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Comparative Study of Pre-Peritoneal Versus Onlay Mesh Repair of Ventral Hernias

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ABSTRACT

Aim: To compare the efficacy of Preperitoneal and Onlay mesh repair of Ventral Hernia.

Methodology: It was a prospective, observational and comparative study. 50 patients presenting with ventral hernia admitted to Kamineni institute of medical sciences, Narketpally, were preoperatively assessed clinically and by ultrasonography to confirm the diagnosis. 26 patients underwent Onlay and 24 patients underwent Preperitoneal mesh repair after obtaining Informed consent and satisfying the inclusion & exclusion criteria.

Results: The age in the study ranged from 22 years to 65 years' age group. More than 50% patients were between 31-60 age groups. In our study out of 28 cases with incisional hernia, 9 cases (32.14%) had under gone Hysterectomy(TAH), 2 Tubectomy (7.14%),6 LSCS (21.44%), 2 open appendectomies (7.14%), 7 laparotomy(25%),1 oophorectomy (3.57%), 1 psoas abscess (3.57%). The smallest defect measured 1 x 0.5 cm and the largest defect measured 7 x 4 cm in this study. 24 Patients underwent Pre-peritoneal mesh repair and 26 patients underwent onlay mesh repair. Mean duration of surgery in Onlay Mesh repair (60 – 100mins) was 77.08 mins compared to that in Pre-Peritoneal Mesh repair was 95.63mins (70 – 125 mins). Recurrence was observed only in one patient with Onlay mesh repair**.**

Conclusion: The study concluded that Preperitoneal mesh repair is a good alternative to Onlay mesh repair that may be applicable to all forms of ventral hernias.

Keywords: Preperitoneal mesh repair, Ventral Hernia, Laprotomy, Hysterectomy

INTRODUCTION

Abdominal wall is the most site of variety of hernia because of erect posture of a man. The term hernia is used to describe a weakness or defect of the abdominal wall, through which abdominal contents can protrude. Abdominal wall defects arise at areas of weakness in the abdominal wall. These areas include sites of previous surgery, the umbilicus, as well as areas of weakened abdominal and/or flank musculature such as in lumbar hernias other than groin. Patients may unknowingly have an abdominal wall or fascial defect that only becomes apparent after intraabdominal or preperitoneal contents pass through the hernia defect. This is especially true with umbilical hernias, which are the most common type of ventral abdominal hernia. [1] Based on national operative statistics, incisional hernia may occur within two years of a midline incision, with a rate ranging between 10% and 20%, umbilical and epigastric hernias constitute 10% of hernias. Incisional hernias are twice as common in women as in men. As a result of the almost 4 million laparotomies performed annually in the United States and 2% to 30% incidence of incisional hernia, almost 150,000 ventral hernia repairs are performed each year.

These defects can be categorized as spontaneous (primary) or acquired or by their location on the abdominal wall. Epigastric hernias occur from xiphoid process to the umbilicus, umbilical hernias occur at the umbilicus and Spigelian hernias can occur anywhere along the Spigelian line. Acquired hernias typically occur after surgical incisions and are therefore termed *incisional hernias.* [(2)] The patient seeks medical advice for the swelling, discomfort, acute pain, associated gastrointestinal symptoms or cosmetic symptoms. Diagnosis can be achieved by the clinical examination or by ultrasound scanning. The formation of ventral hernias is a multifactorial and complex process. Three types of ventral hernias are recognized: Spontaneous, congenital, and incisional hernias. In 90% of patients, if is an acquired defect that is a direct result of increased abdominal pressure.

A number of predisposing factors have been identified that may be related to specific patient characteristics, an underlying pathologic process, or iatrogenic factors. There are various surgical techniques for the repair.

Incisional hernias are only abdominal wall hernias that are considered to be iatrogenic. It continues to be one of the most common complications of abdominal surgical procedures and is a significant source of morbidity and loss of time from productive employment.

Hernia is one of the common surgical problems. Repair of ventral hernia is one of the commonest surgical procedures worldwide, irrespective of country, race or socio-economic status and constitutes a major health-care issue in every

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country.

