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Cyanoacrylate Glue Versus Suture for Mesh Fixation in Open Inguinal Hernioplasty

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ABSTRACT

Background: In general surgery, the most common technique is inguinal hernia repair. A mesh prosthesis is implanted ventral to the transversalis fascia in the Lichtenstein repair. After the introduction of tension-free surgical repair with the use of prosthetic mesh, patients' comfort was reported to be significantly improved over that acquired by traditional, tension-producing procedures. The use of cyanoacrylate (CA) to secure the mesh may result in better results and reduce tension on the pubis, muscles, and nerves.

Objectives: Our study aimed to clarify the efficacy and complications of cyanoacrylate glue and nonabsorbable sutures for mesh fixation in Lichtenstein hernia repair techniques.

Matrials and Method: Prospective observational study for 6 months at General Surgery Department, Zagazig University Hospitals. 24 patients were divided into two groups. Group A undergoes hernioplasty using glue for mesh fixation and group B using sutures fixation. Patients were followed for 6 months for post-operative pain, recurrence, and complication.

Results: In our analysis the mean age of glue group was 50 ± 7 years, while in the sutures group it was 49.3 ± 6.7 years. Mean operation time in the glue group was 41.2 ± 5.1 min, while in the sutures group it was 47.6 ± 4.9 min with statistically significantly higher mean operation time in the sutures group. There was no substantial difference between the two groups after a considerable period of follow-up.

Conclusion: Histoacryl glue appears to be a promising alternative for mesh attachment in Lichtenstein inguinal hernia repair. According to our data, it showed replication of tissue integration and mechanical behavior of sutures while requiring less time to do. It's also associated with a decrease in persistent inguinal pain.

Keywords: Histoacryl glue, Inguinal hernia, Lichtenstein repair, mesh fixation, cyanoacrylate.

INTRODUCTION

In general surgery, the most common operation is inguinal hernia repair. In the Lichtenstein repair, a mesh prosthesis is inserted ventral to the transversalis fascia. Non-mesh methods such as Shouldice and Bassini repairs, on the other hand, use a continuous non-absorbable suture to reconstruct muscle layers and strengthen the inguinal floor [1]**.**

In adult men, surgical correction of an inguinal hernia is a common treatment. However, postoperative pain and incapacity are common. After the introduction of tension-free surgical repair with the use of prosthetic mesh, patients' comfort was found to be significantly improved over that acquired by traditional, tension-producing procedures [2]**.**

The best surgical method for inguinal hernia repair is still up for debate. To achieve tension-free healing, most procedures involve reinforcing of the inguinal floor with a synthetic or organic material [3]. In a multicenter RCT, the fibrin sealant was found to have a lower incidence of postoperative neuralgia than suture or staple fixation, with no difference in the rate of recurrence [4]**.**

Following typical hernia repair methods, postoperative groin discomfort might include neuralgia, chronic inguinal pain of varying degrees, and paresthesia. Although they are not related, their genesis could be linked to the use of sutures, which could create a foreign-body reaction, or an inflammatory response triggered by the maneuvers and biomaterials [5]. The use of cyanoacrylate (CA) to secure the mesh may result in better results and reduce tension on the pubis, muscles, and nerves [6]**.**

Our study aimed to clarify the efficacy and complications of cyanoacrylate glue and nonabsorbable sutures for mesh fixation in Lichtenstein hernia repair techniques.

PATIENTS AND METHODS

A Prospective Observational study for 6 months at General Surgery Department, Zagazig University Hospitals. Twenty-Four cases that fulfilled the inclusion and exclusion criteria were included in the study. Male patients aged between 20 and 60 years were scheduled for elective virgine inguinal hernia repair. Patients were anynomusly divided into two groups:

Group A (an odd number)**:** They underwent mesh fixation with glue.

Group B (even number)**:** They underwent mesh fixation with sutures.

