

## **Suture repair versus mesh repair of midline ventral hernias**

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**How to citation this article:** Dr. Ankur Bhimnathwala, Dr. Kalpesh Patel, Dr. Sushil Damor, Dr. Digant Patel, Dr. Jagrut Patel, “Suture repair versus mesh repair of midline ventral hernias”, IJMACR- October - 2023, Volume – 6, Issue - 5, P. No. 106 – 114.

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### **Abstract**

**Introduction:** All hernias were repaired anatomically before the mesh era started. But the large size and complex hernias were a problem for anatomical repairs due to more complications and recurrences. Use of mesh implants have shown improved results with reduced recurrence rates in such large size hernias. Later it was gradually used to even small size and uncomplicated hernias as well due to simplicity of procedure.

**Aims:** To compare the incidence of recurrence of ventral hernia, Surgical site infection (SSI), postoperative pain, Seroma and Hematoma in both groups.

**Materials and Methods:** A prospective cohort study was performed in the Department of General Surgery, Medical College, Baroda. In a period of one year, a total of 30

patients were enrolled in study, 15 for mashplasty and 15 for 4-layer repair for suture repair versus mesh repair of milline ventral hernias study.

**Results and outcome:** It showed that there was no statistical difference of the mean age, gender, BMI, Defect size, Surgical site infection, post operative pain on day 1, 3 and day of discharge of patient and both groups were comparable. There was significant difference in post-operative pain on day 7 and recurrence of hernia in both the group.

**Conclusion:** Repair of small and medium sized midline abdominal wall hernia by this 4-layer technique without mesh shows good recovery with acceptable complication and recurrence rate without any foreign body

complications. Therefore, it can be used as a first choice of repair in such patients.

**Keywords:** Abdominal wall defect, Abdominal wall hernia, Hernia, Incisional hernia, Mesh repair, Ventral hernia

### Introduction

“Ventral hernia” is defined as a protrusion of loops of intestine, fat, or fibrous tissue through a defect or weakened region of the abdominal wall. The protrusion may involve, for example, preperitoneal fat, intestinal contents, or omentum. Ventral hernia may be congenital or acquired.

All hernias were repaired anatomically before the mesh era started. But the large size and complex hernias were a problem for anatomical repairs due to more complications and recurrences. Use of mesh implants have shown improved results with reduced recurrence rates in such large size hernias. Later it was gradually used to even smallsize and uncomplicated hernias as well due to simplicity of procedure. Today, mesh implant, open or laparoscopic, has become a routine to be used in all types of hernias even though many of them could have been repaired anatomically without mesh with excellent results and success. In this context, the study was aimed to compare the two surgical procedures, Mesh hernioplasty and 4-Layer suture repair in the patients with midline ventral hernia assess on the basis of post-operative complication, post-operative pain and recurrence of hernia.

**Aims of the study:** Aim of this study is answer following questions:

1. Have mesh implants really reduced recurrence rates over the suture repairs especially in small and medium sized hernias?
2. Can foreign body complications seen with mesh override the benefit of supposedly reduced recurrence rates?

This study was conducted to find the outcomes of pure tissue repairs of small/medium size midline ventral hernias on physiological principle.

To compare 4-layer suture repair based on physiological principal versus retro rectus sublay mesh hernioplasty of midline ventral hernias in terms of:

### Primary Aim

- To compare the incidence of recurrence of ventral hernia in both groups

### Secondary Aim

- To compare the incidence of Surgical site infection (SSI)in both groups
- To compare the incidence of postoperative pain in both groups
- To compare the incidence of Seroma in both groups
- To compare the incidence of Hematoma in both groups.

### Inclusion criteria

Age: 18 to 80 years age

Size of defect:  $\leq 4$ cm

Site of defect: midline ventral hernias

BMI:  $\leq 35$

Uncomplicated hernias

Number of defects: single

### Exclusion criteria

Immunocompromised patients

ASA Grade 4 and 5

Recurrent midline ventral hernias

Bleeding disorder

Umbilical hernia

Infra-umbilical hernia

### Patients and statistical analysis

Study type: Prospective cohort, Interventional

Sample size: Among 70-75 ventral hernia surgeries performed every year at SSG, 3- 4% patients fit into the inclusion criteria of this study. Based on these statistics total 30 patients were to be enrolled in study, 15 for meshplasty and 15 for 4 layered suture repairs.

