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Original Article

Comparative Study of Onlay Versus Sublay Meshplasty in Ventral Hernia Repair: A Randomised Controlled Study

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Abstract

Background: Ventral hernia is the commonest complication post laparotomy. As the spectrum of repair ranges from different techniques of open as well as laparoscopic, the optimal approach for abdominal ventral hernias is customized from patient-to-patient basis. This study is restricted to open ventral hernia repairs and it aims to compare Onlay with Sublay techniques for uncomplicated ventral hernias. ***Materials & Methods:*** This is a randomised control study that included 56 patients of uncomplicated ventral hernias, where patients were allocated into two groups of Onlay & Sublay techniques equally. Both the groups were comparable in terms of Age, Gender, BMI and size of defect to avoid selection bias. ***Results:*** 56 patients were included in the study with 28 patients in each group. The mean age& gender in both groups were comparable. The location of defect was found at umbilical region in 75.1% patients. The mean size of defect in group A & group B was 2.27cm & 2.34cm respectively. The mean operative time for Onlay meshplasty was 70.35 minutes as compared to 86.14 minutes for Sublay meshplasty which was statistically significant (p-value 0.0001). 10 patients (17.8%), with 7 patients belonging to Onlay group and 3 patients under Sublay group developed superficial SSI. No patient had mesh rejection, seroma formation or recurrence in the follow up period of one year. ***Conclusion:*** The different parameters compared for both the techniques in form of post-operative pain, length of hospital stays, development of SSI, seroma formation and incidence of recurrences were found to be insignificant. Therefore, we can conclude that neither of the technique proves superior to each other. The choice remains with operating surgeon, institutional or departmental policies and patient's relevant anatomy related to hernial sac, defect size and location.

Keywords: ***Ventral Hernia; Onlay; Sublay; Polypropylene mesh***

Introduction

The term "hernia" originates from the Latin word for "prolapse," and the earliest evidence of an inguinal hernia was recorded in approximately 1552 BC by Ebers Papyrus in ancient Egypt [1]. Majority, approximately 75% of all hernias are inguinal and 25% are ventral. The ventral hernia encompasses a range of hernias that include epigastric, umbilical, paraumbilical, spigelian, parastomal and all incisional hernias. Of all ventral hernia, about 14% of hernias are umbilical, about 10% of hernias are incisional [2] and estimated 75% of hernias of the anterior abdominal wall are primary ventral (non-incisional) [3]. Primary ventral hernias occur in approximately one in five adults, and incisional hernias develop secondary to laparotomy incisions in 10-30% of midline abdominal incision [4,5]. The pathogenesis of primary ventral hernias is multifactorial, involving non-modifiable factors such as age, gender, anatomic variation and inheritance, and modifiable factors like obesity and smoking [6].

The various modalities of treatment of ventral hernia include, anatomic closure with non-absorbable material, Mayo's double breasting technique and/or prosthetic mesh repair. This meshplasty can be performed by either open or laparoscopic technique i.e. intra peritoneal onlay meshplasty (IPOM), Intraperitoneal Onlay meshplasty with closure of defect (IPOM plus), enhanced Total Extraperitoneal repair (eTEP) or component separation techniques. The same procedures can be performed by open techniques, but carries a lot of morbidities in terms of pain, operative time, length of incision, longer duration of hospital stay and post-operative Quality of life, especially if defect size is more than 5cms. For defects equal to or less than 5cms, open surgical treatment can be done by placing the mesh below the anterior rectus sheath (Sublay) or above the anterior rectus sheath (Onlay) [7]. Onlay mesh placement is the preferred method for repair by most of the surgeons because of its ease of deployment, lesser tissue dissection and less operative time [8,9]. But it carries a risk for seroma formation, surgical site infection or recurrence [10-12]. The purpose of this study

is to compare the post-operative complications in patients who had undergone open ventral hernia repair between two commonly used mesh placement techniques (Onlay vs Sublay).

