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Original Research Article

Glue versus suture for mesh fixation in open inguinal hernia repair

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ABSTRACT

Background: Inguinal hernia is the most common surgical problem presenting to the surgical OPD. Lichenstein's tension free hernioplasty is the one of the first surgeries learnt by surgical residents. Pain after inguinal hernia surgery is found to be debilitating and alters the quality of life in several patients, which has been attributed to the traumatic fixation of the mesh with sutures. Hence this study, to compare traumatic and atraumatic methods of mesh fixation in inguinal hernia repair. The aim of this study was to compare suture fixation versus tissue glue fixation of the mesh in inguinal hernia repair. Objective was to compare the immediate and chronic post- operative pain, intra operative time and complications if any.
Methods: This study was done in the General Surgery Department of SRM Hospital, Medical College and Research Centre, Kattangulathur after ethics committee clearance. It is a single blinded study conducted on 51 consenting patients and meeting the inclusion criteria from March 2016 to August 2017, of which 26 were selected for glue (N Butyl-2-Cyanoacrylate) fixation and 25 for suture fixation according to simple randomization. A note of the pain on VAS scale at various time intervals, operative time and any complications were also recorded was made.
Results: Results developed using SPSS software show a significant difference in the intraoperative time by both methods, with glue taking a significantly lower time than sutures. A Significantly lower immediate and chronic postoperative pain is observed in the glue group. However, the complication rates in both the groups were found to be equal.
Conclusion: It can thus be concluded from this study that tissue glue mesh fixation is superior to suture mesh fixation in open inguinal repair in terms of operative time, immediate and chronic post-operative time.

Keywords: Glue, N- Butyl 2 Cyanoacrylate, Postoperative pain, Sutures

INTRODUCTION

Hernias are the most common problems encountered in the surgical OPD, inguinal hernias being the commonest, accounting for 75% of all abdominal hernias. The incidence of inguinal hernia is found to be 27% in males and 3% in females. This incidence is found to have a bimodal peak in males, the first peak occurring commonly before 1 year of age and the second after 40 years of age.[1] And males are 25% more prone to develop inguinal hernias than females.[2] Inguinal hernia repair has undergone evolution over a period of several centuries. Lichenstein's open tension free hernioplasty is the procedure of choice worldwide owing to its simplicity and very rewarding results. It is also, one of the first surgeries learnt by junior residents owing to its ease, safety and easy learning curve.

Several improvisations have been made to the classical Lichtenstein's hernioplasty technique over the years. Instead of sutures, staplers, tackers, tissue adhesives, self-gripping meshes, and even placing the mesh without

fixation have been practiced. It has however been observed that several patients experience severe pain in the immediate postoperative period and also, a persisting dragging pain in the inguinal region several months following the surgery which has been attributed to the traumatic fixation of the mesh. Various studies conducted revealed that atraumatic fixation of the mesh produced less pain without compromising on the outcomes. Hence the choice of this study, to observe the differences in traumatic and atraumatic mesh fixation.

The aim of the study was to compare the operative outcomes of mesh fixation with suture versus that with glue. The primary objective was to compare pain in the immediate postoperative period and chronic postoperative pain.

Pain at immediate postoperative period was to be measured serially, at 12, 24, 48, 72 hours, 1 week and 1 month using a pain score and the results were to be compared in both the groups.

Chronic postoperative pain: pain at 3 months and 6 months were to be measured in both the groups and compared. The secondary objectives were to compare-Operative time and wound infection and other associated complications.

METHODS

A simple randomized prospective study type was adopted. Two groups were selected for the study, one for the suture fixation method and the other for the glue fixation method. Simple randomization was done by selecting every alternate patient for suture mesh fixation and glue mesh fixation. In order to maintain a uniformity of the surgeries performed, patients operated by one surgical team were selected for the study. The period of study was from March 2016 to August 2017. The patients to be included in the study were done so after explaining the study to them in detail in their local language and consenting patients meeting the inclusion criteria were included.