Formula used: Cochran formula

### Method of randomization:

Patients were allotted alternatively in both groups.

Software used for statistical analysis:

(1) Medcalc

(2) Epiinfo 5

### Methodology

#### Pre-operative management

- All patients included in the study were evaluated by detailed history, general examination, clinical examination and basic investigations.
- Special investigations (CECT Abdomen) were done as and when required.
- From these, those patients who fit in the inclusion criteria were selected.
- After explaining the procedure to the patient, informed written consent for procedure was obtained.
- Then patients were enrolled in study and randomly divided in groups.
- Patients were allotted in either study groups alternately.
- Injection Amoxiclav 1.2 g Intra-Venous was given the night before procedure and also just before induction.

- Patients were given Injection Amoxiclav 1.2 g Intra-Venous 12 hourly for 3 days and oral tablet Amoxiclav 625 mg for next 7 days.
- Pain assessment was done on post-operative day 1, 3, 7 and at time of discharge by visual analogue scale.
- Injection Paracetamol 500 mg intra-venous 8 hourly was given to all patients for 24 to 48 hours depending on the nil by mouth status of patient and was continued for 5 days. For more intensive pain injection diclofenac sodium intra-muscular will be given as and when required.
- In case of difficult dissection of layers, onlaymeshplasty was to be done and patient was to be excluded from study.
- Drain placement was done as and when required.
- After 5 days patient was encouraged to resume daily routines and use analgesics as and when required.
- Dressing was done on 5th, 10th and 14th post-operative day
- If clinically suspected infection was present then wound and/ or blood culture sensitivity sample was sent and definitive antibiotic started accordingly.
- Daily dressing was done in case of infection.
- After discharge patient was followed up on 6 months and 1 year post operatively to see for post-operative complications.
- Patient was admitted again as and when required.
- Suture removal was done on post op day 14.
- In case of recurrence or burst abdomen re operation was to be done if indicated.

#### Operative technique

#### 4 layered suture repairs based on physiological principle

- After anesthesia, painting and draping was done taking anti-septic precautions.

- Appropriate size skin incision kept, hernia sac identified and dissected and reduced into abdominal cavity.

First suture line- Closure of hernia defect

By polypropylene 1 (Round Body) interrupted running simple sutures Anterior rectus sheath will be incised lateral to Linea alba and medial & lateral flaps of anterior rectus sheath created on both sides.

- Medial flaps of anterior rectus sheath on both sides were sutured with polypropylene 1 (Reverse Cutting) simple continuous interlocking sutures.

Second suture line- Suturing of medial flaps

By polypropylene 1 (Reverse Cutting) continuous interlocking sutures

- Rectus muscles on both sides sutured with polyglactin 0 (Round Body) interrupted simple sutures

Third suture line- Rectus Muscle approximation

By polyglactin 0 (Round Body) interrupted simple sutures

- Lateral flaps of anterior rectus sheath sutured in midline with polypropylene 1 Reverse Cutting simple continuous interlocking sutures.

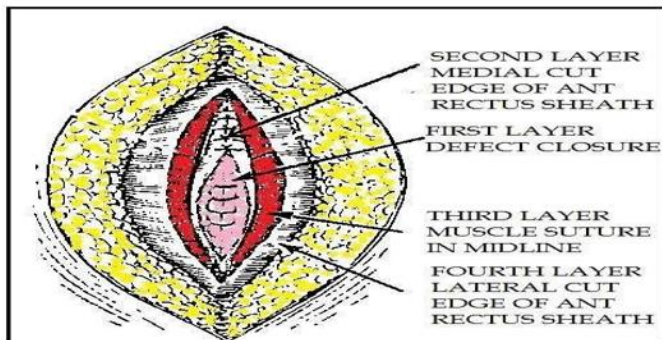
Fourth suture line- Suturing of lateral flaps