Materials and Methods

It was a randomized controlled study conducted at a tertiary referral centre in Central India after approval from Institute Ethics Committee. The duration of study was one and a half years with inclusion criteria of patients with clinically diagnosed cases of ventral hernia of age more than 18 years, of either of the genders. Patients with recurrent hernias, intra-abdominal malignancy or malignant ascites, complicated hernias with symptoms & signs of obstruction or strangulation or loss of domain were excluded from the study. A total of 56 patients were randomized in two groups by block randomization method. Group A patients underwent Onlay meshplasty and in group B Sublay meshplasty was performed.

In both the groups, peri-operative protocols were same and they were operated by same team of surgeons. Patients of Group A underwent Onlay meshplasty where, after reduction of hernial contents, peritoneal defect was closed with polyglactin 2-0 round body, whenever feasible. The defect in rectus sheath was closed primarily with interrupted polypropylene No. 1 suture. A subcutaneous space anterior to rectus sheath was created almost 5 cm from edge of defect for placement of mesh. Polypropylene mesh was deployed as Onlay technique and anchored to anterior rectus sheath with polypropylene 2-0 sutures. Skin closure was done after placing negative suction drain. In group B, after reduction of hernial contents, a preperitoneal space is created between posterior rectus sheath/ rectus muscle and pre peritoneal layer depending upon location of defect. Polypropylene mesh of adequate size was placed and fixed with polypropylene 2-0 sutures. A negative suction drain no. 12 is kept in the vicinity of mesh, followed by defect closure with interrupted polypropylene no. 1-0. Post operative pain using VAS score on post operative day 1,3,5 and 7 was done. Any occurrence of Surgical Site infection and seroma formation was also assessed on post operative day 4, day 7 and at 2 weeks. Length of hospital stay in days and recurrence at 1st,3rd, 6th months and 1year post operatively was assessed.

Statistical analysis

In summarizing the data obtained from the study, statistics were tabulated as Mean ± standard deviation, maximum and minimum, depending on distribution for continuous variables. Statistical evaluation of differences between groups, hernia recurrence, seroma was performed using the Chi square test and Students t test. Differences with $p<0.05$ were considered significant. Statistical analysis was performed with SPSS version 28.

Results

With 28 patients in each group, the mean age in group A was 46.2yrs and in group B was 50.7yrs. Gender distribution for both the groups were also comparable. The location of defect was found at umbilical region in 75.1% patients, Infraumbilical in 14.2% patients and supraumbilical in 10.7% of patients. The mean size of defect in group A was 2.27cm whereas in group B was 2.34cm. The mean operative time for Onlay meshplasty was 70.35 minutes as compared to 86.14 minutes for Sublay meshplasty which was statistically significant (p-value 0.0001). In our study, on post-operative day (POD) 1, pain score for group A was 6.32 and in group B was 5.6 with p value of 0.04 which was significant, but p value at POD 3, 5 and 7 was found to be insignificant. The incidence of Superficial Surgical Site Infection (SSI) was found to be in only 10 patients (17.8%), with 7 patients belonging to Onlay group and 3 patients under Sublay group. These patients were managed by daily dressing and syringing. None of our patient presents with rejection or removal of mesh, seroma formation or recurrence in the follow up period of one year.