All patients were subjected to the following: Full history taking, clinical examination, and routine preoperative preparation

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Surgical technique:

- General or spinal anesthesia
- Supine position
- Open surgery:

- We cut a half-inch incision above and parallel to the inguinal ligament's medial two-thirds. The ilioinguinal and iliohypogastric nerves were identified and preserved after opening the external oblique aponeurosis up to the external ring. In the instance of an indirect hernia, the sac is dissected until it reaches the internal ring, which is then transfixed and removed.
- In the instance of a direct hernia, the sac was inverted and the defect was closed with 2/0 polypropylene before mesh was applied. We used polypropylene mish 6×11 cm. tailored for every patient to cover 2 cm medial to the pubic tubercle.
- In group A, All sutures were removed and replaced with Histoacryl dots.
- The mesh in group B was secured with 2/0 polypropylene (Prolene) continuous and interrupted sutures to the inguinal ligament and internal oblique muscle.
- Closure with or without drain

Post-operative follow up:

After surgery, the patients were discharged at the same day or the next day. They were free to roam for the following six months, but they were not allowed to carry heavy goods. The visual analog scale (VAS) was used to track postoperative pain after 12, 24 hs, 1wk, and 1 month after surgery [7]**.** All patients were observed in the outpatient clinic for one week, one month, and then six months. To assess postoperative numbness, recurrence, and local recurrence.

Ethical approval:

Approval of the study was obtained from General Surgery Department after Institutional Review Broad, Zagazig University [IRB-ZU] approval. Every patients gives informed consent to be part of this study after explaining the aim of our study and possiple compilications. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

SPSS version 23 was used to tabulate and analyse the gathered data (Spss Inc, Chicago, ILL Company). In this study, the acceptable threshold of significance was ≤ 0.05 (P ≤ 0.05 was considered significant). Categorical data were presented as number and percentages. Quantitative data were expressed as mean ± standard deviation, median and range.

RESULTS

Clinical and demographic data were present in **tables 1 & 2**. The mean operation time in glue (group A) was 41.2 ± 5.1 min, while in sutures (group B) it was 47.6 ± 4.9 min with statistically significantly higher mean operation time in the sutures group. For two patients in group A and three cases in group B, we used a suction drain. In table **(3),** post-operative data were illustrated and showed statistically significant higher mean pain in the sutures group at 12 hr post-operative. Table **(4)** illustrated post-operative complication without any significant difference between both study groups.

Table 1. Demographic data of study groups

	Group A	**Group B**	**P-value**
	mean± SD	**mean± SD**	
Age(years)	50±6	49.3±6.7	0.742
BMI	20.6±1.6	20.6±1.5	0.917

t-test for continuous data

Table (2): Clinical data

		Group A	**Group B**	**P-value**
		N(%)	**N(%)**	
Type of Hernia	**Direct**	2(16.7%0	3(25%)	0.721
	Indirect	10(83.3%)	9(75%)	
Laterality	**Right**	8(66.7%)	9(75%)	0.723
	Left	4(33.3%0	3(25%)	
		mean± SD	**mean± SD**	
Size of defect (cm)		3.3±0.5	3.4±0.5	0.053

t-test ; fisher exact test

Table (3): postoperative data

		Group A	Group B	P-value
		mean± SD	mean± SD	
Pain VAS score	**12Hr**	6.2±1.3	7.2±0.9	0.009*
	24Hr	3.7±1.5	4.3±1	0.16
	1Weak	1.1±0.9	1.4±0.8	0.263
	1Month	0	0	
Hospital Stay (Hr)		16.7±5.9	19.6±7.9	0.218

t-test for continuous data; * for significance

Table (4): postoperative complication

		Group A	Group B	P-value
		N(%)	N(%)	
Complication	**Seroma**	1(8.3%)	2(16.7%)	0.484
	Surgical site infection	0	1(8.3%)	
Local Numbness		1(8.3%)	3(25%)	0.405
Recurrent		1(8.3%)	0	0.484

Fisher exact test for categorical data

DISCUSSION

In adult men, surgical correction of an inguinal hernia is a common treatment. However, postoperative pain and incapacity are common. After the introduction of tension-free surgical repair with the use of prosthetic mesh, patients' comfort was found to be significantly improved over that acquired by traditional, tension-producing procedures [2].

