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COMPARISON BETWEEN CYANOACRYLATE GLUE FIXATION VERSUS SUTURE FIXATION OF MESH IN LICHTENSTEIN'S HERNIOPLASTY

General Surgery

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ABSTRACT

Inguinal hernia repair is one of the most common surgeries performed by surgeons followed by appendectomy. There are myriad operative procedures mentioned for repair of hernia. With introduction of Lichtenstein's mesh repair in 1986, most of the tissue based repairs are rarely performed as mesh repair has low recurrence rates and easy learning curve. One of the most serious complication associated with mesh based repair is chronic groin pain, which at some times can be debilitating to the patients. Many methods to overcome this complication had been introduced. One such method is use of N-Butyl-2-Cyanoacrylate glue for mesh fixation. In this study the efficacy of glue is compared with standard method of mesh fixation with polypropylene sutures. **Materials & Methods** The prospective randomised control trial was conducted in J.J.M. Medical College department of general surgery. 100 patients admitted to department of general surgery undergoing Lichtenstein hernioplasty and willing to participate in study were included and randomised to mesh fixation with polypropylene suture (Group A) and mesh fixation with N-Butyl-2-Cyanoacrylate glue (group B). The main outcomes for the study were immediate post operative pain and chronic groin pain. The secondary outcomes were duration of surgery, post operative length of stay, recovery time to perform daily activities, wound infection, foreign body sensation, hematoma seroma formation and recurrence. **Results** The operative time, early post operative pain and chronic groin pain, seroma formation, return to daily activities and hospital stay were significantly low in cyanoacrylate group. The incidence of hematoma, wound infection were same in both the groups. **Conclusions** This study shows that the mesh fixation with glue causes less early post operative pain, chronic groin pain and lesser post operative time than mesh fixation with suture which makes glue better and safer option for mesh fixation in Lichtenstein hernioplasty.

KEYWORDS

Chronic Groin Pain, Mesh Fixation, Inguinal Hernia, N Butyl 2 Cyanoacrylate Glue, Polypropylene Suture.

INTRODUCTION

Hernia is derived from ancient Greece (Hernios: off shoot or bud) reflecting in part pathophysiological mechanism of the disease. The disease dates back to 1552 BC (1). The definition of hernia is an abnormal protrusion of a part or whole of the viscus through defect in the walls of its containing cavity (2). Inguinal Hernia accounts for 75% of abdominal hernias and is one of the most common abdominal hernia. The life time rate of hernia is 27% in males and 3% in females (3). Inguinal hernia repair is one of the most common performed surgeries by general surgeons accounting for 15% of the total operations. Before introduction of Lichtenstein mesh repair there were several methods of repairing the defect, after introduction of Lichtenstein hernioplasty in 1984 it gained wide popularity and is now the most commonly performed technique for open inguinal hernia repair due to its safety, efficacy and low recurrences rates with short learning curve (4). In the adults presenting with hernia mesh will be placed and fixed using non absorbable sutures which cause trauma to the surrounding tissues. One of the complication associated with Lichtenstein hernioplasty is chronic groin pain (CGP). The patient is said to be suffering from chronic groin pain if the pain persists for more than 3 months after operation (5). The incidence of CGP is from 0.7% to 62.9% (6,7). CGP causes can be neuropathic and non-neuropathic causes. Neuropathic CGP can be caused due to trauma to the nerves in inguinal region, entrapment of nerves secondary to mesh related fibrosis. Non neuropathic CGP causes are periosteal reaction of suture fixation at pubic tubercle, displacement of mesh, inflammatory reaction to the mesh and use of heavy weight mesh for hernia repair (8). Due to complications associated with suture mesh fixation, atraumatic methods of mesh fixation have been recommended (9). N-Butyl-2-Cyanoacrylate glue which avoids injury to tissues caused by suture material so there is increased popularity for mesh fixation with glue in recent years. It has been postulated that mesh fixation with glue will reduce the operating time and post operative pain compared to mesh fixation with suture or tackers (10).

