

A Comparative Study of Pre Peritoneal and Onlay Mesh Repair in the Management of Ventral Hernias

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Abstract

Background: Ventral hernia is a protrusion of an abdominal viscus or part of a viscus through the anterior abdominal wall. Ventral hernias are common clinical entity encountered in people of all age groups. They present a challenge because they occur in variety of sizes, may be quite complicated to repair and have relatively high recurrence rates. Mesh repair in ventral hernia can be onlay, inlay, pre peritoneal. Each of the mesh placement techniques are practiced widely and each have their own advantages and disadvantages. This is a prospective study to compare the pre peritoneal mesh repair and onlay mesh repair techniques and their outcomes in management of ventral hernias.

Aims and Objectives: To compare the onlay and pre peritoneal mesh repair techniques and their outcomes with respect to post operative pain, seroma formation, wound infection and recurrence in the management of ventral hernias. To assess the anatomical, clinic pathological factors leading to ventral hernias.

Methods: Source of data:

Patients diagnosed by the surgeon as confirmed cases of ventral hernias, admitted department of general surgery, in hospitals attached to Bangalore Medical College and Research Institute, Bengaluru

Methodology:

It was a Prospective comparative study

Total sample size was 100.

After admission, patients fulfilling the inclusion & exclusion criteria were taken into study after obtaining written informed consent.

Patients were allotted to groups randomly using computer generated random number.

Group A were 50 cases who underwent onlay mesh repair and group B were 50 cases who underwent pre peritoneal mesh repair

Patient details and investigations were recorded were recorded in the case record form (CRF) at baseline visit.

Patients underwent the mesh repair and duration of surgery was recorded.

Patients were followed up at 4 weeks (visit 2), 8 weeks (visit 3) and 24 weeks (visit 4) after the surgery. The various complications were studied in the follow up visits.

Results:

The mean operative time was 46.68 minutes in onlay group and 56.26 minutes in pre-peritoneal group showing statistical significance. In our study, 22% of onlay group and 6.0% of pre-peritoneal group complaint of chronic post operative pain during the follow up visits showing p value which is statistically significant. 22% were in onlay group and 6.0% in pre-peritoneal group developed seroma with a p value showing statistical significance. Average post operative hospital stay period in present series for onlay repair was 7.48 days, as compared to 5.90 days average stay for Pre-peritoneal Mesh repair which also was statistically significant.

Conclusion: According to our study onlay repair had more complication rates in terms of seroma and post operative pain compared to pre-peritoneal mesh repair. Even though the operative time for onlay

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repair was less, increased chances of complications limit its use. Taking into consideration all the above our study concludes that pre peritoneal mesh repair is superior to onlay mesh repair.

Keywords: Ventral hernia; Mesh repair; Onlay; Pre-peritoneal; Seroma; Post operative pain.

Introduction

Hernia is a the Latin word meaning rupture. A hernia is defined as an abnormal protrusion of a whole or a part viscus through a defect in its surrounding walls. These defects are seen most commonly in the abdominal wall due to man's erect posture.

A ventral hernia is defined by a protrusion through the anterior abdominal wall fascia at any site other than the groin. Incisional hernias, paraumbilical hernias, umbilical hernias, epigastric hernias and spigilian hernias are all included under ventral hernias. These defects can be categorized as spontaneous or acquired or by their location on the abdominal wall.¹

Epigastric hernias occur from the xiphoid process to the umbilicus, umbilical hernias occur at the umbilicus, and hypogastric hernias are rare spontaneous hernias that occur below the umbilicus in the midline.

Acquired hernias typically occur after surgical incisions and are therefore termed incisional hernias.

A spigelian hernia occurs through the aponeurotic layer between rectus muscle medially and senilunar line laterally, and requires surgical repair due to high chances of intestinal obstruction.

Hernias occurring through the linea alba abutting superiorly or inferiorly or one side of umbilicus are called praumbilical hernias.¹

In 90% of patients, it is an acquired defect that is a direct result of increased abdominal pressure. Causes of this increase in abdominal pressure include multiparous status, obesity, and cirrhosis with ascites, obesity, older age, male gender, sleep apnea, emphysema and other chronic lung conditions.

The clinical presentation varies from asymptomatic swelling to obstructed hernias.

Diagnosis is made by clinical examination or by ultrasound scanning.²

All surgical repairs for repair of hernias follow the same basic principles:

1. Reduction of the hernia content into the abdominal cavity with removal of any non-viable tissue and bowel repair if necessary
2. Ecision and closure of peritoneal sac or replacing it deep to the muscles
3. Reapproximation of the walls of the neck of the hernia if possible
4. Permanent reinforcement of the abdominal wall defect with sutures or mesh.³

Materials and Method

Source of data

Patients diagnosed by the surgeon as confirmed cases of ventral hernias, admitted department of general surgery, in hospitals attached to Bangalore Medical College and Research Institute, Bengaluru.