Various types of repairs have been used by both anatomical and prosthetic techniques in repair of ventral hernia. The introduction of prosthetics has revolutionized hernia surgery with the concept of tension free repair. Although a wide Variety of surgical procedures has been adopted for repair of Incisional hernia, implantation of prosthetic mesh remains the most efficient method of dealing with ventral hernia

The techniques of placement of mesh include Onlay, inlay, sublay (pre peritoneal, retro rectus) and underlay but the best position for inserting the mesh hasnot been conclusively established till date as per literature.

Repair of ventral hernias with mesh as opposed to suture has substantially improved the long-term outcomes and is accepted as the standard of care. [3,4] However, many studies demonstrate an increased risk for the wound complications with mesh placement including infections, seromas, and mesh erosions. [5,6]

Preperitoneal repair is often considered more challenging and complex to perform with. Dissection of this plane can risk damaging the muscle, blood supply, and the nerves to the rectus abdominus. In addition, this mesh location may not be appropriate for off midline defects. However, this space potentially protects the mesh from both superficial wound complications and intra-peritoneal contents. In addition, it also allows for load-bearing tissue in-growth from two directions and theoretically decreases the risk of recurrence. [7]

This is a prospective study to compare Preperitoneal versus Onlay mesh plasty in the management of ventral hernia with regards to the duration of surgery, Length of hospital stay, Post-operative complications, outcome and the recurrence.

AIMS AND OBJECTIVES

The Aim and Objectives of the present study are:

- To compare the efficacy of Preperitoneal and Onlay mesh repair of Ventral Hernia and to look on the controversial issues of these procedures using the following parameters.
  - Duration of operative procedure
  - Duration of hospital stay
  - Post-operative complications (seroma, hematoma, wound infection,mesh removal and Flap necrosis)

Recurrence after both procedures in short term follow up

PATIENTS AND METHODS

STUDY DESIGN: PROSPECTIVE, OBSERVATIONAL AND COMPARATIVESTUDY

Study site: Kamineni Institute of Medical Sciences, Narketpally.Study population: Patients with ventral hernias at surgical unit

Study design: A Prospective, observational and comparative study.Sample size: 50

Time frame: October 2019 to September 2021.

INCLUSION CRITERIA: All Patients presenting to surgical OPD with anteriorabdominal wall hernias:

- Both genders
- All uncomplicated Ventral Hernia (umbilical/incisional/ Epigastric/Spigelian hernia)
- Irrespective of comorbid conditions (except obesity) and previous surgeries

Exclusion Criteria:

- All Complicated hernias
- Recurrent hernias
- Groin Hernias
- Patients medically not fit forsurgery

Patients with previous woundinfection

- Patients who are obese
- Patients less than 18 years ofAge

METHODOLOGY:

50 patients presenting with ventral hernia admitted to Kamineni institute of medical sciences, Narketpally, were

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preoperatively assessed clinically and by ultrasonography to confirm the diagnosis. 26 patients underwent Onlay and 24 patients underwent Preperitoneal mesh repair after obtaining Informed consent and satisfying the inclusion & exclusion criteria. Clearance obtained from institutional ethics committee, Kamineni institute of medical sciences,Narketpally, before starting the study.

OBSERVATIONS AND RESULTS

VENTRAL HERNIAS:

The percentage distribution of ventral hernias according to types in this study isshown in Table 1.

Table 1: Types of ventral hernias with respect to number and percentage

SI No.	Type of Hernia	Number(n)	Percentage(%)
1.	Umbilical hernia(UH)	16	32
2	Epigastric hernia(EH)	6	12
3	Incisional hernia (IH)	28	56
	Total	**50**	**100**

The age in the study ranged from 22 years to 65 years' age group. More than 50% patients were between 31-60 age groups.

