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### Application of Staple Gun versus Proline Suture during Inguinal Hernia Mesh Hernioplasty in Terms of Post-operative Complications

<sup>1</sup>Dr. Imran Khan, <sup>2</sup>Dr. Zarak Khan, <sup>3</sup>Dr. Syed Kazim Shah Bukhari, <sup>4</sup>Dr. Syed Murtaza Shah Bukhari, <sup>5</sup>Dr. Muhammad Ishraq

<sup>1</sup> Post Graduate Resident, Department of Surgery, Khyber Teaching Hospital, Peshawar KPK, Pakistan

<sup>2</sup> Post Graduate Resident, Department of Surgery, Hayatabad Medical Complex, Peshawar KPK, Pakistan

<sup>3</sup> Post Graduate Resident, Department of Surgery, Pakistan Kidney and Liver Institute, Lahore, Punjab, Pakistan

<sup>4,5</sup> Department of Physiology, Khyber Medical University, Peshawar KPK, Pakistan

Corresponding Author: **Dr. Syed Kazim Shah Bukhari**

#### Abstract

**Objectives:** To compare the efficacy of mesh fixation with staple gun tacks versus polypropylene suture in terms of post-operative outcomes during Lichtenstein mesh hernioplasty for inguinal hernias.

**Study Design:** Prospective comparative study.

**Setting:** Department of Surgery, Khyber Teaching Hospital, Peshawar.

**Duration:** From 1<sup>st</sup> January, 2022, to 31<sup>st</sup> December, 2022.

**Methodology:** After attaining approval from the Hospital ethical committee, the patients were allocated in two groups through blocked randomization: Group A (using staple gun for mesh fixation) and Group B (using polypropylene suture for mesh fixation). Outcomes such as post-operative pain (VRS scale), hematoma formation and urinary retention were studied. Results were analyzed on Statistical Package

for Social Sciences (SPSS) Version 23 and depicted in the form of description, statistical tables and charts.

**Results:** The mean age of the patients was 44.404 years  $\pm$  1.85 and all were males in both groups. Hematoma was unnoticeable in both groups. Relatively same proportion of patients had post-operative urinary retention, 5 in proline group and 6 in staple gun group. Higher mean pain on VRS was observed in the staple gun group (0.42  $\pm$  0.57 standard deviation) as compared to the proline suture group (0.12  $\pm$  0.39 standard deviation).

**Conclusion:** According to this study post-operative pain was the single most important variable that favored utilization of proline suture as the better technique for mesh fixation in inguinal mesh hernioplasty.

**Keywords:** Proline Suture, Staple Gun, Inguinal Hernia, Post-operative Outcome

#### Introduction

Inguinal hernia is a common clinical condition and mesh hernioplasty is regularly performed as an elective procedure<sup>[1]</sup> in the general surgery wards. If not dealt with on time, although rarely, it can lead to adverse events especially in the elderly<sup>[2]</sup>. Both the conventional open technique and the minimally invasive laparoscopic techniques have been employed in mesh hernioplasty with variable and desirable results. Annually, around 8 lack inguinal hernioplasties are performed in Britain<sup>[4]</sup> as compared to America<sup>[3]</sup> where almost 7 lack procedures are undertaken in the surgical wards. A hernia is the abdominal exit of tissue or an organ such as the bowel through the wall of the cavity in which it normally resides<sup>[5]</sup>.

The main ideology behind inguinal hernia repair involves tension free repair of the defect in the deep inguinal ring from where the hernia has protruded followed by fixation of a prosthetic mesh<sup>[6,7]</sup>. One of the issues highlighted in the previous years was recurrence and to counteract this problem, Lichtenstein in 1989 developed the concept of tension free hernia repair. Recent advances like the transabdominal preperitoneal (TAPP) repair and totally extraperitoneal repair (TEP) have revolutionized hernia surgery, however, Lichtenstein mesh hernioplasty still prevails as the procedure of choice due to operative ease and better patient outcomes<sup>[8]</sup>.

