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Original Research Article

A comparative study between onlay and sublay meshplasty in ventral hernias: a randomized controlled trial

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ABSTRACT

Background: Ventral hernias are one of the most common surgical problems of the modern age. About 15-18% of all the surgical procedures performed around the world comprises of hernia repair. This study aims to compare the two common options of mesh placement in open ventral hernia repairs; over the anterior rectus sheath, the 'Onlay meshplasty' and in the retrorectus plane, the 'Sublay meshplasty'.
Methods: A prospective controlled study was done between March 2017 to August 2018 on 150 patients with ventral hernia randomizing patients into 2 groups. Group A (Onlay meshplasty) and Group B (Sublay meshplasty). Duration of surgery, post-operative pain, wound infection, duration of hospital stay and recurrences were analysed with 12 months follow up.
Results: The mean duration of surgery in group A was 48.49±0.71 minutes and in group B was 72.84±0.72 minutes. Group B experienced significantly lesser pain when compared with group A. The mean asepsis score in group A was 3.60±1.09 and in group B was 0.47±0.30 with a p value of 0.006. Group A had significantly longer hospital stay (9.39 days) than group B (5.71 days). The recurrences in both the groups were statistically insignificant (Group A- 2 patients; Group B- 1 patient).
Conclusions: Sublay meshplasty although requires longer time to perform, proves to be a better alternate in terms of post-operative pain, wound infection and hospital stay.

Keywords: Ventral hernia, Hernia repair, Mesh repair, Meshplasty, Onlay, Sublay, Retrorectus repair

INTRODUCTION

Hernia, a word which has its roots in Greek language, means an offshoot or a bulge. And in Latin, it means rupture. And by definition, when the viscus from one anatomical space protrudes into another anatomical space it's termed as hernia. Hernia can also be defined as an outpouching of the parietal peritoneum into a preformed or secondarily established hiatus.[1,2] The disease of hernia by no means is new to the modern world. Historical records have been found even in the oldest literature of Ancient Egypt. Hernias of the Inguinal region were first mentioned in human history by the Egyptian Medical Papyrus known as Ebers Papyrus (circa 1555B.C.E) and the great ancient Greek physician Hippocrates of Kos (460-375B.C.E) has mentioned about hernias in his literatures.[2] Historical accounts of ventral hernias are far less and infrequent than inguinal hernias due to the fact, they are far less common and are associated with fewer symptoms and complications when compared with their inguinal counterpart.[2] Celsus in 100A.D. has made first documentation about paraumbilical hernia as "an indecent prominence of the navel" and the first repair was done in United States of America in 1894 by Stoser.

Arnauls de Villeneuve has described the epigastric hernias first in 1285 A.D. and the first successful repair of the same was described in 1805. Ever since the advent of anaesthesia, asepsis and anti-sepsis in twelfth century, increased number of abdominal surgeries were performed which in turn reflected upon the increased incidence of the incisional hernias and thereon it made the surgeons to look at this problem a bit more carefully.[3]

In modern age, ventral hernias are one of the most common problems encountered by the surgeons and the repair of ventral hernias accounts to 15-18% of all the surgical procedures with incisional hernias being the most common long-term complication of the midline laparotomy incisions. About 3-13% of the patients undergoing laparotomy develops incisional hernia and the rate increases to 23%.[4-7]

Surgical repair of the ventral hernias has evolved over the period of time. The high recurrences associated with the primary suture repair of the fascial defect, tension free meshplasty has overtaken as the gold standard for ventral hernias. With increased understanding of the anterior abdominal wall anatomy, the placement of the mesh started to vary with the onlay- over the rectus mesh repair and sublay- preperitoneal mesh repair emerging as favourites of the open ventral hernia repairs among general surgeons.[8,9]