Cyanoacrylates were discovered in 1949 by Ardis. NBCA is a tissue adhesive which has been used as alternative for suture for more than 40 years. The cyanoacrylate glue was first used by Helbling and Schlumpf in the Lichtenstein mesh repair in 1993 (11). Cyanoacrylate glue is also used for treatment of varicose veins, oesophageal variceal bleeding and portal vein embolization. It is monomer when in liquid solution and when comes in contact with the tissue results in polymerisation, it has bacteriostatic effect hemostatic properties and biodegradable and biocompatible which adheres to surface within 5-6 seconds when comes in contact with water and undergoes exothermic polymerisation within 60seconds. It has tight bonding to biological tissues when compared with other types of glue and requires 10 months for degradation (12,13).

OBJECTIVE

The primary objective of the study is to compare immediate post operative pain and chronic groin pain in patients who underwent open hernia mesh repair with suture and NBCA. The secondary objective of the study is to compare NBCA with suture regarding operative time, length of stay in hospital, return to daily activities and complications like seroma, hematoma, foreign body sensation and wound infection.

MATERIALS AND METHODS

The prospective randomised controlled trial was conducted from July 2021 to February 2023 in department of general surgery JJMMC, Davangere

Source of data

Patients diagnosed with inguinal hernia and planned to undergo open inguinal hernia mesh repair admitted to Bapuji hospital and Chigateri general hospital attached to JJMMC willing to participate in the study were randomised into suture and glue groups and included in the study.

Inclusion Criteria

- Age more than 18 years
- Reducible hernia
- Patients willing to participate in study

Exclusion criteria

- Strangulated hernia
- Sliding hernia
- Recurrent hernia
- Large hernia and hernias undergoing orchidectomy at same time
- Age less than 18 years
- Patient not willing to give consent
- Collagen/ connective tissue disorder

This study is prospective randomised controlled trial conducted fromJuly 2021 to February 2023 with approval from ethical and scientific research committee, JJMMC. A total of 100 patients were included in the study with 50 patients each in suture group and NBCA group. The randomisation had been done consecutively. One patient who was allotted suture group the next patient will be allotted glue group. The patients included in the study were followed post operatively for 6 months. The pain was measured by showing the patients Visual Analog Scale (VAS) and 30 mm was considered as chronic groin pain.

Control group (Group A)

The patients included in this group underwent Lichtenstein's hernioplasty and mesh fixation done with suture.

Test group (Group B)
The patients included in this group were those where mesh fixation was done with NBCA glue

Informed consent
The patients satisfying the inclusion criteria and willing to participate in the study were explained about the surgery, study, follow up period and benefits, complications of glue for mesh fixation, complications of the surgery and written informed consent was taken from patient and patient attender.

Investigations
Patients underwent the following investigations complete hemogram with blood grouping and Rh typing, Random Blood Sugar, HbA1C, Liver Function Tests, Renal Function Tests (blood urea and serum creatinine), serum electrolytes, ECG, chest X-ray (Postero- anterior view) and pulmonology opinion if the patient is having any respiratory complaints. USG of abdomen and pelvis to rule out Benign Prostatic Hypertrophy (BPH), ascites and intra-abdominal tumors which are predisposing factors for hernia. The patients underwent pre-anaesthetic checkup before taking for the operation.

Surgical procedure
The patients included in study underwent Lichtenstein mesh repair, incision is done above and parallel to the inguinal ligament. The incision is deepened until the external oblique aponeurosis is exposed. The aponeurosis is divided along fibres. Ilioinguinal nerve is identified and preserved. The covering of spermatic cord was incised in indirect hernia and looked for hernial sac and the contents of the sac were reduced and sac was plicated. Direct hernia when present contents are reduced and is repaired by fixation of the fascia to Cooper's ligament to obliterate the dead space and prevent seroma formation. Dissection was done to create a plane for mesh placement. The landmarks like pubic tubercle, inguinal ligament and conjoined tendon were identified mesh was placed and slit was made to accommodate the spermatic cord. In suture group the first stitch was taken at pubic tubercle tissues, periosteal bite was avoided to prevent osteitis and with a 2cm mesh overlap over pubic tubercle. Mesh is fixed in interrupted fashion to conjoined tendon and inguinal ligament. The two tails created for accommodating the spermatic cord were overlapped and polypropylene suture was placed to create new deep ring. The external oblique aponeurosis is closed in running sutures.

Lichtenstein mesh fixation using glue
The steps followed in glue group were similar with that of suture group. After identifying landmarks pubic tubercle, inguinal ligament and conjoint tendon the mesh is placed and fixed using glue at pubic tubercle, along conjoint tendon and along inguinal ligament the two tails created were overlapped and fixed with glue.

