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Comparison of Mesh Fixation with Prolene Suture and Staple Gun in Terms of Post-Operative Outcome Following Inguinal Hernioplasty

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Abstract

Objectives

To compare the efficacy of using prolene suture and staple gun during mesh fixation in terms of post-operative outcomes during Lichtenstein repair for inguinal hernias.

Study Design

Prospective comparative study.

Setting

Department of Surgery, Khyber Teaching Hospital, Peshawar.

Duration

From 1st January, 2023, to 31st December, 2023.

Methodology

After attaining approval from the Hospital ethical committee, the patients were allocated in two groups through blocked randomization: Group A (use of prolene suture for mesh fixation) and Group B (using staple gun for mesh fixation). Outcomes such as seroma formation,

surgical site infection, post-operative ileus and mean operative time 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 44.40 years \pm 1.85 and all were males. Equal number of patients in both groups had surgical site infection (n=3,6%) while none of them had post-operative ileus. Seroma formation was seen more in group B (n=6,12%) and mean operative time was comparatively less in the same group (46 \pm 8.20 minutes).

Conclusion

In terms of post-operative complications there is no noticeable difference between the two techniques of mesh hernioplasty other than duration of surgery which is relatively better in the staple gun technique.

Keywords: Prolene Suture, Staple Gun, Inguinal Hernia, Post-Operative Outcome

Introduction

One of the most regularly encountered clinical problems requiring elective surgical intervention is inguinal hernias ^[1] and it needs to be dealt with on time to prevent the occurrence of complications in the future ^[2]. Inguinal herniorrhaphy is performed both through the open technique and laparoscopically. Per annum, around 700000 inguinal hernia procedures are performed in USA ^[3] and average 800000 in the United Kingdom ^[4]. By definition, a hernia is basically a protrusion of a viscus or part of a viscus through an anatomical weak point in the wall of its containing cavity ^[5].

The basic principle of inguinal hernioplasty is the tension free repair of the defect in the deep inguinal ring followed by placement of a mesh, preferably a prosthetic mesh ^[6, 7]. Liechtenstein, in 1989, concluded that recurrence rates were reported to be the lowest for tension free mesh hernioplasty technique and despite advances in inguinal hernia repair techniques which include the transabdominal preperitoneal (TAPP) repair and totally extraperitoneal repair (TEP), Liechtenstein mesh hernioplasty is still widely practiced due to operative ease, surgeon preference, reasonable expenses and better patient response ^[8].

The traditional method of mesh fixation that has been regularly utilized is with the help of a non-absorbable polypropylene suture with the benefit of avoiding mesh migration and wrinkling [9]. The alternative and relatively safe time saving technique is the application of skin tacks with a staple gun to fix the mesh [10]. Both these techniques have been studied at national and international level with varying results. Some papers have favored the staple gun fixation technique citing reasons that this technique is quick to use, reduces the mean operative time and also significantly controls infection rates [11]. Therefore, the following study was designed to explore difference in outcomes between the two techniques and find out which method was relatively more satisfactory.

Methodology

This randomized controlled trial was conducted in a tertiary care Hospital in Peshawar from 1st January 2023, to 31stDecember, 2023. 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 in two groups through blocked randomization. Group A (use of proline suture) and Group B (use of staple gun). All patients were given spinal anesthesia and pre-operative antiseptic techniques were the same for both groups of patients. The procedures were performed by final year post graduate residents 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). The time taken throughout the surgical procedures was recorded and all the patients were given injection 500 mg Gracil (Gentamicin) and 2 gm injection sulzone (cefoperazone and sulbactam) in the post operative period factors such as mean operative time and pain was recorded. In the OPD follow up after 7 days surgical site infection (SSI) and seroma formation, if present, was documented. Patients were properly counselled regarding avoidance of physical activity and daily wound dressing and discharged with tablet Ciproxin 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 mean operative time were calculated as Means ± Standard deviation. Categorical variables i.e., gender, technique of mesh fixation, and surgical site infections 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. Patients were followed in the OPD on 7th post op day and it was observed that equal number of patients had evidence of surgical site infection for both group A and B (n= 3, 6%). About the same number of candidates (n= 3, 6%) had seroma formation who had mesh fixation done with proline (group A) as compared to staple gun technique (group B) where 6 patients (12%) developed seroma formation in the post-op period.

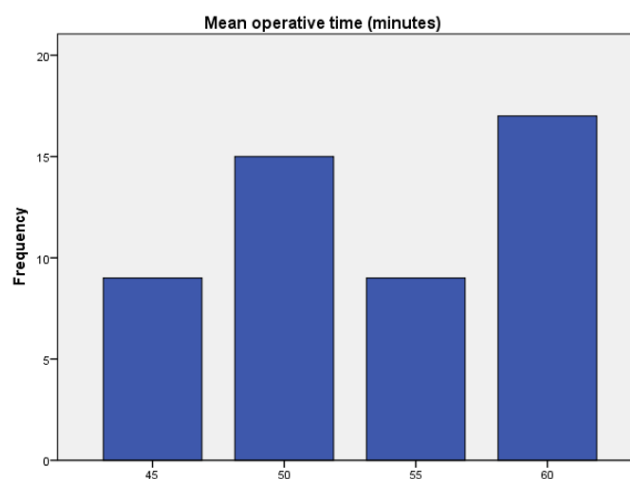
Table 1: Frequencies and percentages for post-operative complications in both groups

Surgical complication	Frequency (Group A)	Percentage (Group A)	Frequency (Group B)	Percentage (Group B)
Surgical site infection	3 (out of 50)	6%	3 (out of 50)	6%
Seroma formation	3 (out of 50)	6%	6 (out of 50)	12%
Post operative ileus	none	0	none	0
Total	50	100	50	100

The mean operative time for the proline suture group was relatively longer, 49.7 ± 7.94 minutes, in contrast to the staple gun group, 46 ± 8.20 minutes. Post-operative ileus, documented for 3 post-surgery days, was not seen in any of the patients from both groups. Cross tabulation using the Pearson chi square test revealed strong correlation between the type of mesh fixation technique and mean operative time (p-value <0.05).