Methods of collection of data:

- a. *Study design:* Prospective comparative study
- b. *Study period:* November 2017 to May 2019.
- c. *Place of study:* The study was conducted among the patients admitted in department of General surgery in hospitals attached to Bangalore Medical College and Research Institute, Bengaluru.

Inclusion criteria

Patients willing to give written informed consent (Annexure-1).

Patients of either sex aged above 18 years.

All patients who are confirmed cases of anterior abdominal wall hernias:

- a. umbilical hernias
- b. paraumbilical hernias
- c. epigastric hernias
- d. incisional hernias
- e. spigelian hernias

Patients undergoing elective surgeries for ventral hernia repair will be considered.

F. Exclusion criteria :

- Groin hernia
- Divarication of recti

Methodology

After obtaining institutional ethics committee clearance, and written informed consent (Annexure-1) the inpatients in the department of General surgery fulfilling inclusion criteria were enrolled in the study.

100 patients with confirmed cases of ventral hernias were divided into two groups randomly using a computer generated random number.

Group A - 50 patients undergoing pre peritoneal mesh repair.

Group B - 50 patients undergoing onlay mesh repair.

- Demographic data, medical history, concomitant medications, intercurrent illness, physical examination, clinical examination including recording of vital signs, local examination, relevant investigations (Annexure 3) done was recorded in the case record form (CRF) at baseline visit (visit 1) (Annexure 2). Each patient was given a unique identity number.
- Patients underwent the mesh repair and duration of surgery was recorded.
- Patients were followed up at 4 weeks (visit 2), 8 weeks (visit 3) and 24 weeks (visit 4) after the surgery. A deviation of ± 2 days for first follow-up and ± 1 week for subsequent follow-ups will be accepted. At each visit parameters which include, post operative pain, seroma formation, wound infection, recurrence rate will be recorded (annexure 4)

The details of patient visit schedule and follow up is as follows:

Visit 1/ Initial or baseline assessment -

- Patients were given a thorough explanation of the study and written informed consent (Annexure-1) was obtained.
- Patients fulfilling the inclusion criteria were enrolled in the study
- 100 patients with confirmed cases of ventral hernias were divided into two groups randomly by computer generated random numbers.
- Group A - 50 patients undergoing pre peritoneal mesh repair.
- Group B - 50 patients undergoing onlay mesh repair.

- Details of patient's demographic characteristics, and medical history, concomitant medication, intercurrent illness, detailed physical, clinical evaluation was recorded.

Patient underwent the mesh repair and duration of surgery was recorded.

The study termination was done at visit 4

Statistical Analysis:

Data was entered in MS excel spreadsheet and analyzed using IBM SPSS version 20.0 software. Results were presented and as descriptive statistics in the form of mean/ proportion and percentage and possible associations will be derived by using Chi square test, Fisher's exact test, Student's t test etc. Results were presented as tables, charts and figures as applicable.

Subsequent visits in follow up were documented as below.

	Postoperative pain	Seroma	Wound infection	Recurrence
Visit 2/week 4	-	-	-	-
Visit 3/week 8	-	-	-	-
Visit 4/week 24	-	-	-	-

Investigations

The investigations are as follows (Annexure 3)

1. Routine investigations; Hb, TC, DC, Blood urea, Serum creatinine, FBS, PPBS, Urine routine/ microscopy, serology
2. LFT
3. Chest X-ray
4. USG Abdomen
5. ECG

Statistical Analysis

SPSS (Statistical Package For Social Sciences) version 20. [IBM SPSS statistics (IBM corp. Armonk, NY, USA released 2011)] was used to perform the statistical analysis

- Data was entered in the excel spreadsheet.
- Descriptive statistics of the explanatory and outcome variables was calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables.
- Inferential statistics like Chi square test was applied to test the association between quantitative variables and unpaired t test was applied to check the statistical difference between quantitative variables. The level of significance is set at 5%.

Table 1: Distribution of the study subjects according to age.

Age group	Onlay	Pre peritoneal	Total	Chi square test	p value
26 - 35	7 14.0%	9 18.0%	16 16.0%	2.353	0.671
36-45	15 30.0%	17 34.0%	32 32.0%		
46-55	15 30.0%	10 20.0%	25 25.0%		
56-65	8 16.0%	6 12.0%	14 14.0%		
66-75	5 10.0%	8 16.0%	13 13.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

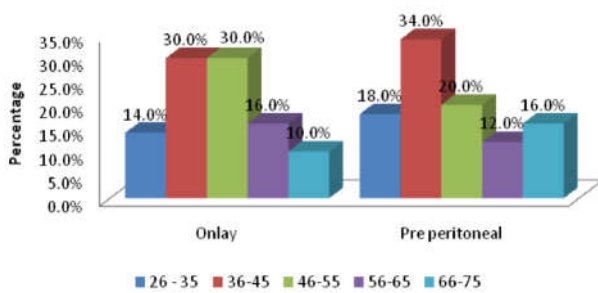


Chart 1: Age wise distribution of the study subjects.

Table 2: Mean age of the study subjects.