The study was commenced after obtaining approval from the Ethics committee. A total of 51 patients consented and fulfilled all the criteria and formed a part of the study, of which 26 underwent suture mesh fixation and 25 underwent glue mesh fixation.

It was a single blinded study. Pain was monitored using the visual analogue scoring (VAS) scale which was done by a trained staff who was unaware of the method used. Monitoring of pain was done at 12 hours, 24 hours, 48 hours, 72 hours while at the hospital and were followed up in the OPD at 1 week, 1 month, 3 months and 6 months. Patients were kept on serial follow up for 6 months. Other parameters, namely, operative time in minutes and presence of wound infection, seroma collection, ecchymoses, immediate recurrence was made a note of. The inclusion criteria were unilateral inguinal hernia, patients undergoing open hernioplasty patients willing for regular follow up. Whereas patients having recurrent inguinal hernias, complicated inguinal hernias, bilateral inguinal hernias, patients undergoing other concomitant abdominal surgeries, patients on long term analgesics/steroid treatment, patients having connective tissue disorders were excluded.

All patients underwent a basic blood work up namely-complete blood count, renal function tests, serum electrolyte levels, random blood glucose levels. A complete diabetic work up if diabetic, cardiac evaluation in the presence of HTN or cardiac conditions, chest radiograph and pulmonology assessment in the presence of respiratory symptoms was also done. An ultrasound of the abdomen to detect the prostate volume and the post void residual volume was performed in all patients to rule out BPH as the predisposing factor. Urologist clearance was sought before operating on patients with BPH.

A proper anaesthesia fitness was sought and all the cases were performed under spinal anaesthesia. The patients were put on basic analgesics according to VAS score for 3 days during their stay in the hospital and were discharged after 72 hours following a 1st look of the wound. During the stay, pain, seroma, wound infections and any other complaints were recorded.

Patients were discharged and were asked to visit the hospital for review on the given dates.

RESULTS

The statistical analysis was done using SPSS software-version-20.

A total of 51 patients were a part of the study, out of which 25 (n = 25) underwent mesh fixation using N-Butyl 2 Cyanoacrylate (glue) and 26 (n = 26) patients underwent the classical Lichenstein's hernioplasty using suture (3-0 prolene).

Table 1: Summary statistics-operative time.

Group	Mean	SD	Mean±SD
Glue	41.8	5.65	41.8±5.65
Suture	52.6	4.64	52.6±4.64
Total	47.29	7.46	47.29±7.46

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.

Operative time, measured in minutes was found to be 41.8 minutes on an average with the use of glue and 52.6 minutes with the use of suture. An average difference of 10.8 minutes was seen between the 2 methods with the

procedure taking a comparatively longer time to complete when suture was used. This difference was found to be statistically significant(p=0.00) (Table 1, Table 2).

Table 2: Results of t test-operative time.

Group	Mean	SD	t - value	p - value	Significant/ not significant
Glue	41.8	5.65	7.45	0.00	S
Suture	52.58	4.64			

Note: S-significant at 5% level (p value <0.05)

The pain at 12 hours was taken as the baseline score with which a comparison was made of the subsequent pain scores at 24, 48, 72 hours, 1 week, 1 month, 3 months and 6 months. The mean VAS pain score at 12 hours was found to be 5 (SD-0.82) and 6.69 (SD-0.93) in the glue and suture groups respectively, thus showing a significant (p <0.05).

Table 3: Results of t test-pain at 12 hours.

Group	Mean	SD	t - value	p - value	Significant/ not significant
Glue	5.00	0.82	6.903	0.00	S
Suture	6.69	0.93			

The mean VAS score has come down to 3.80 and 6.03 at 24 hours in the glue and suture groups respectively with a SD of 0.96 and 0.11. The score at 48 hours is 2.96 (SD 1.49) in the glue group and 4.88 (SD 1.39) in the suture group with a p value of 0.00.

The mean VAS score is 1.96 (SD- 1.27) and 3.62 (SD-1.09) in the glue and suture groups at 72 hours (Table 3).

