalidating pain or dysesthesia (1), which, at times, is chronic and permanent and can lead to poor quality of life (2).

The incidence of these chronic complications was underestimated for a long time and is currently estimated to be between 0% and 75.5%<sup>3</sup>. With the reduction or even disappearance of recurrence of hernia, this morbidity is now of importance, and therefore, Pooblan *et al* modified the method used to anchor prosthesis using fibrin glue (3).

Fibrin glue/sealant is a commercial tissue adhesive containing fibrinogen and thrombin. The commercial product is a two component system from human plasma that contains more fibrinogen and thrombin. The first component contains highly concentrated fibrinogen, factor XIII, fibronectin, and traces of other plasma proteins.

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The second component contains thrombin, calcium chloride, and antifibrinolytic agent such as aprotinin. Mixing of two components leads to activation of fibrinogen and thrombin by calcium chloride, formation and cross linking of fibrin leading to the formation of polymerized fibrin chains, duplicating the last step of the coagulation cascade, that is how it adheres the mesh to the tissues. The fibrinogen component gives tensile strength, thrombin stimulates fibroblast proliferation and aprotinin, an antifibrinolytic agent enhances the life span of the sealant. Fibrin glue has been used in many areas of surgical treatment in recent years because of its haemostatic and adhesive properties (4). Promising initial results have shown that the strength of mesh fixation with fibrin glue is at least comparable to that using staples<sup>5</sup>. Increased fibroblast activity even resulted in better and faster incorporation of the mesh material<sup>6</sup>. The main aim of this study was to evaluate the feasibility and efficacy of use of fibrin sealant/fibrin glue in laparoscopic inguinal hernia repair (TAPP and TEP), in terms of, operative time, complications (intraoperative and postoperative), length of hospital stay and recurrence rate.

### **Materials & Methods**

This Prospective case series study comprised of sixty patients admitted for elective laparoscopic surgery for groin hernias in various surgical wards of Govt Medical College & Hospital, Srinagar, India. Patients were randomly picked for either of the two procedures. Randomization was done using computer based programme. The patients with unilateral or bilateral inguinal hernia and failed previous open hernia surgery were selected unbiased from either sex, above 18 years of age. Patients with BMI>35, connective tissue disorders, contraindication to laparoscopy, previous lower abdominal surgery, except open hernia surgery, and age<18 years were excluded from the study.

### **Operative Technique**

#### **Mesh Fixation Using Fibrin Glue in TAPP**

After proper evaluation surgery was performed under general anaesthesia. After reducing the hernia contents

and reducing the hernia sac, sufficient space for mesh placement was created by blunt dissection by lifting peritoneal flaps, parietalization of cord and dissection of Coopers ligament. Mesh was then positioned so as to cover all hernial orifices, Coopers ligament, triangle of pain, triangle of doom, epigastric vessels and spermatic cord.

The mesh was fixed with 1ml of fibrin sealant (Tissucol) for unilateral hernias and 2ml for bilateral hernias. The prosthesis was fixed along its upper margin, from Coopers ligament to the “triangle of doom”, and to the “triangle of pain” using a 3mm catheter (Duplotip: Baxter Healthcare), which fits the Tisseel syringe. Tisseel was applied in two different ways: By resting the tip of the Duplotip catheter, where the mesh is to be fixed and by squeezing out a few drops of glue or the glue seeps across the mesh and fixing it. One can also separate the mesh slightly from the inguinal wall, spray the glue directly on it, and then place the mesh to the wall. Peritoneum was closed by approximating the peritoneal flaps and binding them with fibrin glue.

#### **Mesh Fixation Using Fibrin Glue in TEP**

A curvilinear incision was made near the umbilicus and carried down to the anterior rectus sheath, which was doubly grasped, elevated and incised, entering the rectus sheath. The rectus muscles are retracted laterally exposing the posterior rectus sheath. Preperitoneal space was created either directly by telescope or by indegnious balloon made of finger stall no 8 over suction tip. After dissecting the retro pubic space coopers ligament was identified along with cord structures and inferior epigastric vessels. The cord structures were skeletonized, and the hernia sac was reduced off the internal ring down to the level of peritoneum. Then the mesh was placed into the preperitoneum, unfurled, and placed uncut over the myopectineal orifice. Once the mesh is deployed in the desired position, it is secured to the pubic bone in midline, coopers ligament, the lacunar ligament laterally, and superiorly into the transversalis fascia with the fibrin sealant, which is allowed to set for several minutes. The posterior aspect of the matrix repair is held in place as