Age (years)	N	Mean	Std. Dev	t test	p value
Onlay	50	48.62	11.539	0.299	0.765
Preperitoneal	50	47.88	13.121		

The mean age of the study subjects was 48.62 ± 11.539 years and 47.88 ± 13.121 years in onlay and preperitoneal group respectively.

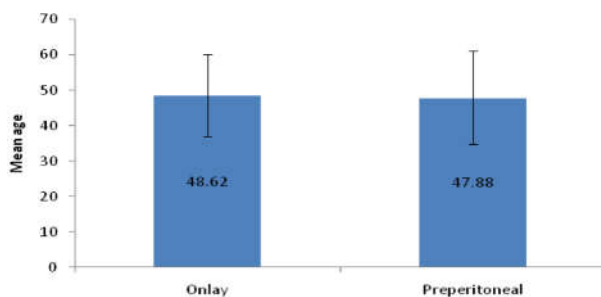


Chart 2: Mean age of the study subjects.

Table 3: Distribution of study subjects according to gender.

Gender	Onlay	Pre peritoneal	Total	Chi square test	p value
Female	34 68.0%	32 64.0%	66 66.0%	1.091	0.58
Male	16 32.0%	18 36.0%	33 34.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Females outnumbered males in both the groups. (Onlay - 68%, Pre peritoneal - 64%).

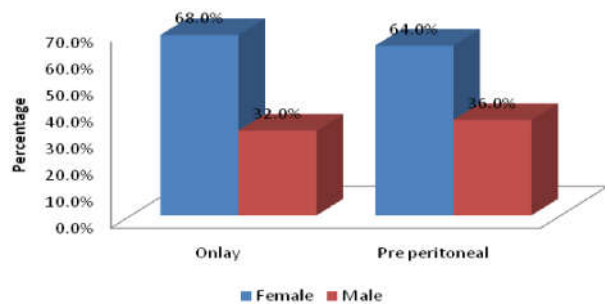


Chart 3: Distribution of study subjects according to gender.

Table 4: Chief complaints of the study subjects.

Chief complaints	Onlay	Pre peritoneal	Total	Chi square test	p value
Swelling	44 88.0%	45 90.0%	89 89.0%	0.102	1
Swelling + Pain	6 12.0%	5 10.0%	11 11.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Swelling alone was found to be high in both the groups (Onlay - 88%, preperitoneal - 90%).

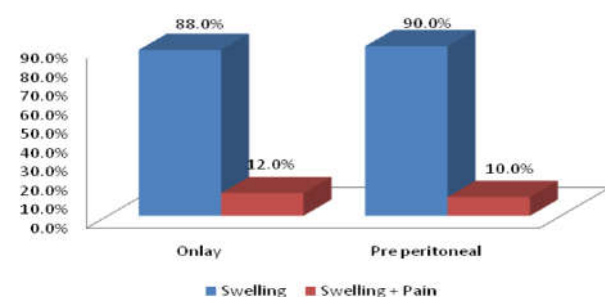


Chart 4: Chief complaints of the study subjects.

Table 5: Distribution of diagnosis between the groups.

Diagnosis	Onlay	Pre peritoneal	Total	Yate's Chi square test	p value
Epigastric hernia	1 2.0%	3 6.0%	4 4.0%	6.881	0.142
Incisional hernia	17 34.0%	8 16.0%	25 25.0%		
Para umbilical hernia	10 20.0%	9 18.0%	19 19.0%		
Spigelian hernia	1 2.0%	0 0.0%	1 1.0%		
Umbilical hernia	21 42.0%	30 60.0%	51 51.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Umbilical hernia was high in both the groups. (Onlay - 42%, Preperitoneal - 60%), followed by incisional hernia in onlay (34%) and para umbilical hernia (18%).

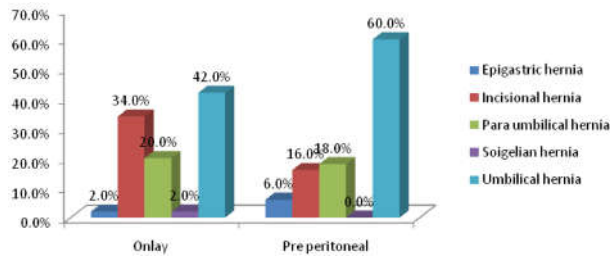


Chart 5: Distribution of diagnosis between the groups.