In a multicenter RCT, the fibrin sealant was found to have a lower incidence of postoperative neuralgia than suture or staple fixation, with no difference in the rate of recurrence [4]. The use of cyanoacrylate (CA) to secure the mesh may result in better results and reduce tension on the pubis, muscles, and nerves. Several studies have proven that using it enables proper and secure fixation with no issues [6].

Mean operation time in glue (group A) was 41.2 ± 5.1 min, while in sutures (group B) was 47.6 ± 4.9 min with statistically significantly higher mean operation time in the sutures group. This is compatible with the results of **Negro *et al.*** [8] study**.** In agreement with our results, a large review by **Ladwa *et al.*** [9]**,** glue groups showed a significant reduction in the operating time compared to the sutures group. Also, the study of **Jeyakumar *et al.***[10] agrees with our finding. They found that sutures method takes a longer time (52.6±4.64) than the glue method (41.8±5.65) with statistical significance (p=0.00). **Arafa and his colleagues** [4] support our findings as they found sutures mesh fixation take significantly longer duration than glue mesh fixation. Unlike our finding **Testini *et al.*** [11] in their study found in suture group that the mean duration of surgery was 54.5 min, while in the Nbutyl-2-cyanoacrylate group was 54.2 min without any statistical significance. When compared to suture mesh fixation, adhesive mesh fixation took less time overall.

Postoperative chronic groyne discomfort in patients who had an open inguinal hernia repair is a complex phenomenon. Nerve excision, nerve compression from sutures, foreign body reaction generated by the mesh, or muscle fibre strain can all cause pain [12]**.**

Regarding the postoperative pain, (VAS) score between study groups showed that there was statistically significant higher mean pain in the sutures group at 12 hr post-operative. Postoperative pain was much more common in the suture group than in the adhesive group [11].

According to the degree of pain, we found that in the cyanoacrylate group the overall pain was less in comparison with the other group [13]**.** The same result was realized by **Liu *et al.*** [14]**.** Their results showed that there was a lower incidence of chronic pain in the cyanoacrylate mesh fixation group**.** The Numerical Rating Scale was used to assess immediate postoperative pain within the first week of surgery, with a mean NRS score of 2.881.22 and 5.200.953 in glue and suture fixation, respectively, with a significant difference (p-value of 0.05). Clinical examination was performed at one, three, and six months, [15]**.** In the study of **Jeyakumar *et al.*** [10], pain VAS scores showed a progressive decline with time with a significantly lower value in the glue group than in the sutures group.

Various strategies for dealing with postoperative chronic groin pain have been recorded, with both positive and negative effects. Another innovation in hernia surgery to address chronic groin discomfort is self-gripping meshes with a surface covering of absorbable micro hooks for tissue fixation, obviating the requirement for sutures or glue fixation [9]**.** According to our findings, atraumatic mesh fixation with adhesive could be another way to lessen the

occurrence of chronic groin pain. Controlling the occurrence of chronic groin pain may also require careful dissection and avoidance of nerve entrapment during mesh fixation and posterior wall repair.

During long-term follow-up after mesh repair, however, up to 75.5% of patients experience chronic pain and this complication was probably previously underestimated **[16]**. Post-herniorrhaphy discomfort can have a big impact on a patient's quality of life. Furthermore, some experts claim that neuropathic pain accounts for a considerable amount of the suffering [17 & 18]**.** As a result, when the genitofemoral, ilioinguinal, and/or iliohypogastric nerves are injured by suture entrapment or mesh contact, the risk of acute or persistent pain following surgery is extremely high.

Due to the potential complications associated with stapled mesh fixation, many experimental and clinical studies have reported the use of glue for prosthetic mesh fixation during laparoscopic procedures or suture during open inguinal hernia repair. Many experimental and clinical studies have reported the use of glue for prosthetic mesh fixation during laparoscopic procedures or suture during open inguinal hernia repair [19 20]**.** When compared to sutures, glues provided much better short- and long-term results. The rationale for the better short- and long-term results with glues over sutures is most likely due to the sutures' nerve and vascular damage. Although the N-butyl2-cyanoacrylate group's inflammatory reaction and retractile fibrosis would suggest a higher incidence of the sense of an external body in the inguinal canal, this was not statistically validated by even one incident [11].