**Table.1 Showing Time for TAPP Vs TEP**

TIME (min)	TAPP	TEP
30-40	1	1
41-50	7	2
51-60	11	6
61-70	5	9
71-80	4	8
81-90	2	4

**Table.3 Showing Complication Rate by TAPP Vs TEP**

Intraoperative and postoperative complications	TAPP (%age)	TEP (%age)
Vascular Injuries	0 (0.0%)	0 (0.0%)
Scrotal Swelling	2 (6.7%)	1 (3.3%)
Port site Hernia	0 (0.0%)	0 (0.0%)
Visceral Injuries	0 (0.0%)	0 (0.0%)
Wound Infection	0 (6.6%)	0 (0.0%)
Seroma	3 (10.0%)	1 (3.3%)
Hematoma	1 (3.3%)	1 (3.3%)
Urinary Retention	1 (3.3%)	1 (3.3%)
Inguinal Paraesthesias	0 (0.0%)	0 (0.0%)
Chronic groin pain	0 (0.0%)	0 (0.0%)
Total complications	7 (23.3%)	4 (13.3%)
Average	2.3	1.3

the pneumoperitoneum is released under direct vision allowing the preperitoneal space to collapse .

**Results**

A total of 60 patients, irrespective of demographic profile were taken into study. In TAPP procedure, minimum age was 19 years and maximum age was 78 years with mean age of 50.53±18.07 years, while as in TEP procedure, minimum age was 27 years and maximum age was 75 years with mean age of 56.60±12.06 years. Majority of the cases belong to male sex in both the

**Table.2 Showing Type of Hernia Repair by TAPP Vs TEP**

TYPE OF HERNIA	TAPP		TOTAL (%age)	TEP		TOTAL (%age)
	No. of cases (%age)			No. of cases (%age)		
	Right	Left	Right	Left		
INDIRECT	10 (33.3)	6 (20.0)	16 (53.3)	9 (30.0)	5 (16.7)	14 (46.7)
DIRECT	4 (13.3)	1 (3.3)	5 (16.7)	3 (10.0)	2 (6.6)	5 (16.7)
PANTALOON	1 (3.3)	0	1 (3.3)	0	0	0
BILATERAL	6 (20.0)		6 (20.0)	8 (26.7)		8 (26.7)
RECURRENT	1 (3.3)	1 (3.3)	2 (6.6)	2 (6.6)	1 (3.3)	3 (10.0)
FEMORAL	0	0	0	0	0	0

**Table.4 Showing Hospital Stay of TAPP Vs TEP**

Hospital Stay in Hours	Range	Mean	SD
TAPP	12-24	19.80	3.12
TEP	10-20	14.53	2.82

**Table.5 Showing Reaccurance Rate of TAPP Vs TEP**

Procedure	No. of cases	%age
TAPP	1	3.3%
TEP	1	3.3%

groups. Only two female patients had inguinal hernia, one each in both groups.

**Operative time**

Total time taken in TAPP procedure was (51-60 minutes) and in TEP procedure was (61-70 minutes). In TAPP procedure, minimum duration of intervention was 34 minutes and maximum duration of intervention was 82 minutes with mean duration of intervention of 58.67±12.58 minutes, while as in TEP procedure,

minimum duration of intervention was 38 minutes and maximum duration of intervention was 88 minutes with mean duration of intervention of  $67.40 \pm 12.43$  minutes.

#### Distribution of cases

Of the 74 hernias repaired (14 bilateral, 46 unilateral), 5 were recurrent and 69 were primary. The majority of the repairs, in both the methods, were for indirect hernias (30/50%) followed by direct hernias (10/16.7%), and some with both direct and indirect components (1/1.67%).

#### Complications

In TAPP procedure, no intraoperative complication was noted. Only postoperative complications noted were 2 cases of scrotal swelling (6.7%), 3 cases of seroma (10.0%), one case of port site hematoma (3.3%) and one case of urinary retention (3.3%). While as in TEP procedure, no intraoperative complication was noted; only postoperative complications noted were one case each of scrotal swelling (3.3%), seroma (3.3%), hematoma (3.3%) and urinary retention (3.3%).