By polypropylene 1 (Reverse Cutting) continuous interlocking sutures

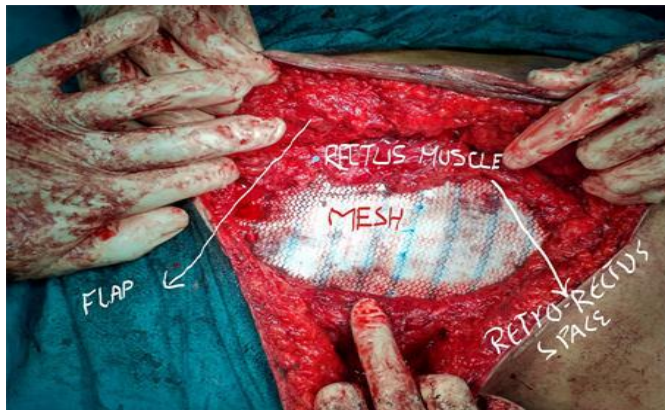
- Skin incision closed with Polyamide 2-0 (Reverse Cutting) intermittent vertical mattress sutures.
- Sterile dressing applied over suture site.

### Sub-lay Retro-rectus meshplasty

- After confirming the effect of anesthesia, painting and draping done taking anti-septic precautions
- Appropriately sized skin incision kept is kept according to size of swelling.
- Subcutaneous tissues dissected and hemostasis achieved using electrocautery and ligation as and when required.
- Hernia sac identified, dissected and reduced into abdominal cavity.
- Anterior rectus sheath incised on any one side.
- Dissection done and anterior rectus sheath separated from rectus muscle.
- Rectus muscle retracted laterally.
- Posterior rectus sheath dissected from rectus muscle and retro rectus space created.
- Closure of hernia defect in fascia transversalis by polypropylene 1 (Round Body) running simple sutures.
- Posterior rectus sheath closed using polypropylene 1 (Reverse Cutting) continuous interlocking sutures.
- Polypropylene mesh of appropriate size (covering the defect 5cm extra circumferentially) placed in retro-rectus space.
- Mesh fixed with posterior rectus sheath using polypropylene sutures.
- Rectus muscle approximated using polyglactin 0 (Round Body) interrupted simple sutures.
- Anterior rectus sheath closed using polypropylene 1 (Reverse Cutting) continuous interlocking sutures.
- Skin incision closed with Polyamide 2-0 (Reverse Cutting) intermittent vertical mattress sutures.



- Sterile dressing applied over suture site.



Mesh placed in retro-rectus space

**Outcome**

**Primary outcome**

Recurrence rate Recurrence is appearance of hernia at within an area of approximate radius equal to size of defect after procedure. Recurrence of hernia will be studied and followed up after 6 months and 1 year. Clinically judged by appearance of swelling. Can be judged radiologically by reappearance of defect.

**Secondary outcome**

1. Infection: Superficial Surgical Site Infections will be taken into consideration. They are characterized by local of inflammation such as redness, pain, heat, swelling or drainage of pus.
2. Hematoma: Collection of blood at local site. In most cases it resolves on its own within 2 weeks
3. Seroma: Seroma is a pocket of clear serous fluid that develop at the site of surgical intervention. Patient will be examined daily and development of a new abnormal swelling at the site of incision will be followed with ultrasonography of local site to look for seroma. Patient will be treated conservatively.
4. Operative pain: The intensity of pain experienced by the patient to be examined 1st, 3rd, 7thday post-operatively and at time of discharge using VAS (visual analogue scale). Paracetamol will be given to

all patients. Injection diclofenac sodium intramuscular will be given for more intense pain as and when required.

**Observation and results**

- Total 30 patients were included in this study from May 2021 to December 2021 followed by 21 months follow-up. Patients were divided by alternate way of randomization with mesh and without mesh placement. Total 15 patients were placed in Group A with mesh and 15 patients in Group B without mesh (4layer suture repair). Study done is prospective cohort study.

- Observation and analysis of all parameters of study are as follows:

Age distribution of patients

Age of the patients	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 0.05 P = 0.96
Mean	48.1	47.9	
Standard deviation	10.3	12.4	

Table 1: Comparison of the age of the patients treated with mesh hernioplasty and 4-layer suture repair (n=30) When both the groups were compared for any difference, it showed that there was no statistical difference of the mean age of the patients and both the groups were comparable.