Mesh fixation is the integral part of hernia surgery and nonabsorbable polypropylene sutures are used in general practice during this part of the procedure to avoid mesh migration and dislodgment<sup>[9]</sup>. In addition, staple tacks can also be used to

instill the mesh at its proper anatomical location [10]. Both methods have been regularly employed as well as analyzed in medical literature in terms of per-operative and post-operative outcomes. The following study has been designed to further augment this comparison and investigate some variables which include pain assessment through VRS scale, hematoma formation and urinary retention in the post operative period and find out that which method is more relatively appropriate for mesh fixation.

**Methodology**

This randomized controlled trial was conducted in a tertiary care Hospital in Peshawar from 1<sup>st</sup> January 2022, to 31<sup>st</sup>December, 2022. The sample size chosen for this study was 100 patients (50 patients in group A and 50 patients in group B divided through lottery method) by applying 95% confidence interval, and 80% power of the test. Non-probability consecutive sampling technique was used.

**Data Collection**

The institution's ethical and research council gave its approval before the study could begin. All patients who met the requirements for inclusion in the study underwent screening in the OPD before being admitted to the ward for further assessment. They were made aware of the aim and purpose of the study and reassured that it was being carried out solely for research. If they agreed, informed consent was obtained.

The patients were allocated into two groups through blocked randomization. Group A (use of staple gun) and Group B (use of polypropylene suture). All patients were given spinal anesthesia and pre-operative antiseptic techniques were the same for both groups of patients. The procedures were performed by an assistant professor, an authorized fellow of the college of physicians and surgeons Pakistan, and injection 500 gm Grasil (Gentamicin) was used as per -operative antibiotic. As per protocol, direct hernias were plicated and indirect hernias were released from the spermatic cord and transfixed. A standard Ethicon proline mesh (size 6\*11) with an opening for the spermatic cord was fashioned. The mesh was fixed to the pubic tubercle, inguinal ligament and conjoint tendon with both techniques (proline 2/0 round body 35mm suture and Covidean Appose ULC 35W skin stapler). All patients were given injection

Toradol (NSAID) per-operatively and in the post-operative period they were put on injection tramal (opiate). Pain scores were recorded for three post-operative days via VRS scale on an average score. If patients went into urinary retention they were catheterized accordingly. In the OPD follow up after 7 days, hematoma formation, if present, was documented. Patients were properly counselled regarding avoidance of physical activity and daily wound dressing and discharged with tablet Nuberol forte 500mg twice daily for 5 days.

**Data Analysis**

Data was analyzed by using a statistical software SPSS version 23.0. Continuous variables i.e., age and pain scores through VRS scale were calculated as Means ± Standard deviation. Categorical variables i.e., gender, technique of mesh fixation, hematoma formation and urinary retention were analyzed as proportions. Outcomes were stratified with age, gender and technique of mesh fixation in both groups and students T test was applied to control the confounders and assumptions. P value of ≤ 0.05 was considered significant. All the results were presented in the form of graphs and tables.

**Results**

The mean age of the patients was 44.404 years ± 1.85 and all were males in both groups. In terms of the type of hernia, 36% patients had left inguinal hernia while 64% patients had a right inguinal hernia. There were no cases of hematoma formation noticed in both the groups. Out of total 50 patients in each group, 5 patients had post-operative urinary retention in the proline suture group compared to 6 patients in the staple gun group. For pain assessment, it was noticed that the mean pain through VRS scale in the proline group was 0.12 +\_ 0.39 standard deviation with maximum patients having no pain at all (n=45, 90%), four patients had a VRS scale of 1 and only one patient had a scale of 2. Pain measurements in the staple gun group showed mean 0.42 +\_ 0.57 standard deviation: 31 patients had zero scale, 17 patients had a scale of 1 and 2 patients had a scale of on VRS. Pearson chi square test was applied to test the correlation between pain grading and type of mesh fixation and the p-value was 0.004.