Table 2. Age distribution

Age in years	No. of cases	Percentage
11 – 20	Nil	0
21 – 30	2	4
31 – 40	14	28
41 – 50	17	34
51 – 60	14	28
61 – 70	3	6

Gender distribution:

In On-lay group 80.76 % (n=21) patients were female. Pre-peritoneal group 54.16 % (n=13) patients were female. Female forms (n=34) 68% of total study group and Female to male ratio was 2.125:1 showed that incidence of ventral hernia was more in female.

Table 3: Gender Distribution in the present study

Sex	No. of patients	Percentage
Male	16	32
Female	34	68

In our study out of 28 cases with incisional hernia, 9 cases (32.14%) had under gone Hysterectomy(TAH), 2 Tubectomy (7.14%),6 LSCS (21.44%), 2 open appendectomies (7.14%), 7 laparotomy(25%) ,1oophorectomy (3.57%), 1 psoas abscess (3.57%).

Table 4: Type of previous operation in incisional hernia cases inthe present study

SI No.	Previous operation	No of Patients	Percentage
1.	Tubectomy	2	7.14
2.	LSCS	6	21.44
3.	Hysterectomy(TAH)	9	32.14
4.	Open Appendectomy	2	7.14
5.	OOPHORECTOMY	1	3.57
6	Laparotomy	7	25
7	Psoas abscess	1	3.57

Associated risk factors/ illness:

Table 5: **Associated risk factors in the present study**

Sl No.	Condition	No. of patients	Percentage (%)
1.	Diabetes	15	30
2.	Hypertension	20	40
3.	Hypothyroidism	1	2

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Size of the defect:
The smallest defect measured 1 x 0.5 cm and the largest defect measured 7 x4 cm in this study.
Type of mesh repair:
24 Patients underwent Pre-peritoneal mesh repair and 26 patients underwentonlay mesh repair.

Table 6: Type of mesh repair in the present study

Sl. No	Type of Mesh repair	No. of Patients	Percentage (%)
1.	Pre-peritoneal MeshRepair	24	48
2.	Onlay Mesh Repair	26	52

Duration of surgery:
Mean duration of surgery in Onlay Mesh repair (60 – 100mins) was 77.08 mins compared to that in Pre-Peritoneal Mesh repair was 95.63mins (70 – 125 mins).

Table 7: Mean duration of surgery in the present study.

Type of Mesh repair	Mean duration of surgery
Onlay (n=26)	77.08 ± 10.107 mins
Pre-peritoneal(n=24)	95.63 ± 13.295 mins
P value	0.000

Hence the mean duration of surgery in the present study is highly significant.
Duration of Hospital stay:
Mean duration of Hospital stay in Onlay Mesh repair was 7.19 days, and that in Pre-Peritoneal Mesh repair was 5.71 days.

Table 8. Duration of Hospital stay:

Type of Mesh repair	Mean duration Hospital stay
Onlay	7.19 ± 3.047
Pre-peritoneal	5.71 ± 1.546
P value	0.034

- t value – 2.196
- The mean duration of hospital stay is found to be significant in this study.

Table 9. Post-operative complications:

Sl No	Complications	Pre-peritoneal (n=24)	Onlay (n=26)	Percentage (%)	
				Pre-peritoneal	Onlay
1.	Seroma	1	8	4.16	30.76
2.	Hematoma	0	0	0	0
3.	Wound infection	2	6	8.33	23.07
4.	Mesh infection	0	1	0	3.84
5.	Mesh Removal	0	0	0	0

Seroma was drained. Wound infection was treated with antibiotics and regular dressings. Chronic pain was managed with pain killers and reassurance.