METHODS

A prospective comparative cohort study was done on 150 patients admitted with ventral hernia to compare the outcomes of onlay and sublay meshplasty over a period of 18 months (March 2017 to August 2018) including a follow up of 12 months. All patients diagnosed with ventral hernias which included umblical/paraumblical hernias, epigastric hernias and incisional hernias formed the study population. Groin hernias, patients less than 18 years of age and medically unfit patients were excluded in the study. The study was commenced after obtaining approval from institutional ethical committee. The work has been reported in line with the STROCSS criteria.[10] A total of 150 patients consented and fulfilled the criteria were included in the study and they were divided equally in 2 groups; group A- Onlay meshplasty and Group B- Sublay meshplasty. In onlay meshplasty, after the primary closure of the hernial defect, the polypropylene mesh placed over the anterior rectus sheath and fixed. In sublay meshplasty, the polypropylene mesh was placed below the rectus abdominus muscle in the plane between posterior rectus sheath and parietal peritoneum and fixed. In both the groups, a synthetic non-absorbable polypropylene mesh (PROLENE) was used.

The total time taken for the surgery from making the skin incision to skin closure was noted with a timer. The post-operative pain was assessed using the classical Visual Analogue Scale (VAS)- psychometric scale ranging from 0 to 10. The wound in the post-operative period was assessed by standard wound ASEPSIS scoring system with scores of 0-10 denotes satisfactory healing and scores of 41 to 50 denoting severe wound infection. The total duration of hospital stay was recorded. All patients were followed up for a period of 1 year and patient developing hernia at the same site was taken as recurrence and documented. Statistical analysis was done using SPSS version 19.0. Chi square test and Fischer exact probability test were used to compare two proportions. Unpaired T test was used to compare the mean between two groups. $P<0.05$ was considered to be statistically significant.

RESULTS

A total of 150 patients were included in the study and they were divided equally in 2 groups; group A- Onlay meshplasty and Group B- Sublay meshplasty.

Distribution of hernias

Out of the 75 patients who underwent onlay meshplasty, 44 cases were diagnosed as paraumblical hernia, 28 cases as incisional hernia and 3 cases as epigastric hernia and among the 75 patients who underwent sublay meshplasty 44 were diagnosed as paraumbilical hernia, 27 cases as incisional hernia, 4 cases as epigastric hernia as shown in Figure 1.

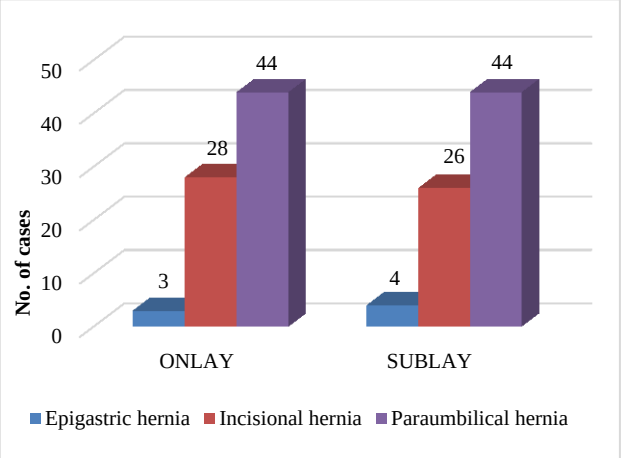

Figure 1: Distribution on types of ventral hernias included in the study population.

Duration of surgery

The mean duration of surgery in onlay meshplasty group was 48.49±0.71 minutes and in sublay meshplasty group was 72.84±0.72 minutes and this was statistically significant with a p=0.0001.

Pain score

The mean pain score was calculated using VAS scale for 2nd, 3rd and 7th postoperative days and the difference

between both groups was significant with p values of 0.0001 for all 3 days as in Figure 2.

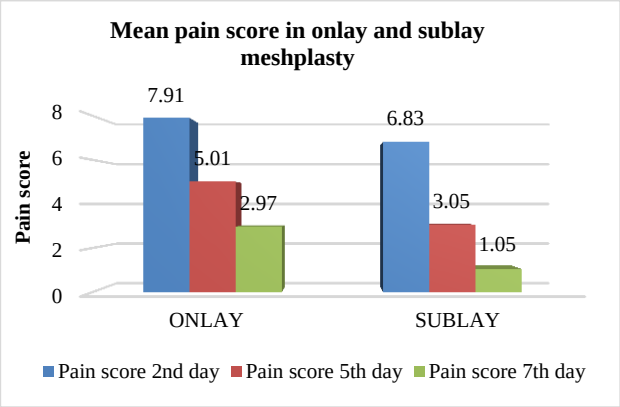

Figure 2: Comparison of pain score on 2nd, 5th and 7th day in the study population.

