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COMPARATIVE STUDY OF TECHNIQUE OF MESH FIXATION IN OPEN INGUINAL HERNIA REPAIR BETWEEN N-BUTYL CYANOACRYLATE GLUE AND SUTURE

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ABSTRACT

Introduction

Inguinal hernia is the most frequently diagnosed hernia. It accounts for 75% of all abdominal wall hernias and has a lifetime incidence of 27% in males and 3% in women. Open inguinal hernia repair has long been the method of choice for most surgeons and is often recommended in contemporary literature as the optimal approach for primary unilateral inguinal hernia. Lichtenstein tension free mesh repair remains the standard criterion. It is known to be relatively simple and effective with minimal pain.

Objective

The aim of this study is to compare the efficacy of N-butyl cyanoacrylate glue with that of classical method of mesh fixation by suture in Lichtenstein tension free Inguinal Hernia repair in terms of chronic groin pain without increasing other complications.

Methods

A Prospective, Hospital based observational comparative study was planned, which includes 40 patients per group. All patients included were above 18 years of age. All the participants were divided into 2 groups mesh fixation with sutures and N-butyl cyanoacrylate glue. Total duration of the study was 3 months from the day of the surgery with 4 intervals of follow up at POD1, POD 7, Month 1 and Month 3.

Results

When comparing postoperative pain between the groups, it was observed that patients in the glue fixation group experienced significantly less pain than those in the suture group at various intervals: postoperative day 1 (POD1), postoperative day 2 (POD2), 1 month, and 3 months. Additionally, immediate pain was notably reduced in the glue fixation group. Furthermore, no reports of pain were recorded at 1 month and 3 months postoperatively. Moreover, the incidence of local complications was lower in the glue fixation group compared to the suture fixation group.

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Conclusion

The use of N-butyl cyanoacrylate glue resulted in reduced immediate postoperative pain and quicker recovery times due to its less invasive nature and avoidance of tissue trauma associated with sutures. Additionally, the application of glue was found to be faster and technically easier, potentially reducing operation time with no recurrence. Conversely, traditional suture fixation, while reliable, was associated with higher postoperative discomfort and a slightly increased risk of complications such as chronic pain.

Introduction

Inguinal hernia repair is one of the most frequently performed surgical procedures worldwide, with over 20 million interventions annually. The Lichtenstein tension-free mesh repair has emerged as a widely accepted standard, offering improved outcomes compared to traditional suture-based techniques. However, despite advances in surgical techniques and materials, chronic groin pain and seroma formation remain significant complications, affecting up to 29% and 17% of patients, respectively.

Chronic groin pain, in particular, has become a major concern, as it can significantly impact a patient's quality of life. The etiology of chronic groin pain is multifactorial, involving factors such as nerve damage, mesh-related fibrosis, and perioperative tissue trauma. Seroma formation, another common complication, can lead to increased morbidity, prolonged hospital stays, and additional surgical interventions.

Recent studies have explored alternative mesh fixation methods, including the use of cyanoacrylate adhesives, to address these complications. N-butyl cyanoacrylate, in particular, has shown promise due to its strong bonding properties, minimal toxicity, and bacteriostatic activity. Its use in various medical applications, including wound closure and tissue repair, has demonstrated efficacy and safety.

This study aims to investigate the efficacy of N-butyl cyanoacrylate glue versus traditional sutures for mesh fixation in Lichtenstein tension-free inguinal hernia repair, with a focus on chronic groin pain, seroma formation, and recurrence rates. The primary objective is to compare the incidence of chronic groin pain between the two mesh fixation techniques, without increasing other complications.

Secondary objectives include assessing the incidence of seroma formation and recurrence rates with N-butyl cyanoacrylate glue versus suture-based mesh fixation. Additionally, this study will evaluate the operative time, hospital stay, and postoperative recovery between the two groups.

The significance of this research lies in its potential to improve patient outcomes and reduce healthcare costs. By identifying a more effective and efficient mesh fixation technique, surgeons can minimize complications and enhance the overall quality of life for patients undergoing inguinal hernia repair. Furthermore, this study may contribute to the development of evidence-based guidelines for mesh fixation in hernia repair, ultimately benefiting the surgical community and patients worldwide.