Discussion

The two widely accepted operative techniques for open ventral hernia repair for small defects are Onlay and Sublay technique of mesh placement. Incidence of ventral hernia is more in older age group due to loss of tone of abdominal wall muscle [13]. The present study shows the incidence of hernia more in males as compared to other studies where the authors have quoted that it is commoner if females, the reason being decreased abdominal tone and obesity. The correlation of development of hernia is directly proportional to the number of comorbidities a patient is having. This holds true if the patient is having obesity, diabetes mellitus, chronic cough as these co-morbidities not only weakens the abdominal muscle tone but also contribute in increasing the intra-abdominal pressure. In our study 24 [85%] patients and 22 [78%] patients were obese in Onlay and Sublay group respectively, and the findings were comparable to that of Martins *et al.* [14]. The incidence of ventral hernia is found to be more in umbilical region as umbilicus is anatomically a scar which can yield or give way for developing hernias. Similarly, the infraumbilical region is also common area for development of hernia, probably due to lack of posterior rectus sheath below the arcuate line. The average defect size of hernia in our study was 2.3 cms in either group. Although, primary repair is advocated for defect size less than 2.5cms which include direct closure of the defect with non-absorbable synthetic sutures or Mayo's double breasting with non-absorbable synthetic sutures, these tissue repairs always carry a risk of repair under tension. Therefore, use of synthetic meshes in either Onlay or Sublay placement is provides a tension free option for defect closure [15]. In our study, mean operative time in group A was 70.35 minutes and in group B was 86.14 minutes, with p value-0.0001 which is significant. Onlay is a faster technique when compared to Sublay as the latter requires more time in creation of preperitoneal space by blunt and sharp dissection with inadvertent button-holing of peritoneum during dissection with intention to close [16]. In some cases, due to dense adhesions, rather than using the preperitoneal space, the mesh was placed in retro rectus space. Onlay placement of mesh also requires time to raise subcutaneous plane and meticulous haemostasis as this plane is more vascular and development of hematoma in this plane can result in mesh infection and put the patient at risk for surgical site infection and/or mesh rejection. Post operative pain is supposed to be more in Sublay group which can be attributed to more handing of tissues, dissection in deeper planes and dissection near recti and rectus sheath where the neurovascular bundles enter. In our study the pain was observed more with Onlay group on post-operative day 1 but on day 3, 5 and 7, it was equal or comparable with Sublay group. The VAS score in Onlay group initially can be due to raising of subcutaneous flaps or it could be subjective depending on patient to patient. In our study there was no difference in rates of seroma occurrence in both groups, but when compared to systematic review conducted by Pereira et al, which showed there is higher incidence of seroma formation in Onlay group because of creation of potential subcutaneous space. The placement of negative suction drain can prevent this complication and we recommend to put a drain in both the techniques. In this study, 10 (17.8%) patients developed Surgical Site Infections (SSI), 7 patients in Onlay group and 3 patients of Sublay group. Majority of patients developing SSI were having erythema and induration (Southampton Grade II) and only one

patient had purulent discharge (Southampton Grade IV). All these patients were managed conservatively with anti-inflammatory drugs and antibiotics according to pus culture & sensitivity reports. None of the patient had deep or severe wound infection that would have required mesh excision. In our study, the length of hospital stay was 6.4 days for Onlay group and 5.89 days for Sublay group with a non-significant p-value. This again can be attributed to development of SSI, more in Onlay group. All these patients were kept under follow-up for one year post-operatively and there were no recurrences.

As both the techniques are having their advantages and disadvantages, there is still no consensus over which is the better techniques. The limitations of this study were small sample size and a shorter follow-up period.

Conclusion

The different parameters compared for both the techniques in form of post-operative pain, length of hospital stays, development of SSI, seroma formation and incidence of recurrences were found to be insignificant. Therefore, we can conclude that neither of the technique proves superior to each other. The choice remains with operating surgeon, institutional or departmental policies and patient's relevant anatomy related to hernial sac, defect size and location.

Abbreviations

BMI: Body Mass Index
SSI: Surgical Site Infections
IPOM: Intra Peritoneal Onlay Meshplasty
eTEP: enhanced Total Extra Peritoneal
VAS: Visual Analogue Scale
POD: Post-Operative Day

Declarations

Data Availability

The authors confirm that the data supporting the findings of this article are available within the article and its supplementary materials. Detail data regarding the participant is available with the authors.

Conflicts of interest

Authors declare that they have no conflicts of interest.

Ethical Approval and Consent to participate

Written and Informed Consent was obtained from the patients regarding their data to be shared for scientific research purpose and publicly in English, Hindi & Local languages through Patient Information Sheet.

Ethical Approval

The study was conducted after approval from Institute Ethics Committee, AIIMS Nagpur.

Consent for publication

Written and Informed Consent were obtained from the patient before submission of article.

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Authors' contributions

Dr. Manish Kumar: Writing - original draft /Data curation / Resources/ Review of Literature
Dr. Prashant Sawarkar: Writing - original draft /Conceptualization/ Data curtion
Dr. Divish Saxena: Writing & Editing- Original Draft/ Validation/ Reviewing & Editing
Dr. Nitin Sherkar: Data Curation/ Resources/ Reviewing & Editing
Dr. Siddharth P. Dubhashi; Supervision/ Validation /Writing - review & editing/ Project administration

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