

# Rectus Repair Vs Mayo's Repair For Midline Ventral Abdominal Wall Hernias

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This was a prospective study carried out from December 1993 to December 1995 at Lahore General Hospital, to find out and compare the merits and demerits of Rectus repair as compared to Mayo's repair. Total number of patients was 100 (50 patients of Rectus repair and 50 patients of Mayo's repair). Majority of patients were between the ages of 31-45 years and the male to female ratio was 1:4. The study showed that duration of operation and duration of anaesthesia were markedly less in Rectus repair as compared to Mayo's repair. Similarly, post-operative complications and period of hospital stay were lower in case of Rectus repair. The patients were followed up for almost five years and there was no recurrence in case of Rectus repair. This study highlights that Rectus repair, although a relatively new technique, is a superior alternative to Mayo's repair. It is safe, cost effective and has the main advantage of being recurrence free.

**Key words:** Rectus repair, Mayo's repair, Midline ventral hernias.

This research project was undertaken as part of Masters Degree in General Surgery submitted to the University of the Punjab, Lahore.

The aims and objectives of this study were to compare and contrast the merits and demerits of Rectus repair and Mayo's repair for midline ventral abdominal wall hernias, with special reference to recurrence rates. Hence to find out the more efficient method for repair of midline ventral abdominal wall hernias.

The midline ventral abdominal wall hernias include epigastric hernia, umbilical hernia, paraumbilical hernia and incisional hernia. However for this study we included the umbilical and paraumbilical hernias which are common surgical problems presenting in any general surgical clinic/unit.

The term hernia is derived from the Greek word meaning an off-shoot, a budding or a bulge and in Latin it means a rupture or tear. Hernia can be defined as the protrusion of a viscus or part of a viscus through an abnormal opening in the wall of its containing cavity<sup>1</sup>.

The ancient Greeks were well aware of hernias and the earliest record of hernia dates back to approximately 1500 B.C. Trusses and bandages were generally used to control the herniation. In the early part of the first century after Christ, Celsus described an operation in vague at that time of Greek-Roman era<sup>2</sup>.

There are many methods for repair of midline ventral abdominal wall hernias but still no method is hundred percent satisfactory, and recurrence-free repair continues to elude surgeons. The factors responsible for recurrence and believed to play an important role are faulty technique, sepsis, obesity and tension or raised intra abdominal pressure<sup>3</sup>. The widespread use of non-absorbable suture material has significantly reduced the incidence of incisional hernia. Tissue failure remains the major cause of hernia recurrence<sup>4</sup>.

The modern surgical management of umbilical and paraumbilical hernias is credited to Mayo who in 1901

described an operation for the radical cure of umbilical hernia. His technique involved an overlapping transverse fascial closure (vest over pants technique) with permanent sutures, largely based on the technique used by Lucas Champinnere for hernia repair. Champinnere according to Mayo, also described vertical overlapping fascial closure for umbilical defects, a technique similar to Rectus repair<sup>1</sup>.

In 1948, Abel reported his initial experience with closing abdominal incisions and repairing hernias with monofilament stainless steel wire. His later reports in 1960 and 1964 summarized his technique (of Rectus repair) whereby after reconstruction of a new linea alba, the rectus abdominus muscles and anterior rectus sheath are brought together in the midline by a continuous over and over suture of stainless steel passing through both these layers on each side in the form of a continuous mass closure. When considerable tension was needed to close large defects, he advised using two sutures at the same time and pulling the layers together in a boot-lace pattern. When, inspite of this tension, he was not able to approximate the layers, especially at the center of the closure, the stainless steel sutures were passed across the gap at 1cm intervals and the gap would presumably be replaced by a layer of fibrous scar tissue. This was the beginning of the modern Rectus repair/Darn technique using monofilament synthetic sutures<sup>5</sup>.

Rectus repair has somehow remained eluded from the surgeons who are only familiar with Mayo's repair for midline ventral abdominal wall hernias. This study was aimed to reintroduce the technique of Rectus repair and highlight its merits, especially its practically zero recurrence free potential. With the advent of modern synthetic sutures, this technique is ideal for midline ventral abdominal wall hernias.

## Patients and methods

The sutures used in this study were Prolene No.1 on round body needle, chromic catgut No.2/0 on round body needle

and silk No.2/0 on cutting needle.