Methodology

This prospective, observational comparative study was conducted at the Department of General Surgery, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, Uttar Pradesh, over a period of

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18 months. The study aimed to compare the effectiveness of N-butyl cyanoacrylate glue versus traditional sutures for mesh fixation in Lichtenstein tension-free inguinal hernia repair. Eighty patients with uncomplicated unilateral inguinal hernia were randomly selected. Patients who refused to sign the consent form, had complicated inguinal hernia, recurrent inguinal hernia, bilateral inguinal hernia, or had comorbidities that prevented surgical intervention were excluded from the study.

Follow-up assessments were conducted at PO1, POD7, 1 month, and 3 months to evaluate the outcomes of the two mesh fixation techniques. Data was compiled in an Excel sheet and transferred to SPSS (Version 20) software for statistical analysis. The study employed simple random sampling and used chi-square test, percentage, proportion, mean, and standard deviation to describe associations between categorical variables and compare between the two groups (suture and mesh) at various intervals. The level of significance was set at p-value ≤ 0.05.

The study included patients who underwent open Lichtenstein hernia repair, a widely accepted standard technique for inguinal hernia repair. A detailed history, clinical examination, and investigations with informed written consent were obtained from all participants. Institutional Ethical Committee approval was obtained prior to the start of the study, ensuring the ethical conduct of the research. Surgery was performed under regional anesthesia, supine position, according to the Lichtenstein Tension-Free Hernia Repair technique, by experienced surgeons. The mesh was secured using either nonabsorbable monofilament suture material (control group) or interrupted drops of cyanoacrylate glue (study group), and the outcomes were compared in terms of chronic groin pain, seroma formation, and recurrence rates.

Results

In order to conduct this study, 80 individuals with simple unilateral inguinal hernias were chosen at random.
To compare the effectiveness of the two mesh fixation methods, follow-up evaluations were carried out at PO1, POD7, one month, and three months. For statistical analysis, data was gathered into an Excel sheet and imported into SPSS (Version 20) software. The study used basic random sampling and compared the two groups (glue and suture) at different intervals, describing relationships between categorical variables using percentage, proportion, mean, and standard deviation. At p-value ≤ 0.05, the significance level was established.

	N	Mean	Std. Deviation	p-Value
Age	80	44.68	16.642	0.01*

Table 1 Mean age of participants involved

Table 2 shows the intergroup comparison of Glue and Sutures for post operative pain at POD1, POD7, 1 Month and 3 Month. Pain was at POD 1 with a mean of 2.37 in suture group and 0.85 in glue group. A p≤0.01 indicated that there was a significant difference between the groups. At POD7 the mean pain reduced to 1.72 in Suture group and 0.37 in Glue group indicating reduction of pain from POD 1. Similar to POD1 in POD 7 a p≤0.01 indicated that there was a significant difference between the groups.

Whereas, at 1 Month no pain was recorded in Glue group, however a mean pain score of 0.85 was recorded in Suture group. Similarly at time interval of Month 3 no pain was recorded in Glue group, whereas, Suture group recorded a pain score of 0.32. p value for both the groups was recorded at

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0.09 which showed no statistically significant difference between the groups. Diminishing of pain at Month1 and 3 shows that Glue group performed better than traditionally used Sutures.

	Groups	N	Mean	Std. Deviation	F-Value	p-Value
POD 1	Suture	40	2.3750	.54006	3.25	0.01*
	Glue	40	.8500	.53349		
POD 7	Suture	40	1.7250	.67889	2.00	0.01*
	Glue	40	.3750	.49029		
Month 1	Suture	40	.8500	.76962	92.63	0.09
	Glue	40	.0000	.00000		
Month 3	Suture	40	.3250	.72986	48.38	0.09
	Glue	40	.0000	.00000		

Table 2 Intergroup comparison of Glue and Sutures for post operative pain at POD1, POD7, 1 Month and 3 Month. Test applied Independent t test

Table 3 shows onset of Local reaction in Suture and Glue group. In the suture group the early onset of reaction was recorded in 7 (17.5%) of the patients. Whereas only 2 (5%) patients had Early Local reaction. The p≤0.01 was recorded showing statistically significant difference between the groups.