Recurrence:

Table 10: **Recurrence**

Sl No.	Type of operation	Recurrence	Percentage(%)
1.	Pre-peritoneal	0	0
2.	Onlay	1	2

Recurrence was observed only in one patient with Onlay mesh repair**.**

DISCUSSION
Ventral hernia in the anterior abdominal wall includes both spontaneous and, most commonly, incisional hernias after an abdominal operation. Incisional hernia has been a frequent complication of abdominal surgery for a long time, with a currentincidence of 2-20% in most series. [8,9]

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Small hernias less than 2 ½ cm in diameter are often successfully closed with primary tissue repairs. However, larger ones have a recurrence rate of up to 30-40% when a tissue repair alone is performed [10]. Hernia recurrence is distressing to patient and embarrassing to surgeons. Nowadays tension free repair using prosthetic mesh has decreased recurrence to negligible 0 – 10%[11, 12]. Despite excellent results increased risk of infection with placement of a foreign body and cost factor still exist; however, operating time and hospital length of stay are shortened. Primary tissue repair is associated with higher unacceptable recurrence rate, nowadays; tension free mesh repair is ideal hernia repair technique. [13]

While repair of ventral hernias with mesh is considered routine, there is no consensus on the best location to place the mesh.

INCIDENCE

Incidence among ventral hernias in the present study is Incisional hernia (n=28) 32%, umbilical hernia (n=16) 12%, and epigastric hernia (n=6) 28%.

Table 11. Comparision of Incidence with previous studies

Study	Umbilical	Incisional	epigastric
Ahmed *et al*[14]	62.5	20	17.5
Aly saber *et al*[15]	-	-	-
Furat shahi *et al*[16]	28.5	71.5	
Raj siddarth *et al*[8]	48.3	40	11.7
Present study	32	56	12

Incisional hernia and umbilical are more common in ventral hernias than the epigastric hernia, the incidence of different ventral hernias are comparable to the previous study except for the Ahmed *et al* study where incisional hernia is very lowwith only 20%

AGE

Ventral hernias are more common in patients aged between 30-60 years in our study. Youngest patient in our study was 22 years old. It was found that ventral hernias are rare after 65 years as no patient was more than 65 years in our study. Mean age in On-lay group was 47.30 years and Pre-peritoneal group mean age was 45.15 years.

In my study,the most common age of presentation was 41-50 yrs followed by 51-60 &31-40. Whereas in Raj Siddharth *et al* [8] study, 31-40 yrs was the most common agegroup.

GENDER

Ventral hernias are more common among females 34 patients were females and 16 patients were male. In literature the ratio is 3:1. in our study it is 2.125:1. Ahmed *et al* have obtained a 62.5% of female population in the study. In our study female population was 68%, while except for the Aly saber *et al* study other studies like Furat shahi *et al* [16] do show a high incidence in ventral hernia in female population in ratio greater than 2:1.

In the present study most contribution to the ventral hernia came from female sex which in turn was a reflection of incisional hernias and are of obstetric and gynaecological surgeries, indicating a more possibility in reduction of ventral hernias with a proper care at the time of primary surgery and proper suturing techniques and early post-operative care.

ASSOCIATED FACTORS

Among incisional hernias Gynaecological surgeries are the most common associated surgery. Hysterectomy constituting (n=9) 32.14% of incisional hernias followed by Laparotomy (n=7) 25% in present study.

15 (30%) patients were Diabetic and 20 (40%) are hypertensive, 1 was Hypothyroid. In the present series postoperative morbidity was not so high in diabetics, in contrast to the general observation, this might be because of the fewer incidences of co-morbities in the sample size and the sample size itself is small to make the conclusions for generalized population. Patients with Obesity were excluded in the study so that the individual causative factors for recurrence or complications are minimized.

MEAN DURATION OF SURGERY

Mean duration of surgery in present study in cases that underwent Onlay mesh repair was 77.08 minutes, while in cases with Pre-Peritoneal Mesh repair mean duration of surgery was 95.63 minutes in present series and it was found to be statistically significant ($p<0.05$).

The mean duration of surgery in the raj siddarth *et al* [8] study and aly saber *et al* study are more In preperitoneal mesh group similar to the present study and are statistically significant and the authors accounted the difference in times might

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bedue to the time taken to create the pre peritoneal space which is critical step in the pre peritoneal mesh repair,

In Aly saber *et al* [15] study, the mean operative time for onlay repair was 67.04±13.19 minutes while in Sublay group was 93.26±24.94 minutes {P≤0.0001} .in Raj siddarth *et al* study 45 min, while in cases with pre-peritoneal Mesh repair took more time and the duration of surgery was 60.15 min in present series (P < 0.0001). In Ahmed Ibrahim *et al* [14] study the mean total time taken to perform surgery in the onlay group was 75–90 (83.41 ± 10.24) min compared with 80–100 (89.52 ± 7.25) min in the sublay group (P = 0.324) which is not significant in this study.