Table 6: Distribution of co-morbidities among the study subjects

Co morbidities	Onlay	Pre peritoneal	Total	Yate's Chi square test	P value
DM	3 6.0%	2 4.0%	5 5.0%	0.475	0.998
DM + Obesity	10 20.0%	10 20.0%	20 8.0%		
HTN	2 4.0%	2 4.0%	4 4.0%		
Hypothyroidism	3 6.0%	4 8.0%	7 2.0%		
Hypothyroidism + Obesity	1 2.0%	0 0.0%	1 1.0%		
Obesity	6 12.0%	4 8.0%	10 10.0%		
None	25 50.0%	28 56.0%	53 70.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

In the present study, majority of the study subjects had diabetes mellitus with obesity (20% in each group), followed by obesity alone in Onlay group (12%) and obesity alone and hypothyroidism in preperitoneal group (8% each). Yate's chi square test showed that there was no significant association between co-morbidities and the groups. (p - 0.998)

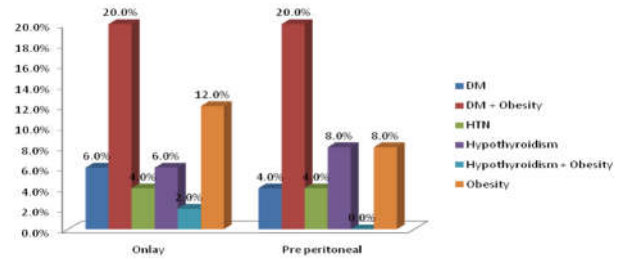


Chart 6: Distribution of co-morbidities among the study subjects

Table 7: History of previous surgeries with respect to treatment groups.

Previous surgeries	Onlay	Pre peritoneal	Total	Yate's Chi square test	p value
Hysterectomy	1 2.0%	0 0.0%	1 1.0%	11.9	0.018
Laparotomy	2 4.0%	1 2.0%	3 3.0%		
LSCS	13 26.0%	4 8.0%	17 17.0%		
Tubectomy	9 18.0%	4 8.0%	13 13.0%		
None	25 50.0%	41 82.0%	66 66.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Previous history of LSCS followed by tubectomy was high in both the groups but both were comparatively found to be high in Onlay group (LSCS - 26%, Tubectomy - 18%) than preperitoneal group (LSCS - 8%, Tubectomy - 8%). Yate's chisquare test showed that there was significant association found between previous surgeries and the groups. (p - 0.018).

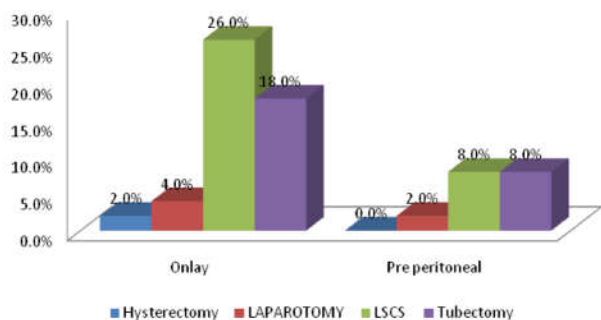


Chart 7: History of previous surgeries with respect to treatment groups.

Table 8: Previous surgeries in all cases of Incisional hernia

Previous surgeries In incisional hernia	Total
Hysterectomy	1 4.0%
Laparotomy	3 12.0%
LSCS	12 48.0%
Tubectomy	9 36.0%
Total incisional hernias	25 100%

Previous surgeries(in Percentage)

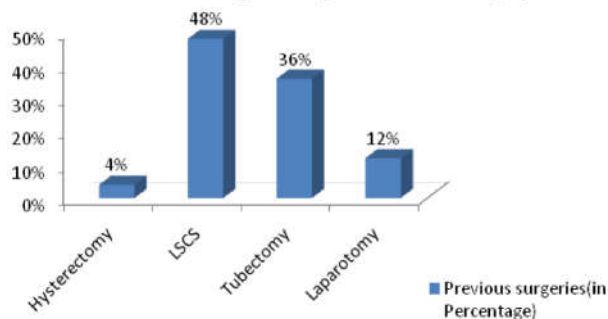


Chart 8a: Previous surgeries (%) in all cases of Incisional hernia.

Previous surgeries (in Number)

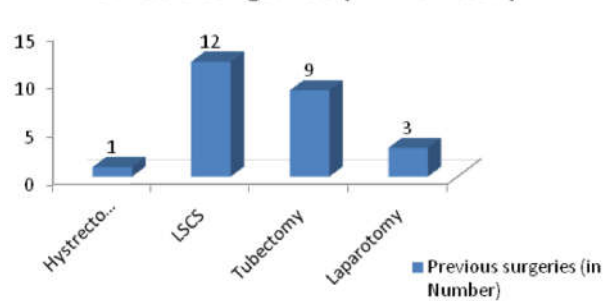


Chart 8b: Previous surgeries(in percentage) in all cases of Incisional hernia.

Table 9: Contents of the hernia among the study subjects

Content	Onlay	Pre peritoneal	Total	Chi square test	p value
Omentum	38 76.0%	38 76.0%	76 76.0%	1.8151	0.403
Omentum + Small bowel	7 14.0%	10 20.0%	17 9.0%		
Small bowel	5 10.0%	2 4.0%	7 7.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Omentum was the most common structure found in hernia among the study subjects in both the groups. (Onlay - 76%, Preperitoneal - 76%), followed by omentum + small bowel in pre peritoneal group (20%) and small bowel in onlay group (10%).