The mean pain score at 1 week is found to be 0.60 in the glue group and 2.23 in the suture group. There is a significant difference in the pain perceived in both the groups as the p value is less than 0.05. At 1 month, the score is 0.20 which is almost close to no pain in the glue group and is 1.69 in the suture group with a SD of 0.58 and 0.93 respectively P <0.05.

The mean VAS score and SD are 0.80 and 0.28 respectively in the glue group and 1.31 and 0.79 respectively in the suture group with a p value of less than 0.05 and the mean pain score is almost nil with 0.04 in the glue category and a persisting score of 1.11 in the suture category. The SD is 0.20 and 0.76 in the glue and suture categories respectively.

This difference in pain at the end of 6 months between the 2 groups is significant as the p value is <0.05. The pain score at 12 hours is taken as the baseline from which the reduction in pain is calculated. It is observed that there is 24% reduction in pain at 24 hours, 40.8% at 48 hours, 60.8% at 72 hours, 88% at 1 week, 96% at 1 month, 98.4% at 3 months and the reduction is almost complete with a reduction percentage of 99.2% at 6 months post-surgery in the glue group patients. In the suture group, the percentage reduction in pain observed is as follows- 9.77% at 24 hours, 27.01% at 48 hours, 45.98% at 72 hours, 66.67% at 1 week, 74.71% at 1 month, 80.46% at 3 months and 83.33% at 6 months indicating the persistence of mild pain at the end of 6 months follow up period.

Table 4: Percentage of reduction in pain.

Group		12hrs	24hrs	48hrs	72hrs	1 week	1 month	3 months	6 months
Glue	Average score	5.00	3.80	2.96	1.96	0.60	0.20	0.08	0.04
	Percentage of reduction		24.00	40.80	60.80	88.00	96.00	98.40	99.20
Suture	Average score	6.69	6.04	4.88	3.62	2.23	1.69	1.31	1.12
	Percentage of reduction		9.77	27.01	45.98	66.67	74.71	80.46	83.33
Total	Average score	5.86	4.94	3.94	2.80	1.43	0.96	0.71	0.59
	Percentage of reduction		15.72	32.78	52.17	75.58	83.61	87.96	89.97

There were no intra- operative complications, no seroma, wound infections or ecchymoses or immediate recurrence the 6 months of follow up (Table 4).

DISCUSSION

Lichenstein's tension free hernioplasty is the most widely practiced hernia surgery as it has been found to be superior in several ways to the other open techniques. However, chronic groin pain, also called as iliodynia is a very commonly encountered postoperative problem which depends on various factors like the method of mesh fixation, type of mesh used and even the subjective threshold of pain.[3] The incidence of chronic pain post inguinal hernia repair is estimated to be 0.5-6%.[4,5] Chronic groin pain has been defined as the pain in the

groin region post hernioplasty lasting beyond a period of 3 months.[6]

Why it is important to address this issue is that a long-lasting pain can significantly alter the quality of life of the individuals. Pain experienced post-surgery has been classified into two categories, namely- neuropathic and non-neuropathic. Neuropathic pain is due to the involvement of ilioinguinal, iliohypogastric or genitofemoral nerves during surgery. Improper identification and lateralization of the ilioinguinal and iliohypogastric nerves may cause damage to these nerves.[7] There can be entrapment of the nerves in the sutures used to fix the mesh or entrapment in the fibrous scar over the mesh thus producing pain. Accidental or deliberate cutting of the nerve results in neuroma formation at the cut ends of the nerves in turn resulting in severe pain.

This type of pain is usually of shooting type, superficial and experienced around the scar and radiating to the scrotum in males or labia in females or to the inner aspect of the thigh. Activities like superficial touch over the scar site, stretching of the hip or walking might trigger this kind of pain.