Asepsis score

The mean asepsis score in onlay mesh repair group was 3.60±1.09 and in sublay mesh repair group was 0.47±0.30. The p value was 0.006 and the difference was statistically significant as in Table 1. On breaking down the ASEPSIS score, 10 patients (13.33%) in onlay group and 2 patients in sublay group (2.67%) required additional treatment with antibiotics and drainage of pus. Seroma formation was seen in 20% in onlay group (15 patients) and 2.67% in sublay group (2 patients). 4 patients (5.63%) in onlay group and 1 patient (1.35%) in sublay group developed erythema. None of the patients in both the groups had tissue gappiung and bacteria was isolated only in onlay group (2 patients-2.67%) and 6 patients in onlay group (8%) and none of the patients in sublay group had extended period of stay due to wound infection.

Table 1: Comparison of mean asepsis score in onlay and sublay meshplasty.

Type of repair	Asepsis score		T test	P value
	Mean	SEM		
Onlay	3.60	1.09	2.763	0.006
Sublay	0.47	0.30		

Wound healing

In our study, among the 75 patients who underwent onlay mesh repair, 65 patients (86.67%) showed satisfactory wound healing, 7 patients (9.33%) showed mild disturbance, 2 patients (2.67%) showed moderate disturbance in wound healing and 1 patient (1.33%) showed severe disturbance in wound healing. Out of the 75 patients who underwent sublay mesh repair 74 patients (98.67%) showed satisfactory wound healing and 1 patient (1.33%) showed mild disturbance in wound healing. The grade of wound healing was better in sublay repair than in onlay repair, which was found to be statistically significant as in Table 2.

Table 2: Comparison of extent/ degree of wound healing in the study group.

Type of repair	Wound healing				Chi square	P value
	Satisfactory	Mild disturbance	Moderate disturbance	Severe disturbance		
Onlay (n=75)	65	7	2	1	8.083	0.044
Sublay (n=75)	74	1	0	0		

Table 3: Comparison of duration of hospital stay post onlay and sublay meshplasty.

Type of repair	Duration of stay		T test	P value
	Mean	SEM		
Onlay	9.39	0.29	11.571	0.0001
Sublay	5.71	0.14		

Duration of hospital stay

The mean duration of post-op hospital stay in onlay meshplasty was 9.39±0.29 days when compared to 5.71±0.14 days in sublay meshplasty with a significant p value of 0.0001 as in Table 3.

Recurrence

In our study, 2 patients who underwent onlay meshplasty and 1 patient who underwent sublay meshplasty developed recurrences of hernia. The difference between these two is insignificant with a p value of 0.560.

DISCUSSION

The mean time duration of surgery for the onlay group was 48.49±0.71 minutes (shortest surgery- 35 minutes; longest surgery- 62 minutes) and the sublay group was 72.84±0.72 minutes (shortest-60 minutes; longest-90 minutes). Sublay meshplasty takes longer duration to complete than onlay meshplasty due to the extensive dissection of the preperitoneal space with mean time

difference of 24.158 minutes as derived by T-test. The studies conducted by Baracs et al in Hungary and Rajsiddharth et al in Telangana, India also shows similarly longer duration for sublay meshplasty.[11,12]