This was a prospective study comprising a total of one hundred patients (50 patients of Rectus repair and 50 patients of Mayo's repair). Patients were randomly allocated and included patients of all ages and sex group; only those patients suffering from diabetes mellitus, enlarged prostate/urinary problems, chronic pulmonary disease, and very obese patients were excluded from this study. This study was conducted on patients who presented in the Surgical Department of Lahore General Hospital affiliated to Postgraduate Medical Institute, Lahore from December 1993 to December 1995.

In Rectus repair, suitable skin incision was given cutting the skin and superficial fascia. The sac was dissected down to its neck and freed from the linea alba extraperitoneally. Dissection was extended laterally for a distance of at least 3cm from the medial edge of the rectus abdominus and not the linea alba. The sac was opened if needed and the contents were returned to the peritoneal cavity. The repair was commenced with the left index finger inserted in the hernial defect extraperitoneally which served two purposes:

- (a) It was to ensure that tissue taken by the suture included full thickness bite of the medial border of the rectus muscle and sheath.
- (b) It also guided the needle to have an extraperitoneal course, ensuring that no underlying viscus was penetrated.

The repair was started 5cm above the hernial defect and was extended approximately same distance below the defect. The sutures were placed 2-3cm lateral to medial border of the rectus, exiting through medial edge of the rectus muscle on the same side. The needle was then entered through the medial edge of the rectus on the opposite side and exited 2-3cm laterally through the muscle (Fig.1). Sutures were placed at 1cm distance apart and were tied only to approximate the tissues without causing suture line tension (inverting suture technique). The suture material used was prolene No.1 on round body needle. Drain was put in if needed and subcutaneous tissue was closed with chromic catgut No.2/0 and the skin was sutured with silk No.2/0. General anaesthesia with muscle relaxation was employed in all cases.

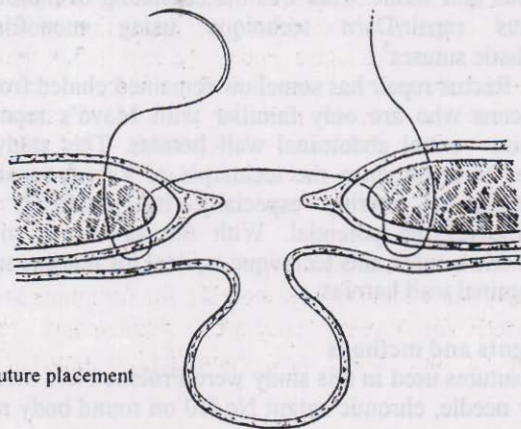


Fig. 1 Suture placement

This technique consisted of wider bites including rectus sheath and rectus muscle enmass thus decreasing the chance of cut-through of stitches to approximately zero. The main aim in this method of repair was to bring the two recti close together in the midline thus closing the hernial defect while inverting the linea alba (Fig.2)

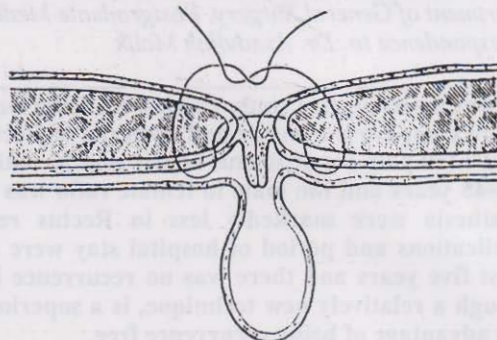


Fig. 2. Rectus muscles approximated in the midline.

In Mayo's repair, the defect is enlarged transversely making the rectus sheath more weak. In this method, linea alba is used (in a double-breast fashion) for the repair which is a weaker part and also the separation of rectus muscles is increased; therefore these two factors in combination predispose to hernia recurrence in the space between the rectus muscles.

### Results

There were 50 patients of Rectus repair and 50 patients of Mayo's repair which were randomly allocated. The data revealed that there were 21(21%) male patients and 79(79%) female patients with the male: female ratio of 1:4. The age distribution showed that 3 patients were between 3-15 years (1 male and 2 female patients), 25 patients were between 16-30 years (7 male and 18 female patients), 40 patients were between 31-45 years (7 male and 33 female patients), 25 patients were between 46-60 years (5 male and 20 female patients) and 7 patients were between 61-75 years (1 male and 6 female patients) (Table I). Mean age of male patients was 37.8 years and that of female patients was 44.6 years (Fig. 3). Sex distribution of patients according to different type of hernias showed that 12 male and 14 female patients had umbilical hernias whereas 9 male and 65 female patients had paraumbilical hernias (Table II).

