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Original Research Article

A comparative study of use of polypropylene and composite mesh in inguinal hernia repair

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ABSTRACT

Background: Hernia most probably has been a disease ever since mankind existed. Repair of inguinal hernia is one of the commonest surgical procedures worldwide. Currently, about one million meshes are used per year world-wide for hernia repair. Therefore, surgical repair of hernia is a hot area of research for keeping the recurrence rates low with few complications using an ideal mesh material. The aim of the study was to compare the use of Polypropylene mesh and Composite mesh in patients undergoing inguinal hernia repair.
Methods: A total of 60 patients of either gender were enrolled in the study and followed upto8 weeks. Out of 60, 30 patients were offered Polypropylene mesh hernioplasty and in rest 30 patients Lichtenstein hernioplasty with composite mesh was done. Postoperative analysis was made in terms of postoperative pain, complications and recurrence.
Results: Both the groups were comparable in terms of age and gender. Post-operative pain at 24 hours was considerably lower in patients undergoing hernia repair using Composite mesh than with Polypropylene mesh group. However, most of the post-operative complications were comparable in early post-operative period and on subsequent follow up visits in both groups.
Conclusions: Polypropylene mesh and composite mesh were comparable in terms of ease of mesh placement and post-operative complications in patients of inguinal hernia repair.

Keywords: Polypropylene, Composite, Hernia, Hernioplasty

INTRODUCTION

Hernia most probably has been a disease ever since mankind existed. Hernia is derived from the Latin word saccihernialis which means rupture. It is defined as a protrusion, bulge or projection of an organ or a part of an organ through the body wall that normally contains it. In an inguinal hernia the protrusion occurs through the inguinal canal.[1] Hernias have been classified into various types which include inguinal, umbilical, and femoral canal regions. Out of these hernias, the incidence of inguinal hernias (75%) is more compare to umbilical (9.5%), incisional (6.2%), femoral (2.7%) and other types including hiatal, or epigastric (8.6%). [2,3]

Inguinal hernias are classified as direct, indirect and combined hernias, depending on their relationship to the inferior epigastric vessels. Inguinal hernias are associated with various risk factors such as: male sex, increase age and family history of groin hernias, smoking, high intra-abdominal pressure, collagen vascular disease, thoracic or abdominal aortic aneurysm, patent processus vaginalis, history of open appendectomy, and peritoneal dialysis.[4,5]

Repair of inguinal hernia is one of the commonest surgical procedures worldwide.[6] Repairs that include the use of mesh to close the defect came up with the better results but still had high recurrence rates due to the low stretching capability of the mesh/tissue complex contrasts with the highly elastic abdominal wall.[7] The advantage of prosthetic surgery over tissue repair in terms of recurrence has been comprehensively attested; the rate drops by 50-75%, and the difference appears to grow over time.[8]

Polypropylene (PP) is the most utilized and researched implant material in hernia surgery, followed by polyethylene terephthalate (PET, "polyester") and expanded polytetrafluoroethylene (ePTFE). A self-gripping mesh was introduced that was claimed to potentially prevent the onset of chronic pain. A self-gripping mechanism is hypothetically superior, as sutures, a potential cause of ongoing pain due to nerve damage, are not required.[9] First generation surgical meshes were predominantly based on polypropylene (PP) systems. In 1958, the first polypropylene mesh was used to repair an abdominal wall; it was a heavyweight mesh with small pores. Due to intense fibrotic reactions, Infections, chronic pain, foreign body sensation, recurrence and other complications associated with PP mesh the search for an "ideal" mesh continued. Therefore, second generation meshes were developed combining more than one synthetic material into their composition as composite meshes with alleged lower rates of complications. So we planned a study to compare the PP mesh with that of a composite mesh.[10] Currently, about one million meshes are used per year world-wide. Therefore, surgical repair of hernia turned to be a hot area of research for keeping the recurrence rates low with few complications.

METHODS

The prospective comparative study was conducted in the department of general surgery, at GGS medical college and Hospital, Faridkot Punjab (India) after ethical committee approval from September 2019 to August 2020. Patients above 18 years of age of either gender with confirmed diagnosis of inguinal hernia and with both direct and indirect inguinal hernia were included. Patients with recurrent hernia, strangulated hernia, obstructed hernia and with known case of diabetes, patients with jaundice, malignancy, bleeding disorders, patients on steroid or chemotherapy were excluded from the study. Keeping in view of the availability and feasibility of participants, convenient sampling technique was adopted and consecutively (60 patients) eligible participants were considered for the study. All the patients were subjected to detailed history & clinical examination. Complete hemogram, coagulation profile, renal function test and any additional investigation if required were done. Patient was kept nil per orally for at least 8 hours before the surgery.