The mean pain score for onlay meshplasty on postop day 2, 5 and 7 were 7.91±0.10, 5.01±0.10 and 2.97±0.11 respectively and the mean pain score for sublay meshplasty on postop day 2, 5 and 7 were 6.83±0.06, 3.05±0.04 and 1.05±0.03 respectively with a significant difference between them (p=0.0001). The patients in the onlay group experience higher degree of pain postoperatively when compared with the patients in the sublay group. In onlay meshplasty, the mesh is placed subcutaneously and fixed just over the anterior rectus sheath where nerve fibres are abundant which stimulates pain. Due to this subcutaneous placement of the mesh, onlay repairs are more prone for wound infection which again leads to increased pain. Studies conducted by Thangamani et al in Tamil Nadu, India and Rajsiddharth et al in Telagana, India have delivered similar results supporting the data of our study. Yet the study conducted in Hungary by Baracs et al shows no significant difference in the perception of pain.[11-13]

The post op wound infection in both the groups were calculated and compared using ASEPSIS scoring system. The mean asepsis score in onlay mesh repair group was 3.60±1.09 and 0.47±0.30 for the sublay mesh repair group with a 'p' value of 0.006 which is statistically significant. On breaking down the asepsis score, 10 out of 75 patients in onlay group needed additional treatment of antibiotics or requiring drainage of seroma or wound debridement, which when compared with only 2 patients out of 75 from sublay group requiring additional treatment. 4 patients (5.63%) in onlay group and only 1 patient (1.35%) of the sublay group developed erythema post-surgery. The 'p' value between these two is an insignificant 0.183. 17 out of 75 patients (20%) in the onlay group developed seroma when compared to 2 patients (2.67%) in the sublay group with a statistically significant 'p' value of 0.001 in our study. Similarly, in a study conducted by Ibrahim et al in Egypt where the patients in onlay mesh repair were more prone for seroma formation when compared with sublay mesh repair group.[14]

From our study, in total, 10 patients (13.33%) in onlay group and only one patient (1.33%) in sublay group had disturbances in wound healing. Of the 10 patients in onlay group, 7 had mild disturbance; 2 with moderate disturbance and 1 had severe disturbance in wound healing and the one patient from sublay group only had mild disturbance. This was statistically ('p' value 0.044) in favour of sublay meshplasty with better wound healing. These results are similar to the studies conducted by Hayes et al and Ibrahim et al which proved significant differences of 40%, 8% and 15% in onlay groups and 6%, 4% and 5% in sublay groups respectively. The requirement of increased dissection of subcutaneous flaps, inadvertent transecting of blood vessels and the presence of a foreign barrier between subcutaneous plane and deep parietal layers may attribute to increased seroma collection and the chances of increased wound infection in onlay mesh repairs when compared to sublay mesh repairs where the mesh is placed in a pre-existing retromuscular plane which requires lesser dissection and comprises rich lymphatics which absorbs the seroma resulting in reduced incidence of wound infection. The mean duration of hospital stay post onlay meshplasty was 9.39±0.29 days which was significantly higher (p=0.0001) than post sublay meshplasty 5.71±0.14 days. The extended hospital stay was due to postoperative pain, seroma formation, wound infection, delayed drain removal. This result has been supported by the series done by Ibrahim et al in Egypt and Thangamani et al, India. In our study, the recurrences between both the groups was insignificant (p=0.560) with 2 patients (0.027%) in onlay group and 1 (0.013%) in sublay group had recurrence. Recurrence rates between onlay and sublay mesh repairs have always been a subject of controversy. In most of the studies conducted, onlay repairs were more prone for recurrences owing to poor wound integrity, higher risk of wound infection due to the subcutaneous placement of mesh. As the mesh is under tension following sublay repairs, there is lesser chance of infection and mesh migration due to mechanical support against gravity by the preperitoneal space by parietal peritoneum and rectus muscle. In the study conducted by, Rajsiddharth et al, few patients in onlay group developed recurrences (16%, 13.33% and 4% respectively) whereas no recurrence were observed following sublay repairs. With a longer duration of follow up, the statistical insignificance may change into significant.[12-15]

CONCLUSION

Sublay meshplasty in ventral hernias proves to be a superior option for onlay meshplasty as the patient experiences minimal post-operative pain, less post-operative morbidity and early return to normalcy. Although in an emergency setting, onlay meshplasty seems to be the ideal option owing to the shorter duration taken to perform the surgery.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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