Table 1. Age distribution among male and female patients

Age (Years)	Male	Female	n=
3-15	1	2	3
16-30	7	18	25
31-45	7	33	40
46-60	5	20	25
61-75	1	6	7
Total	21	79	100

Fig. 3. Age Distribution of patients (Range)

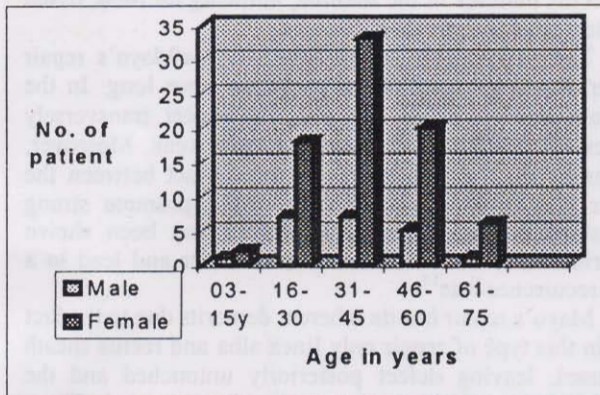


Table II. Distribution according to type of hernias (n=100)

Type	Male	Female
Umbilical	12	14
Paraumbilical	9	65

All patients presented with long history of symptoms and the distribution of symptoms showed that 85 patients had complaint of swelling, 21 patients had pain around the umbilicus. 12 patients presented with vomiting and 5 patients presented with fever, pain and vomiting, i.e., strangulation (Table III).

Table III. Distribution of symptoms (n=100)

Symptoms	%age of patients
Swelling	85
Pain	21
Vomiting (obstruction)	12
Vomiting, pain & fever (strangulation)	5

The distribution of signs showed that 26 patients had umbilical and 74 patients had paraumbilical hernias. Cough impulse was present in 70 patients and was absent in 30 patients. Swelling was reducible in 66 patients and was irreducible in 34 patients. Tenderness over the swelling was present in 5 patients (Table IV).

Table IV. Distribution of signs

Signs	%age of patients
Umbilical swelling	26
Paraumbilical swelling	74
Positive cough impulse	70
Reducible	66
Irreducible	34
Tenderness	5

Rectus repair was done in 16 patients with umbilical hernia and 34 patients with paraumbilical hernia, whereas Mayo's repair was done in 10 patients with umbilical hernia and 40 patients with paraumbilical hernia (Table V).

Table V. Distribution according to type of repair (n=100)

Type	Rectus repair	Mayo's repair
Umbilical	16	10
Paraumbilical	34	40

The duration of operation in our study was defined as duration from incision to closure and the duration of anaesthesia was defined as duration from induction to recovery at the end of the operation. Our study showed marked difference of duration of operation in Rectus repair as compared to Mayo's repair. The duration of operation in case of Rectus repair ranged between 30-44 minutes (mean=39.2 minutes). Whereas the duration of operation in case of Mayo's repair ranged between 47-68 minutes (Mean=60.06 minutes). The duration of anaesthesia in case of Rectus repair ranged from 40-58 minutes (Mean = 49.5 minutes) and in case of Mayo's repair the duration ranged from 58-82 minutes (Mean = 70.46 minutes) (Table VI).

Table VI. Duration of operation and anaesthesia

	Rectus repair Range (Mean)	Mayo's repair Range (Mean)
Duration of operation	30-44 (39.2) min	47-68 (60.06) min
Duration of anaesthesia	40-58 (49.5) min	58-82 (70.46) min

The period of hospital stay in our study was defined as duration in days which a patient stayed in hospital in post operative period; and it included the operation day but excluded the day of discharge. In case of Rectus repair the period of hospital stay ranged from 1-3 days (Mean = 1.39 days) and in case of Mayo's repair this period ranged from 2-5 days (Mean = 2.85 days) Table VII.