In terms of post-operative complications, glue (group A) revealed one case of post-operative seroma that resolved spontaneously without intervention, whereas sutures (group B) exhibited two cases of seroma and one case of superficial infection that responded well to local antibiotics. In a 6-month follow-up, glue (group A) had one case of local numbness and one case of recurrence, while sutures (group B) had three cases with no significant difference between the two groups. **Arafa and his colleague** [4] demonstrated in their study that scrotal edema and seroma were reduced in the glue fixation method (1.2 versus 3.8%, respectively). Recurrence was recorded during their short-term follow-up and was reduced in the glue fixation group [3.8 versus 6.2% (P=0.719)]. Also, they demonstrated that hematoma of the surgical wound, surgical-site infection, and reoperations for hemorrhage is reduced in the mesh fixation group (3.8 versus 5%, 1.2 versus 2.5%, and 0 versus 1.2%, respectively). In the study of **Jeyakumar *et al.***[10]**,** during the 6-month follow-up period, there were no intra-operative problems, seroma, wound infections, or ecchymoses, and no immediate recurrence. The postoperative complications and chronic groin pain were statistically similar in both groups according to **Ladwa *et al.*** [9]**.** Unlike our finding **Shah *et al.*** [21] discovered that there was a considerable difference between the two groups in terms of secondary sequelae, particularly scrotal edoema, which was less in the cyanoacrylate group, as it happened in one patient only in the cyanoacrylate group and in 4 patients in the suture group. Also, hematoma and seroma occurred only in the suture group (3 patients seroma and 1 patient hematoma, P = 0.05).

When we discuss the result of primary complications or recurrence, there was no significant difference in them in our study. This was compatible with the results of **Amer *et al.*** [21 & 22] that confirm our results in both groups**.** There was no significant difference in hernia recurrence in our study. It's possible that this is related to the short follow-up period and limited number of patients. This study found that cyanoacrylate mesh fixation was adequate for securing the prosthesis in open tension-free inguinal hernioplasty.

CONCLUSION

Histoacryl glue appears to be a promising alternative for mesh attachment in Lichtenstein inguinal hernia repair, according to our data, replicating tissue integration and mechanical behavior of sutures while requiring less time to do. It's also associated with a decrease in persistent inguinal pain. To estimate the reliable number of recurrences after inguinal hernioplasty, a minimum of 5- to 10-years follow-up is required, as a result, more studies with a longer length of follow-up are needed to clarify the efficacy of Histoacryl on the recurrence rate.

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REFERENCES

1. **Amid P (2005):** Groin hernia repair: open techniques. World J Surg., 29 (8): 1046-1051.
2. **Abd El-Ghaffar A, Elshafey M, Abd El-Moneam G (2019):** Open Mesh versus Laparoscopic Mesh Repair of Inguinal Hernia. Sci J Al-Azhar Med Fac Girls, 3(2):378.
3. **Basiouny A, Ragheb R, Elsharkawy A (2020):**Comparative Study between Unilateral Inguinal Hernia by Open Technique versus TAPP Repair. Med J Cairo Univ., 88 (12): 1673-1678.
4. **Arafa, Khairy M, Rushdy T, Gomaa M (2019):** Cyanoacrylate glue mesh fixation versus suture mesh fixation in Lichtenstein inguinal hernia repair. Egypt J Surg., 38 (3): 471.
5. **Bjurstrom M, Nicol A, Amid P, Chen D (2014):** Pain control following inguinal herniorrhaphy: Current perspectives. J Pain Res., 7: 277-290.
6. **Moreno-Egea A (2014):** Is it possible to eliminate sutures in open (Lichtenstein Technique) and laparoscopic (Totally Extraperitoneal Endoscopic) inguinal hernia repair? A randomized controlled trial with tissue adhesive (n-hexyl-α-cyanoacrylate). Surg Innov., 21 (6): 590-599.
7. **Ismail A, Abdul Ghafar M, Shamsuddin N, Roslan N, Kaharuddin H, Nik Muhamad N (2015):** The Assessment of Acute Pain in Pre-Hospital Care Using Verbal Numerical Rating and Visual Analogue Scales. J

Emerg Med., 49 (3): 287-293.