Table 2: Mean operative time in Group A

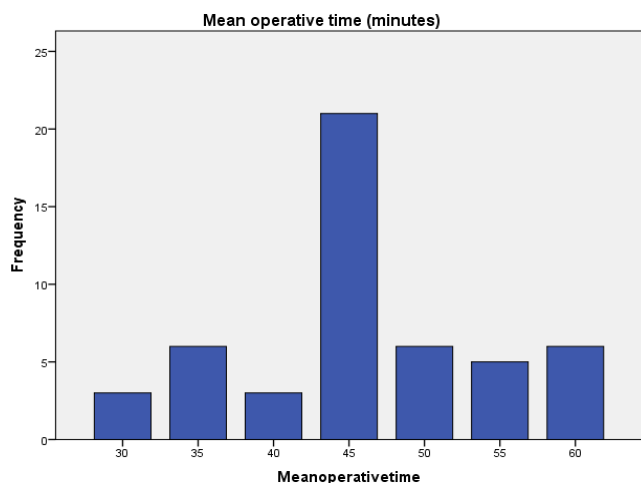
Time (minutes)	Frequency	Percentage	Valid Percentage	p-value
45	9	9.0	18.0	< 0.05
50	15	15.0	30.0	
55	9	9.0	18.0	
60	17	17.0	34.0	
Total	50	50.0	100.0	



Bar Chart 1: Mean operative time for group A

Table 3: Mean operative time in Group B

Time (minutes)	Frequency	Percentage	Valid Percentage	P=
30	3	3.0	6.0	< 0.05
35	6	6.0	12.0	
40	3	3.0	6.0	
45	21	21.0	42.0	
50	6	6.0	12.0	
55	5	5.0	10.0	
60	6	6.0	12.0	
Total	50	50.0	100.0	



Bar chart 2: Mean operative time for Group B

Discussion

Inguinal herniorrhaphy and mesh hernioplasty techniques have culminated over the past few decades from bassini repair described by Edward bassini [12] over a century back to the famous Lichtenstein mesh repair widely practiced these days as the procedure of choice [13]. One chief reason that has been thoroughly investigated for failure in hernia surgeries, especially in terms of recurrence, is suture line tension [14]. Primitive repairs had a suture line where edges were approximated under tension hence leading to suture line cut through and tissue ischemia [15]. Lichtenstein tension free repair has the advantage of taking certain factors into account hence providing relative strength to the transversalis fascia along with a tension free defect repair. The technique of mesh fixation with staples was first introduced by Egger *et al* [16].

Post-operative quality of life and recovery has regularly been assessed in previous studies following inguinal hernia repair by analyzing several factors [17, 18]. The mean age of presentation in our study was 44.4 which is similar to research conducted by Mumtaz Wani and his colleagues where the age range was 41-50 years [19] and a study by Pragya and co-workers where the mean age of the patients was 44.3 [20]. Our study depicted equal percentage of surgical site infection in both groups and slightly raised occurrence of seroma formation in the staple gun group. It has been observed in literature that limited differences in complications were seen while comparing these two techniques. Mumtaz Wani noted (7.5%) SSI in both groups [18] However Munghate *et al* [21] has described surgical site infections being more prevalent with proline (24%) in contrast to staple gun (4%). Khulique A *et al* [22] also perceived more ratio of SSI with proline (12.3%) than with staples (3.1%).

In our study, 6 patients (12%) had seroma formation in

group B while 3 of them (6%) had this adverse event in group A. This finding was not significantly altered in Garg *et al* report who reported almost equal incidence of this complication in both the groups [23] and the results were supported by Pragya *et al* [20] in their analysis as well. On the contrary Mumtaz [19] and coworkers have described 10% chance of seroma formation with proline and a 7.5% ratio with the staple gun technique.

The main distinguishing factor between the two approaches is the mean operative time which was slightly better for group B in our study. Several studies have reinforced the verdict that staple gun mesh hernioplasty slightly decreases the average duration of surgery [24]. A recent study has shown that mean operative time with the staple gun technique was 50 ±16 minutes versus 56 ±17 minutes for the polypropylene group [2]. Difference of 12 minutes was found between the two groups which was significant ($P < 0.001$) thus proving that staples can be applied much more quickly than sutures hence saving the operating time, as represented by Munghate *et al* [21]. The analysis conducted by Mumtaz and his colleagues showed mean operative time of 45 and 59.25 minutes for staple gun and proline suture techniques, respectively.

Conclusion

According to the results of this paper and the findings from international literature on this topic, we can safely conclude that both methods of mesh fixation are equally safe and acceptable techniques in terms of post-operative outcome and recovery however staple fixation provides the luxury of a proportionately shorter duration of surgery and an earlier return to normal life activities as compared to hernioplasty with a proline suture. Further research in the form of multicentric trials are warranted to further augment and validate these findings.

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