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Light Weight vs Heavy Weight Polypropylene Mesh , A Comparative Study in the Repair of Anterior Abdominal Wall Hernia

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Abstract

Introduction: Hernia can occur in any site of the body, the common site being the anterior abdominal wall includes epigastric, umbilical, Spigelian and inguinal hernia, the latter being the most commonly encountered hernia in surgical departments. Hernia repair is one of the most commonly performed surgeries in the globe. Hernia surgery has drastically improved from a simple tissue repair method and then prosthetic repair to minimally invasive techniques. Despite the advancement in hernia repair technique and frequency of this surgery, the pain remains an important complication following surgery. **Materials and Method:** 100 patients included in this study are equally grouped into the lightweight mesh group and heavy-weight mesh group by randomisation. This study is conducted in department of General Surgery, VIMSAR, Sambalpur, Odisha from March 2023 to February 2024 in a prospective manner and single-blinded. Patients were followed up 6 months postoperatively and complications observed were compared and analysed. **Result:** In the heavy-weight mesh group, the incidence of seroma formation is 20%, chronic post-operative pain and wound infection is 12% each, hematoma formation is 8%, and recurrence and sinus formation is 4% each. In the lightweight mesh group, the incidence of seroma formation is 20%, chronic post-operative pain and wound infection is 8% each, hematoma formation is 4% and no incidence of sinus formation or recurrence. There are no incidences of mesh infection or enterocutaneous fistula in either group. The analysis of data showed that complications observed are more in heavy weight mesh group although the difference in the incidence of complications between the two groups are minimal. **Conclusion:** There is no discernible difference in the open repair of anterior abdominal wall hernias between the use of lightweight and heavy-weight prosthetic mesh.

Keywords: Lightweight mesh, Heavyweight mesh, Postoperative complications

Introduction

A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.Hernia can occur in any site of the body, the common site being anterior abdominal wall which includes epigastric, umbilical, Spigelian and inguinal hernia **[1]** , the latter being the most commonly encountered hernia in surgical departments. Inguinal hernias can be direct, indirect or combined type, indirect hernia is common among them. Incidence of the abdominal wall hernia in the general population is estimated at around 5%, of which 75% occur in inguinal region **[1-2]** .

Hernia repair is one of the most commonly performed surgeries all around the world. Hernia surgery has drastically improved from a simple tissue repair method and then prosthetic repair to minimally invasive techniques. Despite the advancement in hernia repair technique and frequency of this surgery, the pain remains an important complication following surgery. Different types of mesh are used in the repair of hernia nowadays. It can be prosthetic, absorbable or biological mesh. The composition and structure of prosthetic meshes vary widely, which influences the healing process following meshplasty **[3]** . The complications in patients following hernioplasty using lightweight and heavy-weight mesh are compared and analysed in this study. The focus of this study is on the prevention of post-operative pain when two different types of mesh are used.

Aim Of The Study:

To assess the effectiveness of heavy-weight and composite light-weight polypropylene mesh in anterior abdominal wall hernia repair. To follow up with the patients postoperatively and compare the influence of both meshes in the incidence of chronic postoperative pain. To compare the incidence of sinus formation and recurrence of hernia following repair with both types of mesh.

Materials:

Patients who were admitted to the General Surgery Department , VIMSAR, Sambalpur with anterior abdominal wall hernia as primary complaints were included in this study. The study period was from March 2023 to February 2024. Only those patients who were willing to give consent been included in this study and followed up for six months post-operatively.

Inclusion Criteria:

Patients with primary anterior abdominal wall hernia as primary complaintPatients of both sexes.

Patients in the age group between 30 to 70 years.

Patients who were willing to give consent for the study.

Exclusion Criteria:

Patients with recurrent hernia in the anterior abdominal wall.

Patients with incisional hernia.

Patients with strangulated hernia.

Patients with incarcerated hernia.

Method:

1000 eligible patients were chosen after getting informed written consent for the study. Patients were allotted to either the lightweight mesh repair group or the heavyweight mesh repair group by randomization. History of presenting complaints, risk factors clinical findings and diagnosis were recorded. Basic blood investigations and x-ray findings were recorded. Lichtenstein tension-free hernioplasty and Onlay meshplasty were done depending on the type of hernia. The mesh used in each patient depends on the group to which they were allotted. Patients were followed up for six months postoperatively from the day of surgery. Postoperative complications if any were individually recorded and treated accordingly and the same were also recorded. Data were finally compiled and analysed.

Design Of Study:

1. The study was conducted in a Prospective manner. The study started in March 2023 and concluded in February 2024.

2. A randomized controlled study.

Patients were randomly allotted to either the lightweight mesh group or the heavyweight mesh group. Randomisation was done by simple token technique. Patients were asked to randomly select a token, numbered from 1 to 100. Tokens were already randomly marked as either one of the two groups. Single blinded study Patients were unaware of which group they were allotted.