In Suture group 17 (42.5%) developed intermediate local reaction while 3(7.5%) patients developed intermediate local reaction. A p≤0.01 was recorded showing statistically significant difference between the groups.

13 (32.5%) developed late local reactions in Suture group, whereas only 2 patients developed late local reactions in Glue Group. A statistically significant difference of p value ≤0.01 was recorded.

		Suture		Glue		p-Value
		n	%	n	%	
Early	Yes	7	17.5	2	5.0	0.01*
	No	33	82.5	38	95	
Intermediate	Yes	17	42.5	3	7.5	0.01*
	No	23	57.5	37	92.5	
Late	Yes	13	32.5	2	5	

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	No	27	67.5	38	95	0.01*

Table 3: Local Reaction. Test applied Chi square Test (8.16)

Discussion

This prospective, observational comparative study was conducted to compare the efficacy of N-butyl cyanoacrylate glue with traditional sutures for mesh fixation in Lichtenstein inguinal hernia repair. A total of 80 patients were enrolled in the study and divided into two groups: Group 1 (n=40) underwent mesh fixation using conventional interrupted nonabsorbable monofilament suture, while Group 2 (n=40) underwent mesh fixation using N-butyl cyanoacrylate glue. The study aimed to assess the efficacy of N-butyl cyanoacrylate glue in terms of post-operative pain, mesh fixation time, local complications, and length of hospital stay.

The study found that the glue group had significantly less post-operative pain compared to the suture group. The mean pain score on day 1 after surgery (POD 1) was 0.85 in the glue group, compared to 2.37 in the suture group. This significant difference in pain scores was also observed on POD 7, with the glue group reporting a mean pain score of 0.37, compared to 1.72 in the suture group. The reduced pain scores in the glue group can be attributed to the minimal tissue trauma caused by the glue fixation technique, which results in less inflammation and discomfort.

The study also found that the glue group had a shorter mesh fixation time, with a mean time of 2.47 minutes, compared to 11.95 minutes in the suture group. This significant reduction in mesh fixation time can be attributed to the ease of application and rapid bonding properties of N-butyl cyanoacrylate glue. Additionally, the glue group had fewer local complications, such as surgical site infection and hematoma, compared to the suture group. The incidence of surgical site infection was 5% in the glue group, compared to 17.5% in the suture group, while the incidence of hematoma was 7.5% in the glue group, compared to 42.5% in the suture group.

The length of hospital stay was also significantly shorter in the glue group, with a mean stay of 1.1 days, compared to 2.27 days in the suture group. None of the patients in the suture group were discharged on the first day after surgery, while 36 patients (90%) in the glue group were discharged on the same day. The reduced length of hospital stay in the glue group can be attributed to the minimal post-operative pain and complications, which enables patients to recover faster and be discharged earlier.

Overall, the study concluded that the use of N-butyl cyanoacrylate glue is a safe and effective alternative to traditional sutures for mesh fixation in inguinal hernia repair. The glue fixation technique offers several advantages, including reduced post-operative pain, shorter mesh fixation time, fewer local complications, and shorter length of hospital stay. These findings suggest that N-butyl cyanoacrylate glue can be a valuable addition to the surgical armamentarium for inguinal hernia repair.

Conclusion

In our study, n-butyl 2-cyanoacrylate glue was compared to sutures for mesh fixation in a Lichtenstein tension-free mesh repair hernioplasty. The results showed that cyanoacrylate glue had several advantages over sutures. Firstly, it required less intraoperative time for mesh fixation, which reduced the total length of operating time compared to sutures and decreased the chance of infection by air. Secondly, postoperative pain was found to be less in the glue group at various intervals (POD1, POD2, 1 month, and 3 months), with reduced immediate pain. Moreover, no pain

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was recorded 1 and 3 months postoperatively. Additionally, there was a reduced incidence of local complications and foreign body sensation compared to the suture group. Notably, there was no incidence of hernia recurrence in either the glue fixation technique or suture group, indicating that the glue fixation technique is not inferior to sutures in terms of hernia recurrence. Furthermore, early painless ambulation was observed, which led to a decrease in the length of hospital stay and early discharge. However, our study was small and further analysis through large, randomized controlled trials is needed to provide a more definitive opinion.

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