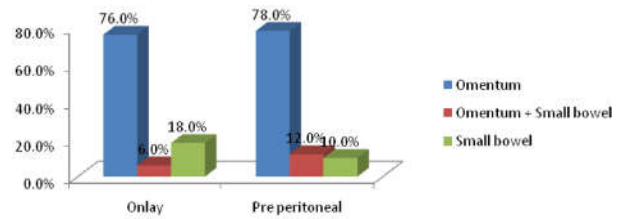


Chart 9: Contents of the hernia among the study subjects.

Table 10: Defect size of the hernias and the groups.

Defect size (cm)	Onlay	Pre peritoneal	Total	Yate's Chi square test	p value
2-3	15 30.0%	15 30.0%	30 30.0%	4.315	0.505
3-4	16 32.0%	14 28.0%	30 30.0%		
4-5	10 20.0%	12 24.0%	22 22.0%		
5-6	3 6.0%	6 12.0%	9 9.0%		
6-7	6 12.0%	2 4.0%	8 8.0%		
7-8	0 0.0%	1 2.0%	1 1.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

Both the groups had almost equal distribution of study subjects with defect sizes. Majority of the study subjects had defect size in between 2 and 4cm in both the groups. There was no significant association found between defect sizes and the groups. (p - 0.505).

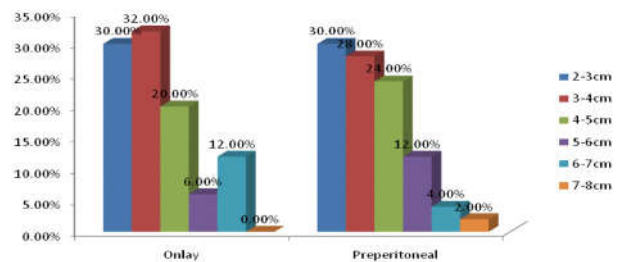


Chart 10: Defect size of the hernias and the groups.

The mean size of defect in ventral hernia studies was 3.5cm. The largest defect was 2.2cm and the smallest defect was 7.6cm.

Table 11: Duration of surgery between the groups.

Duration of surgery	Onlay	Pre peritoneal	Total	Fisher's exact test	p value
< 1 hour	47 94.0%	41 82.0%	88 88.0%	3.409	0.121
> 1 hour	3 6.0%	9 18.0%	12 12.0%		
Total	50 100.0%	50 100.0%	100 100.0%		

In both the groups, the duration of surgery was less than an hour in many cases. (Onlay - 94%, Preperitoneal - 82%). There was no significant association found between the duration of surgery and the treatment groups. (p - 0.121).

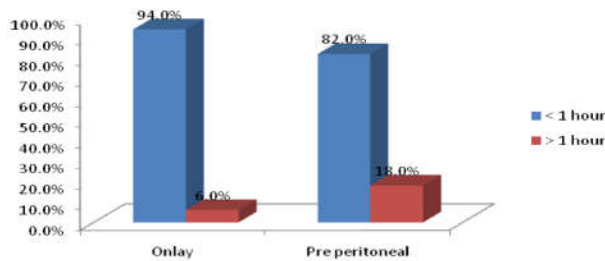


Chart 11: Duration of surgery between the groups.

Table 12: Mean duration of surgery between the groups.

Duration of surgery (min)	N	Mean	Std. Dev	t test	p value
Onlay	50	46.68	7.813	-5.746	0.000
Preperitoneal	50	56.26	8.829		

The mean duration of surgery in onlay group was 46.68 ± 7.813 min and 56.26 ± 8.829 min in preperitoneal group. Unpaired t test showed that there was significant difference found between duration of surgery (min) and the treatment group. (p - 0.001)

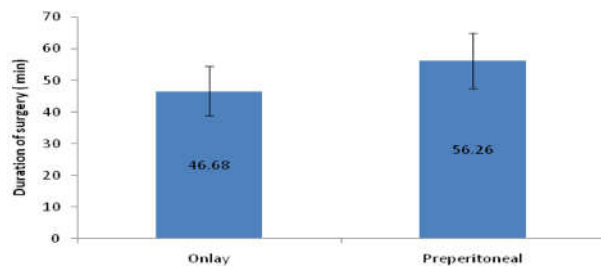


Chart 12: Mean duration of surgery between the groups.

Table 13: Mean duration of hospital stay of the study subjects.

Hospital stay (days)	N	Mean	Std. Dev	t test	p value
Onlay	50	7.48	2.644	3.767	0.001
Preperitoneal	50	5.90	1.344		

The mean duration of hospital stay was high in onlay group (7.48 ± 2.644 days) than preperitoneal group (5.9 ± 1.344 days). Unpaired t test showed that there was significant difference found between duration of hospital stay and the treatment given. (p - 0.001)

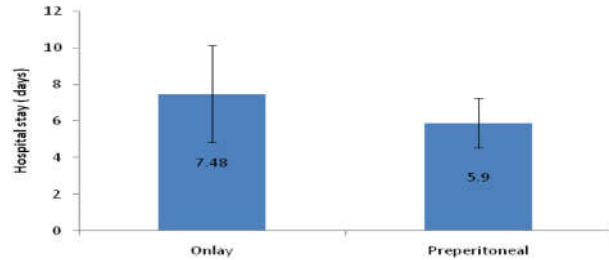


Chart 13: Mean duration of surgery between the groups.