**Table 1:** Post-operative complications in both groups

Hematoma Formation	Frequency	Percentage	Valid Percentage	P-Value
1. Proline group	0 (none)	0	0	<0.001
2. Staple gun group	0 (none)	0	0	
Urinary Retention	Frequency	Percentage	Valid Percentage	P-value
1. Proline group	5	4.5%	4.5%	<0.001
2. Staple gun group	6	5.4%	5.4%	

**Table 2:** Pain (VRS) distribution for proline suture

		Frequency	Percentage	Valid Percentage	P-value
VRS Scale	0	45	40.5	90	0.004
	1	4	3.6	8	
	2	1	.9	2	
	Total	50	45.0	100	

**Table 3:** Pain (VRS) distribution for staple gun technique

VRS Scale	Frequency		Percentage		Valid Percentage	P-value
	0	1	2	Total		
	31	17	2	50	62	0.004
	27.9	15.3	1.8	45.0	34	
					4	
					100	

### Discussion

Inguinal hernia is a common surgical problem found in the outpatient setting and most often it requires surgical intervention<sup>[11]</sup> as part of complete treatment though in some cases it can be managed by watchful waiting<sup>[12]</sup>. Lichtenstein mesh repair is the most commonly practiced method of tension free mesh repair worldwide and in most cases is the surgeon's preference<sup>[13]</sup>. The usual technique of mesh fixation involves using a non-absorbable polypropylene suture as compared to the novel technique of using a staple gun that has the advantage of decreasing the mean operative time<sup>[14]</sup>.

Several papers have been published in the previous decade or so depicting high ratios of post-operative discomfort and chronic pain following mesh hernioplasty<sup>[15-17]</sup>. In our study Pain measurements in the staple gun group showed mean 0.42  $\pm$  0.57 standard deviation: 31 patients had zero scale, 17 patients had a scale of 1 and 2 patients had a scale of on VRS so the statistics showed proportionately greater pain following mesh fixation with staple tacks compared to proline suture. Kim-Fuchs<sup>[18]</sup> and his colleagues determined in their paper that the suture-less technique resulted in relatively less chronic pain contradicting the findings of our paper. Mills and coworkers are of the view that there was no significant difference in the incidence of postoperative complications or pain score. The study group reported earlier return to normal activity (4 weeks 0 days *versus* 6 weeks 2 days,  $P_{0.01}$ ) although there was no difference in the time taken to return to work or driving<sup>[19]</sup>. In a study done by Usman shah Bukhari and co-researchers, the mean post-operative pain score was 2.73 $\pm$ 2.07 in the Polypropylene-Group and 1.95 $\pm$ 2.18 in the Staples-Group.

In our study there were no reports of hematoma formation in both the groups and only one more patient had post-operative urinary retention in the staple gun group as compared to the proline suture group. This outcome is similar to the results of a study conducted by Khulique *et al.*<sup>[20]</sup> where post-operative outcomes such as occurrence of hematoma and post-operative urinary retention were relatively similar. An analysis organized by Muhammad H Zeb *et al.* illustrated that hematoma formation is an infrequent complication in inguinal herniorrhaphy and it was only significantly seen in patients who were on warfarin for some clinical condition<sup>[21]</sup>. According to Kevin *et al.* postoperative urinary retention (POUR) can occur in 0.2–35% of patients after inguinal hernia repair: Based on odds ratio estimates, for every 10-minute increase in operative time, an 11% increase in the odds of urinary retention is expected (OR 1.11, CI 1.004 – 1.223;  $p=0.04$ ).

### Conclusion

Mesh fixation during inguinal herniorrhaphy is the principal step in Lichtenstein tension free repair and improved methods of mesh fixation are still under research. In our study which involved using proline vs staple gun, both techniques have their own merits and demerits but they are relatively similar in post-operative outcomes. In patients

where staple gun was used, slightly higher VRS scores were recorded hence affecting hospital stay. However, further multicentric trials involving other variables should be undertaken to decide which method is more preferable.

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