Skin was prepared with 10% betadine solution. After giving incision skin and subcutaneous layer was opened. External oblique aponeurosis (EOA) was exposed and opened in line of incision. Space created by dissecting beneath the medial and lateral flaps of EOA and then down the inguinal ligament clearing its shelving edge to the pubic tubercle. Direct hernia sac was inverted with polypropylene 2-0 suture. In Indirect hernias sac was dissected from the spermatic cord and then divided, transfixed with 2-0 silk and distal part was excised. A sheet of mesh 3"x6" inch was cut to shape and laid over posterior wall over the inguinal canal so that it would overlap the pubic tubercle by atleast 1cm medially, extend superiorly to lay over the conjoint tendon and to a point atleast 2 cm lateral to deep inguinal ring and fixed with polypropylene 2-0 suture. In group A (n=30) Polypropylene mesh was used for hernia repair while in group B (n=30) Composite mesh was used.

Mesh was fixed with interrupted sutures of polypropylene 2-0. The spermatic cord was passed through a slit in the mesh. EOA was sutured with polygalactin no 2-0. Skin closure was done using interrupted sutures of silk 2-0 which were removed after 7 days. Ease in placement of mesh at the time of surgery was noted. Postoperative analysis was made in terms of postoperative pain, wound infections, seroma formation, haematoma formation, scrotal edema, hospital stay and cost effectiveness, foreign body sensation, recurrence. For pain a visual analogue scale (VAS) was used. The patients were followed up upto 8 weeks for any late complication like chronic pain and recurrence.

After completion of the study, observations obtained were tabulated, analyzed and evaluated using statistical methods. Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables were presented as mean±SD or median if the data was unevenly distributed. Categorical variables were expressed as frequencies and percentages. The comparisons of normally distributed continuous variables between the groups were performed using Student's t test. Nominal categorical data between the groups were compared using Chi-Square test or Fisher's exact test as appropriate. Non-normal distribution continuous variables were compared using Mann Whitney U test. For all statistical tests, a p value less than 0.05 was taken to indicate a significant difference.

RESULTS

In the present study, total sample of 60 patients were included and were divided into two groups comprising of 30 patients each. Both the groups were comparable in terms of age and gender distribution (Table 1). Mean age of the study group A who underwent polypropylene mesh was 52.43±15.49 and mean age of the study Group B who underwent composite mesh was

Intraoperative findings are given in (Table 2).

Table 1: Demographic characteristics (n=30).

Parameter	Group A	Group B	P value
Age	52.43±15.49	49.57±15.27	0.23
Gender Male: female	14:1	29:1	0.55

Table 2: Intraoperative findings (n=30).

Parameter	Group A	Group B	P value
Side of inguinal hernia (left:right)	7 : 23	9: 21	0.559
Type of inguinal hernia (direct: indirect)	13:17	5:25	0.024
Content of inguinal hernia (gut:omentum)	11: 19	10: 20	0.787
State of posterior abdominal wall (defective:normal)	13:17	5:25	0.024
size of deep ring (dilated:normal)	16:15	25:5	0.02
Ease of mesh placement (difficult:normal)	7:23	27:3	0.166
Operative time (minutes, mean±SD)	41.36±4.58	39.13±4.321	0.3

It was observed that putting mesh was easy in 23 (76.7%) patients in group A and 27 (90%) patients in group B whereas in 7 (23.3%) and 3 (10%) patients of group A and B respectively, the mesh placement was difficult.

Post-operative VAS scores are given in (Table 3). At 24 hours post-operatively, mean VAS for group A patients was 1.5 while for group B was 1.2. Post-operative complications are given in (Table 4). In early post-operative complications 3 (10%) cases of urinary retention were seen in group A and 2 (6.7%) cases in group B. The difference between both the groups was statistically insignificant. After 1 week of follow up in group A, 2 (6.7%) patients presented with pain, 3 (10%) patients presented with scrotal edema and 2 (6.7%) patients had wound infection. In group B, 1(3.3%) patient had pain, 2 (6.7%) had wound infection and 1(3.3%) had scrotal oedema. Although patients in group A showed more complications but the difference was not statistically significant. After 4 weeks 3 (10%) patients presented with foreign body sensation and 1 (3.3%) patient presented with pain in group A, whereas in group B2 (6.7%) patients presented with foreign body sensation and 1 (3.3%) patient presented with pain. The difference between both the groups was insignificant (Table 4).

Table 3: Postoperative VAS.

Visual analogue scale (VAS) (n=30) (Mean score±SD)	Group A	Group B	P value
1 hour	4.40±0.563	4.13±0.730	0.2
6 hours	3.40±.675	3.67±0.758	0.255
12 hours	2.73±0.69	2.63±0.80	0.23
24 hours	1.5±0.65	1.2±0.53	0.039

Table 4: Postoperative stay and complications.