Table 14: Complications of the study subjects in both the groups.

Complications	Onlay	Pre peritoneal	Total	Yate's Chi square test	p value
Post operative chronic pain	11 22.0%	3 6.0%	14 14.0%	4.07	0.04
None	20 40.0%	41 82.0%	61 61.0%	12.26*	0.001
Recurrence	1 2.0%	0 0.0%	1 1.0%	0	1
Seroma	11 22.0%	3 6.0%	14 14.0%	4.07	0.04
Seroma + post operative Chronic pain	1 2.0%	0 0.0%	1 1.0%	0	1
Seroma + Wound infection	1 2.0%	2 4.0%	3 3.0%	0	1
Seroma + wound infection + post operative Chronic pain	1 2.0%	0 0.0%	1 1.0%	0	1
Wound infection	4 8.0%	1 2.0%	5 5.0%	0.842	0.35
Total	50 100.0%	50 100.0%	100 100.0%		

Chi square test*

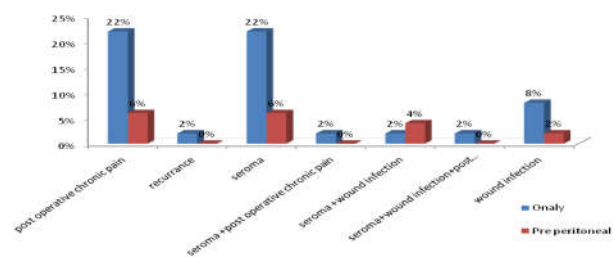


Chart 14: Complications of the study subjects in both the groups.

Post operative Chronic pain was found to be high in Onlay group (22%) than preperitoneal group (6%) and it was found to be significantly associated with the treatment groups. (p - 0.04). No complications were found in 40% and 82% of the study subjects in Onlay and preperitoneal group respectively. This was found to be significantly associated between the groups. (p - 0.001).

Seroma was found to be high in onlay group (22%) than 6% in preperitoneal group. Yate's chi square test showed that there was significant association between presence of seroma and the treatment group. (p - 0.04).

Recurrence, seroma + chronic pain, seroma + wound infection + chronic pain, wound infection were not found to be significantly associated between the groups. ($p > 0.05$).

Discussion

Ventral hernia in the anterior abdominal wall includes both spontaneous and acquired hernias. Around 2 to 10% of all abdominal operations result in an incisional hernia.

Small hernias less than 2.5 cm in diameter are closed with primary tissue repairs and do not require a mesh repair. However, larger ones have a recurrence rate of up to 30-40% when a tissue repair alone is performed.⁵

Hernia recurrence is distressing to patient and embarrassing to surgeons. With the advent of tension free repair using prosthetic mesh in the recent days recurrence has decreased to negligible.

Mesh repairs are associated with an increased risk of infection to the foreign body and higher cost of surgery. Nevertheless tension free mesh repair is considered ideal for hernia repair since primary repairs are associated with higher unacceptable recurrence rate.¹

A study conducted by McKnight et. al. observed that current data strongly supports the use of synthetic mesh for ventral hernias > 3cm in size, there is decrease in recurrence rates for mesh repair of smaller defects also.⁶

Mesh repair can be pre-peritoneal or onlay. Controversy exists among the surgeons regarding the use of type of either mesh repair, due to differences in ease in performing the surgery, time of surgery, complications occurring in the post operative period and the recurrence.

Our study attempts to study the onlay and pre peritoneal mesh repair techniques and their outcomes.

100 patients with ventral hernia admitted in hospitals attached to Bangalore medical college and research institute, bangalore from November 2017 to May 2019 were taken into our study. 50 underwent onlay mesh repair, 50 pre-peritoneal mesh repair. The results were analyzed.

Incidence

Incidence of various ventral hernias in our study was as follows:

Age

The most number of patients are in the 36-45 years

group forming 32% of the total. 46-55 years age group constitutes 25% of the total number. 56-65 years age group makes up 14%, 26-35 years 16%. The youngest patient in the group was 28 years of age, the oldest was 78 years of age.

Mean age of the total study group was 48.25 years.

Sex

In the study, 34 of the patients were male making 34% of the study population; 66 of the patients were female making up 66% of the study population. Other studies have shown similar comparable results.

Table 15: Studies compared - Incidence of various ventral hernias.

Diagnosis	P. Thangamani et. al. ⁴	Rajsiddharth B et. al. ²	Present study
Epigastric hernia	4 8.0%	7 11.7%	4 4.0%
Incisional hernia	17 34.0%	24 40	25 25.0%
Para umbilical hernia	13 26.0%	18% 30	19 19.0%
Spigelian hernia	0 0%	0 0%	1 1.0%
Umbilical hernia	16 32.0%	11.7 18.3%	51 51.0%
Total	50 100.0%	60 100%	100 100.0%

Table 16: Percentage wise distribution of age groups.