Size Of The Study:

100 patients divided into 2 groups of 50 each.

Factors Which Are Analysed:

The post-operative complications which are analysed in this study are seroma formation, hematoma formation, wound infection, chronic post operative pain, recurrence, sinus formation, mesh infection, enterocutaneous fistula.

The type of procedure done, Mesh used in each individual, and post-operative complication if any are recorded in proforma. Data are finally compiled and analysed.

Result:

The study is a comparative study between two groups. The 100 patients were divided into two equal groups, one group of 50 patients operated with lightweight composite mesh and the other group of 50

patients operated with heavy-weight polypropylene mesh. The age group of patients, sex of patients, types of hernia operated, surgery performed, post-operative complication analyzed in each group, common and least complications in each group were analyzed and the data are shown below. The analysis of age incidence of hernia showed Out of 100 patients who were included in the study, who were in the age group 30 – 70years, 36 patients (36%) are in the age group 30 – 40, 22 patients (22%) in 40 – 50 age group, 24 patients (24%) in the 50 – 60 age group and 18 patients (18%) in 60 – 70 age group. The sex ratio of the patients was analyzed and it shows that out of 100 patients, 82 patients (82%) are males and 18 patients (18%) are females. In the lightweight mesh group out of 50 patients, 40 patients (80%) are males, 10 patients (20%) are females. In the heavy-weight mesh group out of 50 patients, 42 patients (84%) are males, and 08 patients (16%) are females.

The various types of hernia are analyzed in this study group which showed indirect inguinal hernia is the most common presentation in patients included in this study and it accounts for 36 % (36 patients) of study group. Other types of hernia analyzed in this study are direct inguinal hernia 22% (22 patients), pantaloon hernia 12% (12 patients), bilateral inguinal hernia 10% (10 patients), para umbilical hernia 10% (10 patients), epigastric hernia 8 % (8 patients), umbilical hernia 2% (2 patient). Lichtenstein repair has been done for 80% (80 patients) of patients in the study and only meshplasty for 20% (20 patients) in the study.

The post-operative complications following hernioplasty have been recorded individually in all patients of both groups and compared between them. The results of the comparison are discussed below.

The incidence of seroma formation in lightweight composite mesh group patients is 20% (10 patients) and that of heavyweight mesh group is the same at 20% (10 patients). The incidence of hematoma formation is found to be 4% (2 patient) in the lightweight mesh group and 8% (4 patients) in the heavyweight mesh group. The incidence of wound infection is found to be 8% (4 patients) in the lightweight mesh group and 12% (6 patients) in the heavyweight group. The incidence of chronic postoperative pain is 8% (4 patients) in lightweight mesh group patients and 12% (6 patients) in heavy-weight mesh group patients. The incidence of recurrence is 4% (2 patient) in the heavyweight mesh group and no recurrence in the lightweight mesh group. The incidence of sinus formation in this study is 4% (2 patient) in the heavyweight mesh group and none in the lightweight mesh group. There is no incidence of mesh infection and enterocutaneous fistula in this study.

Sl.No.	Complications	Chi Square test / Fisher's test	p-value	Percentage (%)	
				Light weight Mesh	Heavy weight Mesh
1.	Seroma Formation	0.00	1.00	00	20
2.	Hematoma Formation	0.00	1.00	04	08
3.	Wound Infection	0.00	1.00	08	12
4.	Chronic Post-operative pain	0.00	1.00	08	12
5.	Recurrence	0.00	1.00	00	4
6.	Sinus Formation	0.00	1.00	00	04

Discussion:

Patients who are treated in this study are more in the age group of 30 – 40 years. It can be inferred by then that the incidence of hernia is higher in patients of the age group of 30 – 40 years followed by the 50 – 60 years age group. This study group includes more male patients. By this study incidence of hernia is higher in male patients. Indirect inguinal hernia is the most common type of hernia in this study followed by direct inguinal hernia, pantaloon hernia, paraumbilical and epigastric hernia. The type of hernia may have a confounding effect on post-operative complications which we are analysing. Seroma formation may be common following some procedures like epigastric hernia repair where there is dead space postoperatively. Seroma may get infected and complications so on. Since indirect inguinal hernia is the most common hernia that we are analyzing in this study and dead space formation in Lichtenstein repair is the least, this confounding influence may have a lesser effect on the results of this study **[4]** . Lichtenstein repair and Onlay hernioplasty are the two surgical procedures done in this study for abdominal wall hernia. The mesh used depends on the group to which patients are allotted. Lichtenstein repair is the most commonly performed hernia surgery in this study **[4-5]** .