**Gender wise distribution of patients**

Gender of the patients	Mesh hernioplasty (n=15)	4 Layer suture repair (n=15)	
Male	9 (60%)	11 (73.3%)	Chi-square=0.15 P = 0.698
Female	6 (40%)	4 (26.7%)	
Total	15	15	

Table 2: Comparison of gender of the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference for the gender of the patients and both the groups were comparable.

**Body mass index**

BMI of the patients	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 1.483 P=0.1463
Mean	25.8	26.9	
Standard deviation	2.2	2.5	

Table 3: Comparison of BMI of the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference of the mean BMI of the patients and both the groups were comparable.

**Defect size**

Defect size	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 0.892 P=0.3780
Mean	2.15	2.35	
Standard deviation	0.7	0.67	

Table 4: Comparison of the defect size in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference of the mean centimeters of the defect size of the patients and both the groups were comparable.

**Incidence of Surgical site infection (SSI)**

Surgical siteinfection	Yes	No	
Mesh hernioplasty(n=15)	2 (13.33%)	13 (86.77%)	Chi-square=0 P = 1
4 Layer suture repair (n=15)	3 (20%)	12 (80%)	
Total	15	15	

Table 5: Association of the surgical site infection in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical association for the surgical site infection in the patients.

None of the patients of both groups developed seroma and hematoma.

**Post operative pain on day 1**

Post-operative pain (Day-1)	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 1.885 P = 0.0671
Arithmetic mean	1.95	1.2	
Standard deviation	1.23	1.28	

Table 6: Comparison of the pain score at day-1 in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference of the mean VAS score at post-operative day-1 of the patients.

**Post operative pain on day-3**

Post-operative pain (Day-3)	Mesh hernioplasty	4 Layer suture repair	

Sample size	15	15	Unpaired t-test= 1.381
Arithmetic mean	1.1	0.65	P = 0.1754
Standard deviation	1.21	0.81	

Table 7: Comparison of the pain score at day-3 in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference of the mean VAS score at post-operative day-3 of the patients.

**Post operative pain on day-7**

Table 8: Comparison of the pain score at day-7 in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, It showed that there was post operative mean Visual Analogue Score for pain assessment on post operative day 7 is statistically significantly higher in patients treated with retro-rectus sublay meshplasty then in those treated with 4-layer suture repair based on physiological principle.

**Post operative pain on day of discharge:**

Post-operative pain (at discharge)	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 0.000
Arithmetic mean	0.1	0.1	P = 1.0000
Standard deviation	0.31	0.31	

Table 9: Comparison of the pain score at discharge in the patients treated with mesh hernioplasty and 4-layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was no statistical difference of the mean VAS score at discharge.

**Recurrence of hernia**

Post-operative pain (Day-7)	Mesh hernioplasty	4 Layer suture repair	
Sample size	15	15	Unpaired t-test= 0.728
Arithmetic mean	0.95	0.75	P = 0.4712
Standard deviation	0.88	0.86	
Recurrence of hernia (clinically)	Yes	No	
Mesh hernioplasty (n=15)	1 (6.66%)	12 (93.44%)	Chi-square= 0.0172
4 Layer suture repair (n=15)	2 (13.33%)	13 (86.77%)	P= 0.8956
Total	3	27	30

Table 10: Distribution of the recurrence of hernia examined clinically in the patients treated with mesh hernioplasty and 4- layer suture repair (n=30)

When both the groups were compared for any difference, it showed that there was more chance of recurrence in 4-layer suture repair compare to mesh hernioplasty statistical difference in recurrence of ventral hernia.

**Discussion**

The study was aimed to compare the two surgical procedures, Mesh hernioplasty and 4-Layer suture repair

in the patients with midline ventral hernia assess on the basis of post-operative complication, post-operative pain and recurrence of hernia.

Both the group are comparable to the each other on the basis of age group, gender and BMI. It showed that there was no statistical difference of the mean centimeters of the defect size of the patients and both the groups were comparable. This study findings are supported by the study done by Dr. Desarda M.P.