Age group	Total
26 - 35	16 16.0%
36-45	32 32.0%
46-55	25 25.0%
56-65	14 14.0%
66-75	13 13.0%
Total	100 100.0%

Table 17: Studies compared- gender wise distribution

Gender	Present study	Furat Shani Aoda et. al. ⁷
Female	66%	80.4%
Male	34%	19.6%
Total	100%	100%

Furat Shani Aoda et al showed 80.4% of female population.

This is accordance with the literature showing female: male ratio of 3:1.

Chief complaints

89% of patients presented with complaints of swelling over the anterior abdominal wall, 11% of the patients complained of swelling and pain in the region of swelling

Swelling was seen to be the most consistent complaint found in all patients. Pain was most commonly described as a dragging pain possibly can be explained by the dragging sensation of omentum which was the frequent content. No strangulated hernias were considered. These symptoms are comparable to other studies.

Co-morbidities

4 of the patients were found to be hypertensive forming 4% of the study group.

5 patients were diabetics forming 5% of the study group.

10 patients had a BMI over 30 and were found to be obese forming 10% of the study group.

2 patients were suffering from hypothyroidism forming 2% of the study group.

Many of the patients had more than 1 co-morbidity.

Both obesity and diabetes mellitus was seen in 8 subjects

Both obesity and hypothyroidism was seen in 1 subject.

Table 18: Studies compared - chief complaints.

Chief complaints	Present study	Bantu rajsiddharth et. al. ²
Swelling	89%	85%
Swelling + Pain	11%	11.67%

In females most precipitating factor was Multiparity. About 50% of females were multipara. This can be attributed to stretching and weakening of anterior abdominal wall musculo-aponeurotic layer.

Next common factor was obesity, 10 patients (10%). Fat penetrates muscle bundles and layers, weakens aponeurosis and favors appearance of hernia.

In the present series postoperative morbidity was considerably high in diabetics, contributing 50% of the cases which had one or the other complication in the postoperative period and 4 of the 5 patients

who developed wound infection were diabetics.

Table 19: Studies compared - co morbidities.

Co Morbidities	Present Study (%)	Biju K Varghese et. al. ⁸ (%)	Rajsiddharth et. al. ² (%)
DM	13	10	13
HTN	4	24	15
Hypothyroidism	2	3	1.67
Obesity	19	18	25

Obesity was another factor that led to increased postoperative morbidity with 13 cases, of 19 cases with obesity in the present series, developed one or the other postoperative complications being obese. These two important factors are compared with series published by Rios A et. al. and Weber et. al. in Table 19. Results in the present series are comparable to both these studies

In our study total 25 cases of incisional hernias were seen. Among these LSCS was the most common predisposing surgery, constituting 12 cases (48)% followed by Tubectomy, 9 cases (36%), Hysterectomy, 1 case (4%). Rajsiddharth B et. al. series² also mentions Gynecological surgeries as the most common associated surgery.

Table 20: Studies compared - Incidence of diabetes and obesity.

Study Group	Diabetes (%)	Obesity (%)
Rios A. et. al.	18	9.3
Weber et. al.	23	30
Present study	13	19

Table 21: Previous surgeries in incisional hernias.

Previous surgeries In incisional hernias	Total
Hysterectomy	1
Laparotomy	4.0%
LSCS	12
Tubectomy	48.0%
Total incisional hernias	9
	36.0%
	25
	100%

Table 22: Studies compared-contents of sac.

Content	Present study	Biju k varghese et. al. ⁸
Omentum	76%	71%
Omentum + Small bowel	17%	21%
Small bowel	7%	8%

Contents of the sac

77% of the total patients in the study had omentum as content which is the commonest content of the hernia sac. 9% of the patients in the study had both omentum and small bowel as content. 14% of the total number of patients had small bowel. These observations are similar to other studies as shown.

Mean size of the defect

The mean size of defect in ventral hernia studies was 3.5cm.

The largest defect was 2.2cm and the smallest defect was 7.6cm .

Type of mesh repair

In our study 50 patients underwent onlay mesh repair and 50 patients underwent pre peritoneal mesh repair.

Mean duration of surgery

The mean operative time in our study in onlay repair was 46.68 minutes and pre-peritoneal repair was 56.26 minutes. The p value was < 0.001 which is statistically significant.

The difference in the operating time could be accounted to more time required for dissection for creating pre peritoneal space. Securing adequate hemostasis is another burden on time. Ease of operation was largely subjective, and depends on surgeons' experience, exposure, quality of assistance and conducive facilities.

Table 23: Type of mesh repair.

Type of mesh repair	Number of patients	Percentage
Onlay	50	50
Pre peritoneal	50	50

John. J. Gleysteen et. al.¹¹ series the mean duration for Onlay and Pre-peritoneal Mesh repair were 42 and 70.5 minutes respectively. Below table shows the comparison of duration of surgery in different series.