There were a total of 4 patients who reported pain, which was mild and relieved of its own in a few days. There was no case reported to develop chronic groin pain, defined as pain lasting over 3 months.

#### Hospital Stay

In TAPP procedure, mean hospital stay was  $19.80 \pm 3.12$  hours, ranging between 12 to 24 hours; while as in TEP procedure, mean hospital stay was  $14.53 \pm 2.82$  hours, ranging between 10 to 20 hours.

#### Recurrence

In both, TAPP and TEP procedures, only one patient in each group had recurrence during the follow-up period of 3 years.

#### Discussion

Inguinal hernia repair is one of the most common elective procedures performed in General surgery. The goal of hernia repair include minimizing intraoperative and postoperative complications, achieving effective repair, lowest possible recurrence, rapid return to normal life, cost effectiveness and better cosmetic results. For these reasons the technique of herniorrhaphy has progressed from various open to laparoscopic techniques.

During the past few years, attention has focused on the pain that may arise after groin hernia surgery. Chronic pain after hernia surgery is a complex and controversial problem that affects not only open but also laparoscopic procedures. Three pain syndromes have been identified: somatic, neuropathic, and visceral pain. Besides nerve damage during dissection, thermal injury due to electrocautery, and inflammatory and/or mechanical reaction to the mesh, stapling of the mesh is the most frequent evoked mechanism (3-7,8). There is a great variation in the rate of postoperative chronic pain, ranging from 0.1% to 0.4% and 22.5% (8,9,10) in laparoscopic repairs in which staples are used to attach the mesh. In a study by S Olmi *et al* (11,12) on fibrin glue mesh fixation in TAPP the results had been encouraging. For laparoscopic hernia repair, the possibility of nerve injury (pain or paresthesia) caused by entrapment from incorrect placement of staples (above all lateral cutaneous femoral nerve, but ilioinguinal, and genitofemoral are also at risk) and epigastric vessels injuries by clips or staples application may be avoided using fibrin glue either in the TAPP technique or in the TEP. In a study by Stark *et al* (13) the rate of nerve entrapment in laparoscopic patients was 4.2%. It seems that not only entrapment but also postoperative fibrous scar around the staples can lead to nerve injury.

Over three years, Graziano Ceccarelli *et al* (14) compared the characteristics of mesh fixation with titanium clips and fibrin glue (Tisseel) and evaluated if the use of fibrin sealant was as safe and effective as conventional stapling. He observed no significant difference concerning seromas, chronic pain and recurrence rate in either group. P Topart *et al* (15) in his retrospective analysis of Tisseel vs tack staples as mesh fixation in totally extraperitoneal laparoscopic repair of groin hernias found that the postoperative chronic pain rate was significantly reduced in the fibrin glue group.

With the main aim to reduce postoperative chronic pain, fibrin sealant was used in our study for mesh fixation. And the following reasons motivated the use of fibrin sealant (Tisseel) in the current study (16).

- Endogenous fibrin sealant is a natural ingredient in the physiological sticking between mesh and host tissue.
- Tisseels thrombin content per se and contamination of growth factors may contribute to enhanced wound healing, as well as to a faster and stronger ingrowth of tissue in the prosthesis.
- Because the adhesive effect is superficial, the mesh may be secured widely without harm to the underlying tissue. This is especially advantageous in the staple-forbidden area (i.e., the lower lateral quadrant of the mesh, or the triangle of doom and the triangle of pain).
- Fibrin sealant promotes homeostasis.
- Fibrin sealant does not adhere to surgical instruments.
- There is a solid safety documentation for the internal use of fibrin sealant.

### Conclusion

The use of fibrin glue has a distinct advantage in laparoscopic repair of groin hernias when compared with other conventional methods of mesh fixation. The use of fibrin sealant reduces the risk of post- and intraoperative complications, such as bleeding, seroma, chronic pain, has a lower incidence of postoperative neuralgia and provides a faster return to social life in addition to mesh fixation. Fibrin glue appears to be a reasonable, feasible, and competitive alternative to the standard tissue-penetrating mesh fixation devices in laparoscopic groin hernia surgery. Mesh fixation with fibrin glue is preferable as it meets the requirements for both efficiency and security of fixation.

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