COMPLICATIONS

The most common complication observed was seroma in 9 patients. Out of 9 patients 1 was in pre-peritoneal and 8 in onlay mesh repair group. This complication was managed with seroma drainage. Onlay technique had more chances of seroma formation, due to the fact that onlay technique requires wide mobilization of subcutaneous tissue flaps leading to creating devascularising skin flaps with seroma formation or infection. Insertion of foreign material temporarily establishes an effective barrier between the circulatory system of the subcutaneous tissues and that of the deeper parietal layers. In Pre peritoneal repair, the bare posterior surface (below the arcuate line) of the of the rectus muscles which is rich in lymphatic is capable of absorbing any collecting seroma. The superficial location of the mesh also puts it in danger of becoming infected if there is a superficial wound infection.

Wound infection was found in 8 cases. Out of these 2 were in preperitoneal group and 6 were in onlay group. These patients were treated with appropriate antibiotics and regular dressing. No patient required removal of mesh because the infection was superficial and responded well to antibiotics. One patient in the onlay group has mesh infected and it is being conservatively by regular dressings in the operation theatre and mesh was successfully conserved but the hospital stay was prolonged.

Present study has difference in complication rates in favour of pre peritoneal mesh repair which was comparable to other series. The highest complications were noted in the raj siddarth *et al* [8] study with 53.33% in onlay group and 20% in pre peritoneal group, Aly saber *et al* [15] reported 24% complications in the onlay group and 2% in the pre peritoneal group.

HOSPITAL STAY

The duration of postoperative hospital stay is an indirect indication of degree of morbidity in terms of postoperative complications. Average postoperative hospital stay period in present series for onlay Mesh repair was 7.19, as compared to 5.71 days average hospital stay for Pre-Peritoneal Mesh repair with (P value 0.034) which is statistically significant and is comparable to raj siddarth study [8]. Ahmed *et al* [14] study also showed less hospital study in pre-peritoneal repair cases compared to onlay group.

The difference can be accounted to post-operative complications which were relatively more in Onlay group and increases post-operative morbidity,

RECURRENCE

No recurrence of hernia was noticed in Pre-Peritoneal Mesh repair, in present series where as in the onlay group recurrence occurred in 1(2%) cases after a 100% follow up for minimum 6 months and is statistically insignificant (P>0.05).

Pre peritoneal repair is not without its own set of challenges. The surgical approach can be perceived as more technically challenging than other techniques, particularly in patients who have had prior abdominal surgeries. Patients with previous abdominal surgeries, stomas, gynecologic procedures, or ventral hernia repairs may have a damaged posterior sheath or damaged rectus muscle. This may leave this space difficult to develop, limited in size, or non-existent in rare circumstances. In addition, risks of damaging the blood supply, muscle, or lateral penetrating nerves pose technical concerns. Furthermore, the semilunar lines limit the lateral extent of the sublay repair and potentially limiting the amount of mesh overlap. Off-midline incisions may not be ideal hernias to approach with this technique. While those new to sublay repair may find it technically daunting, experience has demonstrated ease in learning and adopting this approach. However,studies to evaluate the learning curve are needed.

CONCLUSION AND SUMMARY

Preperitoneal mesh repair is a good alternative to Onlay mesh repair that may be applicable to all forms of ventral hernias. The mesh related overall complication rate is low such as seroma formation, wound infection as well as less Hospital stay and low recurrence rate. In addition, Pre peritoneal mesh placement protects the mesh from exposure from superficial wound complications, intra-abdominal adhesions and contamination. As study period was limited it requires larger number and longer duration of follow up to definitely establish the effectiveness of pre peritoneal mesh repair.

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Conflict of Interest None

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