For all patients polypropylene mesh was used. All the patients were operated under spinal anaesthesia

RESULTS
The study included total of 100 patients and p-value <0.05 was considered significant. The hernia was more common in age group of 41 – 50 years. 92 males had hernia and 8 female patients had hernia with male: female ratio 23:2. Right sided hernia was more common and seen in 60 patients (60%). Indirect inguinal hernia was common in our study, out of 100 patients 69 patients presented with indirect hernia whereas 31 patients had direct inguinal hernia.

Table 1: Laterality of inguinal hernia.

	study group		
SIDE OF HERNIA	A-Prolene	B-Cyanoacrylate	Total
BILATERAL	4	4	8
LEFT	16	16	32
RIGHT	30	30	60
TOTAL	50	50	100

Table 2: Type of hernia

	study group		
TYPE OF HERNIA	A-Polypropylene group	B-Cyanoacrylate group	Total
DIRECT	18	13	31
INDIRECT	32	37	69
TOTAL	50	50	100

The duration of surgery was significantly less in glue group when compared with suture group with p-value of 0.000. The mean duration of surgery in suture group is 50.7 minutes ±7.0660 minutes, whereas the mean duration of surgery in glue group is 42.3 minutes ±5.0133 minutes. Similarly, the duration of mesh fixation was significantly lower with p-value of 0.000. The mean duration of mesh fixation in glue group is 7.04 minutes ±1.6031 minutes whereas the mesh fixation with suture takes 11.3 minutes ±2.2095 minutes.

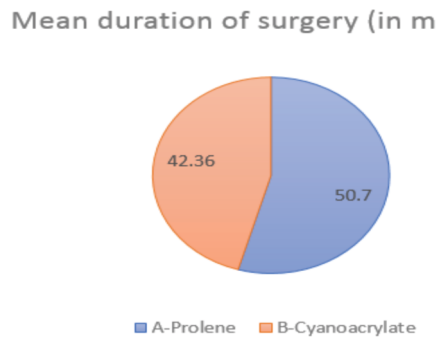

Figure 1: Pie chart illustrating the mean duration of surgery in two study groups

The seroma formation in post operative period was significantly higher in suture group with p-value of 0.04. The time to return to daily activities was significantly lower in the glue group with p-value of 0.0029 and the mean time required in the glue group was 3.7 days ± 0.9858 days and time required for the suture group was 4.3 days ± 0.9817 days. The Chronic Groin Pain (CGP) was significantly lower in the glue group with only 1 patient out of 50 patients developed CGP, whereas 9 patients in suture group progressed towards developing CGP with p-value is 0.007.

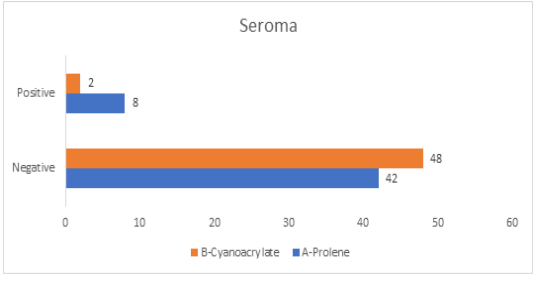

Figure 2: Seroma in two study groups.

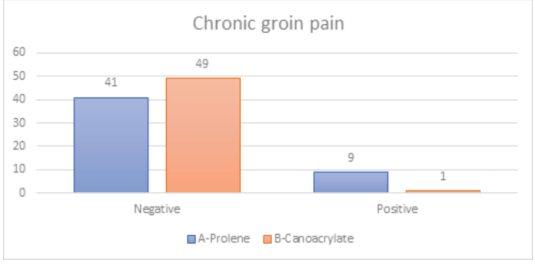

Figure 3: Bar graph illustrating chronic groin pain in the two groups.

Our study showed that there was no significant difference between the two groups for recurrence where 3 patients in glue group and 2 patients in suture group had recurrence with p-value of 0.646. Wound infection was seen in 4 patients each in suture and glue groups with p-value of 1.00. There was also no significant difference in case of hematoma, numbness in both the groups with p- values of 0.46 and 0.39 respectively.