This can be very well prevented by careful identification and preservation of the nerves during surgery and lateralization of the nerve to prevent injury. Use of atraumatic fixing methods like tissue glues prevent the incorporation of the nerves within sutures and finally, use of lightweight meshes induce a thinner fibrotic reaction thus preventing entrapment of the nerves.[8]

Non-neurogenic pain is a constant dull aching pain in the inguinal region which could be due to excessive posterior wall scarring due to heavy weight mesh usage. First bite for mesh fixation is taken at the pubic tubercle. This may induce osteitis of the tubercle and a source for pain. The presence of mesh and fibrosis could be perceived as a foreign body sensation and stiffness in the inguinal region. Traumatic mesh fixation using sutures or staplers, or tackers causes tissue damage and thus pain. Creation of a too tight neo deep ring with the mesh causes constriction of the cord structures causes congestion and produces pain.

In this era of daycare surgery, faster, scarless surgeries, surgeries associated with less pain and earlier discharge from the hospitals are in demand. Testini et al in their study have shown that there is no significant difference in the time taken by both the methods.[9]

A meta-analysis conducted by Goeda et al shows that the surgical procedure with the use of glue is significantly faster as compared to suture and so is the immediate and chronic pain which is lower in the glue group.[10]

Ladwa et al also state from their systemic review that there is a significant difference in the time taken to complete the procedure by the 2 methods with less time taken with glue fixation.[11] However, they have not found any difference in the immediate or chronic postoperative pain experienced by patients in both the groups.

Trauma to the tissues with suture incites inflammatory reaction at the suture points. Use of glue has shown a reduced inflammatory response at the site according Losi P et al.[12]

The study conducted by Negro P et al shows 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.[13] Negro et al also state that the difference in pain between both the groups disappears after 1 month. However, they observed complications like hematoma formation and eccymoses in the glue group.

Tebala et al in their study have 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.[14] However, no significant difference could be appreciated between the 2 methods in terms of chronic pain.

Matikainen et al have also concluded from their study that there is no difference in the chronic pain experienced by both the groups, although the immediate post-operative pain with glue is significantly less.[15]

Quyn et al have also found a significantly lower acute and chronic pain with glue use in their study.[16]

Sun P et al also describe similar results- lower acute and chronic post- operative pain with glue.[17]

Hugh et al, in their systemic review and meta- analysis have shown a significantly lower immediate and chronic pain following surgery for inguinal hernia using glue. The operative time has also been found to be significantly lower.[18]

Silvestro et al have not found any difference in the pain in both the groups after 6 months, although there was significant difference in the pain up to 6 months with the use of tissue adhesive.[19]

Fuchs K et al have also found that although there is a significantly lower pain in the immediate post- operative period, there is no difference in the pain at 5 years post-operative period when glue was used to fix the mesh.[20]

In this study, it is found that the operative time is lower with glue as compared to the suture fixing method as consistent with all the studies. Pain in the immediate post-operative period, upto 3 months is also significantly lower in the glue mesh fixation patients. Pain at different time intervals in the immediate post-operative period

have all been found to be significantly lower in the glue group. It is also found that there is a significantly higher pain (chronic groin pain) after 3 months with suture mesh fixation who needed analgesics to deal with the pain.

No complications in the form of seroma, wound infection, hematoma, eccymoses have occured in this study in either of the groups.

A mention has to be made of the limitations of this study. It is a single blinded study. Also, the sample size of this study is small, results with a bigger sample size may vary or show different results. It is also a limited duration study due to which recurrence rates could not be compared and a comment on the long-term efficiency cannot be made. Pain being a subjective symptom and the pain threshold being variable from person to person, a preoperative pain threshold assessment was not done.

In spite of these limitations, the strength of this study is its homogeneity as it is a single surgeon study.

CONCLUSION

From this study, we can conclude that mesh fixation with glue- N butyl 2 cyanoacrylate is superior to sutures in mesh fixation in several aspects. Glue reduces the operative time which can be useful in high volume centres. The immediate postoperative and chronic postoperative pain are also considerably lower with glue with no added intraoperative or postoperative complications. Sutures are however found to be more cost-effective.

Hence glue can be considered as a good replacement for suture in inguinal hernia repair expecting lesser postoperative morbidities and a better quality of life.

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