8. **Negro P, Basile F, Brescia A *et al.*(2011):** Open tension-free Lichtenstein repair of inguinal hernia: Use of fibrin glue versus sutures for mesh fixation. Hernia, 15 (1): 7-14.
9. **Ladwa N, Sajid M, Sains P, Baig M (2013):** Suture mesh fixation versus glue mesh fixation in open inguinal hernia repair: A systematic review and meta-analysis. Int J Surg., 11 (2): 128-135.
10. **S. J, Chitrambalam T, Chandrasekaran S (2018):** Glue versus suture for mesh fixation in open inguinal hernia repair. Int Surg J., 5 (4): 1443.
11. **Testini M, Lissidini G, Poli E, Gurrado A, Lardo D, Piccinni G (2010):** A single-surgeon randomized trial comparing sutures, N-butyl-2-cyanoacrylate and human fibrin glue for mesh fixation during primary inguinal hernia repair. Can J Surg., 53 (3): 155.
12. **Nowobilski W, Dobosz M, Wojciechowicz T, Mionskowska L (2004):** Lichtenstein inguinal hernioplasty using butyl-2-cyanoacrylate versus sutures. Preliminary experience of a prospective randomized trial. Eur Surg Res., 36 (6): 367-370.
13. **Sajid M, Ladwa N, Kalra L, McFall M, Baig M, Sains P (2013):** A meta-analysis examining the use of tacker mesh fixation versus glue mesh fixation in laparoscopic inguinal hernia repair. Am J Surg., 206 (1): 103-111.
14. **Liu H, Zheng X, Gu Y, Guo S (2014):** A meta-analysis examining the use of fibrin glue mesh fixation versus suture mesh fixation in open inguinal hernia repair. Dig Surg., 31 (6): 444-451.
15. **Shukla A, Mathur RK, Sheikh Z, Jain V(2019):** N-Butyl-2-Cyanoacrylate Glue versus Suture for Mesh Fixation in Open Inguinal Hernioplasty. J Evol Med Dent Sci., 8 (48): 3575-3578.
16. **Erhan Y, Erhan E, Aydede H, Mercan M, Tok D (2008):** Chronic pain after Lichtenstein and preperitoneal (posterior) hernia repair. Can J Surg., 51 (5): 383.
17. **Condon R (2001):** Groin Pain After Hernia Repair. Ann Surg., 233 (1): 8.
18. **Amid P (2002):** A 1-stage surgical treatment for postherniorrhaphy neuropathic pain: triple neurectomy and proximal end implantation without mobilization of the cord. Arch Surg., 137 (1): 100-104.
19. **Phillips E, Arregui M, Carroll B *et al*.(1995):** Incidence of complications following laparoscopic hernioplasty. Surg Endosc., 9 (1): 16-21.
20. **Petter-Puchner A, Fortelny R, Mittermayr R, Öhlinger W, Redl H (2005):** Fibrin sealing versus stapling of hernia meshes in an onlay model in the rat. Hernia, 9 (4): 322-329.
21. **Shah D, Soni K, Bariya M, Vagh T (2021):** Suture mesh fixation versus glue mesh fixation in open Lichtenstein inguinal hernia repair. Int Surg J., 8 (3): 863.
22. **Odobasic A, Krdzalic G, Hodzic M, Hasukic S, Sehanovic A, Odobasic A (2014):** The role of fibrin glue polypropylene mesh fixation in open inguinal hernia repair. Med Arch (Sarajevo, Bosnia Herzegovina), 68 (2): 90-93.