Table 3: Summary Of The Outcomes Of The Study

Study parameters	Polypropylene group(n=50)	Cyanoacrylate group(n=50)	P value
Mean age (in years)	49.94 years	49.48 years	0.86

Seroma(present)	8	2	0.04
Hematoma(present)	5	3	0.46
Local numbness(present)	4	2	0.399
Chronic groin pain (present)	9	1	0.007
Duration of surgery (in minutes)	50.7000 minutes	42.3600 minutes	0.000
Duration of mesh fixation (in minutes)	11.34 minutes	7.04 minutes	0.000
Recurrence(present)	2	3	0.64
Wound infection (present)	4	4	1

DISCUSSION

With introduction of Lichtenstein tension free hernioplasty the complications associated with tissue repair techniques like Bassini and Shouldice repair have been reduced. Lichtenstein hernioplasty is commonly followed procedure for the treatment of the inguinal hernia due to its superiority over tissue based repairs and low recurrence rates. Despite the success of the technique one of the major and debilitating complication associated with Lichtenstein hernioplasty is chronic groin pain.

Chronic groin pain is defined as pain at the operated groin site after 3 months of hernioplasty. CGP after Lichtenstein hernioplasty can be ranging from 0.5% to 6%. (14,15). CGP can be caused due to neuropathic and non-neuropathic causes. Neuropathic pain is due to the trauma caused to ilioinguinal nerve, iliohypogastric nerve and genitofemoral nerve during surgery (16). Meticulous identification and preserving the nerves can reduce incidence of CGP to certain extent. The entrapment of the nerves due to traumatic methods of mesh fixation with prolene and fibrosis of mesh can be reduced by atraumatic method of mesh fixation with glue and using of light weight mesh causes less fibrosis (17). These alternatives can reduce incidence of CGP to certain extent. The other glue most commonly used for mesh fixation is fibrin glue, despite the good results associated with fibrin glue in mesh fixation it is not easily available and much costlier when compared with butyl cyanoacrylate glue which is cheaper and can be stored easily (18,19,20,21).

With usage of the glue there is reduced duration of mesh fixation due to which the operative time is also significantly reduced as stated by Iyanahally A et al (22). This can be explained by faster onset of action of glue after exposure to body fluids. The rate of seroma formation is lesser with the glue group which might be due to absence of tissue injury caused by sutures for mesh fixation.

The hospital stay and time required to return to daily activities were lower with the glue group which may be explained by the less post operative pain related with glue and subsequently lesser analgesic requirement and early recover to perform daily activities, our study results were similar with that of Iyanahally A et al (22).

Fouda E et al (23) and Kalwaniya DS et al (24) in their studies showed that CGP is significantly lower in glue group when compared with the suture group which is similar to our study. Meta-analysis by Sun P et al (25) showed that there is no significant difference between the two groups regarding recurrence, numbness and hematoma formation which are similar to our study. None of the patients in our study required any reoperation for mesh removal or for haemorrhage and there is no adverse reactions to the glue in the patients with mesh fixation with the glue.

Our study showed no significant difference for wound infection which is similar with the meta-analysis by Sun P et al (25).

In the study conducted by Testini M et al (26) it was concluded that there is significant difference between both groups regarding foreign body sensation which was similar with the results of our study. The disadvantages of our study are less sample size and less duration of follow up as for recurrence to occur it will take 5 – 10 years after the index surgery, the quality of life after surgery was also not assessed in this study.

CONCLUSION

In our study there are good results with NBCA glue for mesh fixation when compared with polypropylene sutures and can be used as alternative for mesh fixation. The immediate post operative pain and chronic groin pain is significantly low, due to lesser immediate post operative pain the analgesics and hospital stay is also lesser resulting in lower expenses to patients and return to daily activities is earlier when compared with that of suture group.

The operative time is significantly reduced with glue group, also the seroma formation is lesser in glue group due to absence of trauma caused by sutures.

Hence the NBCA glue can be used as better and safer alternative to polypropylene sutures for mesh fixation in lichtenstein repair.

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Conflict Of Interest: None declared.

Ethical Approval: The study was accepted by the institutional ethical committee.

Abbreviations

BC- Before Christ.
CGP- Chronic Groin Pain.
ECG- electrocardiogram.
Hba1c- glycosylated haemoglobin.
NBCA- N- Butyl- 2- Cyanoacrylate.
Rh typing- Rhesus typing.

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