Duration of post-operative hospital stay

The duration of postoperative hospital stay is a measure of degree of morbidity by the surgery in terms of postoperative complications. Average post operative hospital stay period in present series for onlay repair was 7.48 days, as compared to 5.90 days average stay for Pre-peritoneal Mesh repair with p value of 0.001 showing statistical significance. This was comparable to other studies shown in the table.

Complications

Post operative pain

Chronic post-operative pain can be debilitating to the patient. In our study, 22% of onlay group and 6.0% of pre-peritoneal group complaint of chronic post operative pain during the follow up visits showing p value of 0.04 which is statistically significant. Other studies also show a similar trend as seen the table.

Chronic post operative pain in onlay mesh repair is attributed to the extensive subcutaneous tissue dissection and use of trans fascial sutures to secure the mesh over the rectus sheath.

Seroma

The other common complication observed was seroma. 22% were in onlay group and 6.0% in pre-peritoneal group with a p value of 0.04 showing statistical significance. This was managed with oral anti inflammatory and antibiotic drugs and serratiopeptidases. Aspiration of the seroma under sterile condition was done if unresolved. Onlay technique requires significant subcutaneous dissection to place the mesh, which can lead to devitalized tissue with seroma formation or infection.

Wound infection

Wound infection was found in 5 cases in total. Out of these 1 was in the pre- peritoneal group forming 2% and 4 were in onlay group forming 8%. The p value was found to be 0.35 which is not statistically significant. These patients were treated with appropriate antibiotics and regular dressing. Wound infection which led to wound dehiscence was managed with secondary suturing under antibiotic coverage. Wound infections in onlay group occurs due to extensive dissection for mesh placement causing jeopardy to skin vasculature.

Recurrence

Recurrence was found in one patient in onlay group (2%). The patient was a 51 year old female and was a known hypothyroid and obese with BMI of 32. The pre-peritoneal group had no recurrences.

Pre-peritoneal mesh repair is considered superior because the mesh with significant overlap placed under the muscular abdominal wall working according to Pascal's principles of hydrostatics. The intra-abdominal cavity functions as a cylinder, and the pressure distributed uniformly to all aspects of

the system. Consequently, the same forces that are attempting to push the mesh through hernia defects are also holding the mesh in place against the intact abdominal wall. In this manner, the prosthetic is held firmly in place by intra-abdominal pressure. The mechanical strength of the prosthetic prevents protrusion of the peritoneal cavity through the hernia because the hernia sac is indistensible against the mesh. Over time, the prosthetic is incorporated into the fascia and unites the abdominal wall, now without an area of weakness.

In contrast, onlay mesh repair is considered to be under tension and hence the possibility of recurrence is more.

Table 24: Studies compared – duration of surgery.

Duration of surgery (min)	John. J. Gleysteen et. al. ¹¹	Godara et. al. ¹²	Mean in present study
Onlay	42	49.35	46.68
Preperitoneal	70.5	63.15	56.26

Table 25: Studies compared – duration of hospital stay.

Hospital stay (days)	Raghuveer et. al. ¹³	Rajsiddharth, et. al. ²	John J Gleysteen et. al. ¹¹	Mean in present study	p value in present study
Onlay	6.68	7.53	7.9	7.48	0.001
Preperitoneal	4.8	5.96	5.9	5.90	

Table 26: Studies compared - complications.

Complications	Present study	Other studies	
		Rajsiddharth B etal ²	Biju K Varghese et. al. ⁸
Post operative pain			
Onlay	22.0%	20%	3.90%
Pre peritoneal	6.0%	3.33%	0.0%
Seroma		Rajsiddharth B etal ²	Furat S Aoda et. al. ⁷
Onlay	22.0%	20.0%	24.0%
Pre peritoneal	6.0%	10.0%	2.2%
Wound infection		Rajsiddharth B etal ²	Gleysteen et. al. ¹¹
Onlay	8.0%	13.0%	12.0%
Pre peritoneal	2.0%	6.66%	4%
Recurrence		Rajsiddharth B etal ²	Gleysteen et. al. ⁵⁵
Onlay	2.0%	13.0%	20.0%
Pre peritoneal	0.0%	0.0%	4.0%

Conclusion

1. Ventral hernias are one of the frequently encountered condition in the surgical OPD and umbilical hernias are most common among them.
2. Obesity associated with diabetes mellitus and hypothyroidism were most common associated co morbidities in patients with ventral hernias.
3. Onlay mesh repair has statistically significant less time for the duration of surgery.
4. Seroma formation and chronic post operative pain were significantly more in onlay type of mesh repair. Duration of hospital stay was also more in onlay mesh repair, attributing to the complications.

5. Pre peritoneal type of mesh repair of ventral hernias although takes longer time to operate has an upper hand over only mesh repair owing to the less complications and less hospital stay.
7. According to our study we can conclude that Pre peritoneal mesh repair is superior to onlay mesh repair.

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