When both the groups were compared for any association, it showed that there was no statistical association for the surgical site infection in the patients. The study done by Roland W. Luijendijk et al conclude that post-operative infections developed but did not require removal of the mesh treated with Mesh and suture repair respectively. One more study done by Juan Bellido Luque et al concluded that the most frequently observed postoperative complication was the presence of seroma in the suprapubic area.

Study	Development of complications in Mesh hernioplasty	Development of complications in suture repair
Roland W. Luijendijk et al	3/ 84 (4%) (SSI)	2/ 92 (2.12%) (SSI)
Juan Bellido Luque et al	5/ 21 (23%) (Seroma)	4/ 10 (40%) (Seroma)
Juan Bellido Luque et al	No SSI or wound infection	No SSI or wound infection
Our study	2/ 15 (13.33%) (SSI)	3/ 15 (20%) (SSI)

Table 11: Comparison of statistical data of different study for post operative surgical site infection.

In our study post-operative pain was more in mesh hernioplasty compared to suture repair. But the retrospective study done by Jacobus W. A. Burger et al concluded that post-operative scar pain during first month was more in suture repair compare to mesh hernioplasty.

Study	Post-operative pain in Mesh hernioplasty	Post-operative pain in suture repair
Jacobus W. A. Burger et al	20% patients felt scar pain during first month  (Mean pain score during first month= 1.12)	27% patients felt scar pain during first month  (Mean pain score during first month= 1.17)
Our study	Mean pain score at first day= 1.95  Mean pain score at third day= 1.1  Mean pain score at seventh day= 0.95 Mean pain score at discharge= 0.1	Mean pain score at first day= 1.2  Mean pain score at first day= 0.65  Mean pain score at first day= 0.75  Mean pain score at discharge= 0.1

Table 12: Comparison of statistical data of different study for post operative pain.

In our study recurrence of hernia is more in suture repair compare to mesh hernioplasty. Other study done by Roland W. Luijendijk et al, Juan Bellido Luque et al and Jacobus W. A. Burger et al support our study.

Study	Recurrence in Mesh Hernioplasty	Recurrence in suture repair
Roland W. Luijendijk et al	6% in three-year cumulative recurrence	44% in three-year cumulative recurrence
Juan Bellido Luque et al	No recurrence of Hernia	No recurrence of hernia
Jacobus W.A. Burger et al	32% in ten-year cumulative recurrence	63% in ten-year cumulative recurrence
Our study	1/ 15 (6.66%) during follow-up period	2/ 15 (13.33%) during follow-up period

Table 13: Comparison of statistical data of different study for recurrence of hernia.



## Limitations

The limitations of this study are:

Limited sample size, due to time limitation.

The COVID-19 pandemic further hampered the study as non-urgent, planned surgeries were suspended for a period of about 6 months due to the pandemic and its effects on reduced anesthetist staff, and concerns with General anesthesia during the pandemic.

Another limitation is that this was a single center study, so multicenter study should be conducted and large-scale results should be published so that confounding factors resulting from the numbers of different procedures being performed are taken care of and results are more accurate. There was no long term follow up of patients so complications like recurrence of hernia after more than 2 year and other complications were not recorded. After one year of operation telephonic follow up recorded which is not accurate as personal follow up.

As we provide free services at SSG Hospital Vadodara, cost could not be evaluated in this study.

## Conclusion

There is no statistically significant difference in:

Incidence of recurrence of ventral hernia, Post operative mean pain assessment on post-operative days 1, 3 and day of discharge, Incidence of Surgical Site Infection. Between groups of patients treated with 4-layer suture repair based on physiological principle and retro-rectus sublaymeshplasty.

However, post operative pain assessment on post operative day 7 is statistically significantly higher in patients treated with retro-rectus sublaymeshplasty then in those treated with 4-layer suture repair based on physiological principle.

Repair of small and medium sized midline abdominal wall hernia by this 4-layer technique without mesh shows

good recovery with acceptable complication and recurrence rate without any foreign body complications. Therefore, it can be used as a first choice of repair in such patients.

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