Variables (n=30)	Group A	Group B	P value
Hospital stays in days (Mean±SD)	2.13±.3	2.10±0.3	0.6
Early complications			
Urinary Retention	3	2	0.06
After 1 week complications			
Infection	2	2	0.643
Scrotal Edema	3	1	
Pain	2	1	
After 4 weeks complications			
Foreign body reaction	3	1	0.896
Pain	1	1	
After 8 weeks complications			
Foreign body reaction	5	2	0.481
Pain	1	1	

DISCUSSION

Surgical meshes have been in use since 1891. The use of mesh products to surgically repair or reconstruct inguinal hernia has been widely adopted. The surgical mesh firmly reinforces the weakened area and provides tension-free repair that facilitates the incorporation of fibro collagenous tissue. Given the vast number of post-surgery complications such as infection, fibrosis, adhesions, mesh rejection, and hernia recurrence, research in the area has expanded. Researchers have focused on the analysis of a wide range of meshes with different fiber size, porosity, manufacturing methods, and a variety of surgical and implantation procedures.[11]

In the present study mean age of the study group A who underwent polypropylene mesh was 52.43±15.49 and mean age of Group B who underwent composite mesh was 49.57±15.27, were comparable with each other. In the present study male predominance was observed. Although inguinal hernias occur in both sexes but they are more common in men compared to women. It affects all ages, but the incidence increases with age. It occurs at a later age in women with their peak age range at presentation being 40 to 60 years of age, unlike that of men, which is 10 years earlier.[12,13] O'Dwyer et al also conducted a study in which mean age of patients was55.7±16.4 years in partially absorbable lightweight

mesh group and 57·3±15·8 in non-absorbable heavyweight mesh group.[14]

In present study it was easy to put mesh in 23 (76.7%) patients in group A and 27 (90%) patients in group B whereas in 7 (23.3%) patients in group A and 3 (10%) patients group B there was difficulty in the mesh placement (Table 2). However, the difference between both the groups was statically insignificant. Heikkinen T, et al found that both the meshes were comparable in terms of the surgeon's assessment of the handling of the mesh.[15] In regard to operating time, in present study it was found that the mean operative time in group A (41.36±4.58) was almost comparable to group B (39.13±4.32).The difference between the mean operative time in both the groups was not significant. Khan et al (2010) conducted a randomized clinical trial and found that the mean operating time (mins) in polypropylene mesh group was 49.8±11.5 and in composite mesh group was 49.6±11.6, which was statistically insignificant.[16]

In the present study, post-operative pain score was assessed by using Visual analogue scale at 1, 6 and 12 hours were 4.4±0.56, 3.4±0.67 and 2.73±0.69 in Group A and 4.13±0.73, 3.67±0.76 and 2.63±0.80 in Group B respectively (Table 3). At 24 hours post-operatively, mean VAS for group A patients was 1.5±0.65 while for group B was 1.2±0.53. No significant difference was seen at 1, 6 and 12 hours in post-operative pain score while a significant difference in results were obtained while comparing the means within both the study groups (p=0.03) at 24 hours. Our results were comparable to study of Post et al in which he found that mean pain score in polypropylene mesh group was 3.76 and in composite mesh group was 3.0.[11]

In our study, no early post-operative complications were recorded in 27 (90%) and 28 (93.3%) patients in group A and B respectively. while 3 (10%) patients of urinary retention were seen in group A and 2 (6.7%) in group B (Table 4). Khan et al conducted a prospective study in which he found that there were 4 cases of urinary retention in polypropylene mesh group and 6 were in composite mesh group.[16] Smietanski et al conducted a study in 600 patients and found that 5 cases of urinary retention in polypropylene mesh group and 12 were in composite mesh group.[17]

In comparison of post-operative complications at 1 week (Table 4), patients having wound infection were 2 in both Group A and B, scrotal edema was seen in 3 patients in Group A and only 1 patient in Group B. 2 patients of group A and 1 patient of Group B complained of pain . At 4 weeks of follow up, patients having foreign body sensation were 3 in Group A and 2 in Group B. 1 patient in each Group A and B presented with pain. Similarly at 8 weeks of follow up foreign body sensation and pain were seen in 5 and1 patients in group A and 2 and 1 in group B respectively. The difference between both the groups was non-significant at 1, 4 and 8 weeks of follow up. Mukthinath et al conducted a study on 62 patients and found that there were 2 cases of wound infection in both polypropylene and composite mesh group while feeling of foreign body sensation was seen in 10 patients in polypropylene mesh group and 3 in composite mesh group.[18] This study is a small attempt to compare the polypropylene and composite mesh in patients undergoing inguinal hernia repair. But this study has some inherit limitations being small size study the results can't be generalized to large populations hence large sample size and multicentric studies may be carried out to confirm the findings of present study.

CONCLUSION

Polypropylene mesh and composite mesh are comparable in terms of ease of mesh placement, hospital stay and post-operative complications in patients of inguinal hernia repair. Post-operative pain at 24 hours was considerably lower in patients using composite mesh.

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