.Twenty percent of patients in each group had seroma formation. Seroma formation is the most common post-operative complication we have encountered in this study. Hematoma formation is found to be more. with a heavy-weight mesh group though the difference is negligible **[6]** . Wound infection depends on various factors like the patient's immune status, preoperative antibiotic, sterile surgical technique, the chance of dead space formation and subsequent infection, type of mesh used, post-operative wound dressing, and patient hygiene **[7]** .

Chronic post-operative pain is any pain persisting in the operative site even after 3 months following surgery. One of the main post-operative complications that is analyzed giving due importance is chronic pain, which is troublesome for patients, and affects the quality of life of the patient following surgery **[8]** . The incidence of chronic post-operative pain **[9]** is higher in heavy-weight mesh group patients. Though the difference in chronic pain is seemingly minimal, it needs to be given importance since it is the most troublesome complication for the patient for which he may need to get treatment even 3 months after surgery. The incidence of recurrence rate is found high with heavy-weight mesh group patients. One of the rare complications that we never expect to occur. The immediate recurrence following surgery most commonly is due to inadequate mesh fixation medially, whereas recurrence after a quite long period can be attributed to various factors like predisposing factors with the patient, type of mesh used and so on. Sinus formation following hernioplasty is extremely rare **[10]** . The difference in type of mesh and composition of mesh may influence subsequent seroma formation, infection and sinus formation. Granuloma followed by sinus formation is most commonly due to the polypropylene component of the mesh by foreign body reaction **[11]** . One patient had sinus formation postoperatively. The patient was admitted and wound exploration was done under field block and the sinus tract along with part of the mesh was excised and resutured. The patient recovered well. Mesh infection is the worst complication to deal with. Infected part of mesh or sometimes complete mesh

needs to be removed for a complete cure **[12]** . No cases of enterocutaneous fistula and mesh infection are seen in this study.

In the heavy-weight mesh group, seroma was the most commonly encountered complication in this study. Chronic post-operative pain and Wound infection is the second most common complication encountered. Hematoma formation, sinus formation and recurrence are also seen **[13]** . There is no incidence of mesh infection and enterocutaneous fistula in the six-month study period in this group. In the lightweight mesh group also, Seroma formation remains the most commonly found event post-operatively. Chronic post-operative pain and wound infection remain the second most common event. Hematoma formation is the least encountered **[14]** . However, there is no incidence of recurrence, sinus formation, mesh infection and enterocutaneous fistula in this group **[15]** .

Comparative analysis of data shows seroma formation remains most commonly found complication in both groups and equal in both groups. Incidence of chronic post-operative pain and wound infection is found to be more with heavy weight mesh group than light weight group **[16]** . Recurrence and sinus formation has been reported in heavy weight group but not reported in light weight group. Hematoma formation is also more with heavy weight group. There is no incidence of mesh infection or enterocutaneous fistula in both groups.

The overall comparative analysis of all the observed data from both group shows that patients included in the lightweight mesh group of hernioplasty for anterior abdominal wall hernia have encountered lesser post-operative complication and morbidity than those in heavy weight mesh group. Though the complications encountered is minimal, it seems the lightweight mesh is better tolerated by most patients. The data needs to be further analysed to bring out the statistical importance of the study to confirm the apparent difference which we got in the data analysis.

Conclusion:

Prosthetic mesh repair technique for abdominal wall hernia has dramatically improved from the past in respect with quality of mesh, composition and structure of mesh, patient tolerance and less morbidity. Prosthetic mesh repair has become the gold standard procedure. So, the importance of choice of mesh selection is gaining importance since different types of meshes are available in the market. This study is conducted mainly to compare the influence of composite lightweight and heavy-weight polypropylene mesh in patients after hernioplasty so that we can come up with better quality mesh for future hernioplasty. The fabric weight of two types of mesh is the primary characteristic of mesh that we analyzed in this study. Different other characteristics of the mesh although can influence post-operative complications.

The data observed over a period of six months individually for each patient in both groups were compiled and analyzed. Analysis of data showed that the incidence of seroma formation, hematoma formation, chronic post operative pain are higher with the heavyweight polypropylene mesh group. There is also one case of recurrence and sinus formation in the heavyweight mesh group which is not reported in light weight mesh group. But the differences in the incidence of complications between both

groups are negligible. The data obtained are further statistically analyzed using chi square and fisher's exact probability test and it is proved that there is no statistical difference between two groups. So, it is inferred from the study that there is no significant difference between the use of composite light weight mesh and heavy-weight polypropylene mesh. There are various issues in this study which needs to be further evaluated and analyzed in future studies. The sample size of this study is small and it is a single centre study. The observations are only qualitatively compared between the groups and not quantified. The period of follow up should be more for better comparative results.

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