Table VII. Hospital stay (days)

Rectus repair Range (Mean)	Mayo's Repair Range (Mean)
1-3 (1.39)	2-5 (2.85)

Post operative complications in the two procedures were as follows: In cases of Rectus repair 8 patients (16%) complained of pain, 2 patients (4%) complained of vomiting, 2 patients (4%) developed fever of more than 100°F, 1 patient (2%) developed distension of abdomen due to prolonged ileus and 1 patient (2%) developed wound infection. In cases of Mayo's repair 13 patients (26%) complained of pain. at the site of operation, 4 patients (8%) complained of vomiting, 7 patients (14%) developed fever, 4 patients (8%) had distension of abdomen and wound infection occurred in 5 (10%) patients (Table VIII).

Patients were followed up for 5 years, initially weekly for a month, then monthly for 6 months and then quarterly for 5 years. They were instructed to report as soon as they noted any complication (fever, wound

## Rectus repair vs Mayo's repair

discharge, infection or wound swelling). One patient (2%) after Rectus repair developed wound infection during first week postoperative which followed a small hematoma and was drained. The infection settled with a course of antibiotics and antiseptic dressings. Five patients (10%) after Mayo's repair developed wound infection during first week postoperative, needing antibiotics and antiseptic dressings. One recurrence (2%) was noted after Mayo's repair whereas no recurrence was noted after Rectus repair. Only 5 patients (2 of Rectus repair and 3 of Mayo's repair) did not turn for follow up after 6 months being symptom free. No deaths occurred in our series and recurrence rate was consistent with results quoted in other series Singh et al (1993) 1%<sup>6</sup> Ponka (1980) 8%<sup>7</sup>, (Table IX).

Table VIII. Post operative complication (n=100)

Complications	Rectus Repair	Mayo's Repair
	%age	%age
Post-Op Pain	8(16%)	13(26%)
Vomiting	2(4%)	4(8%)
Fever	2(4%)	7(14%)
Distension	1(2%)	4(8%)
Wound infection	1(2%)	5(10%)
Recurrence	0	1(2%)
n=	14(28%)	34(68%)

Table IX. Comparative study of recurrence rates

Author/Series	n=	Technique	Recurrence rate %age
Ponka, 1980	50	Nylon Darn	8%
Singh et al, 1993	85	Rectus Repair	1%
Author 1999	50	Rectus Repair	0%

## Discussion

Midline ventral abdominal wall hernias are the diseases of centuries. It is the commonest surgical problem in every community and common presentation in general surgical units. But no definitive repair for this condition is acknowledged, as recurrence rates of 30% are reported<sup>8</sup>.

The diagnosis and management of ventral abdominal wall hernias has remained a dilemma. Despite great advancement in modern medical technology, there has not been much improvement in the management of ventral hernias in similar proportions. Surgical treatments available for ventral abdominal wall hernias are Rectus repair, Mayo's repair, Shoe lace darn repair, Keel's repair, Primary fascial closure and Prosthetic/marlax mesh repair<sup>9,10,11</sup>

Almost all the techniques of repair practiced over the past century employ approximation of the linea alba or the rectus sheath (and not the rectus muscle) to obliterate the hernial defect. The linea alba itself is a very weak layer and many spontaneous occurring hernias including divarication. of the rectus muscles, fatty hernia of the linea alba and para-umbilical hernia all occur denovo through defects of this fibroaponeurotic band. Spontaneous herniation through the rectus abdominus however is virtually unknown<sup>6</sup>. Thus the logic repair for ventral

midline abdominal wall hernias would be to approximate the rectus muscles in the midline, allowing no weak tissue to intervene between them.

The well known double-breast repair/Mayo's repair is performed by most of the surgeons since long. In the Mayo's overlap repair enlarging the defect transversely makes rectus sheath and linca alba more weak. Moreover, it was believed that a wide area of contact between the upper and lower fascial sheaths would promote strong adhesions between them. However, it has been shown experimentally not to adhere to each other and lead to a high recurrence rate<sup>12</sup>.

Mayo's repair has its inherent demerits due to the fact that in this type of repair only linea alba and rectus sheath are used, leaving defect posteriorly untouched and the separation of rectus muscles is actually increased. These two factors in combination may predispose to hernia recurrence in the space between the rectus muscles<sup>6</sup>.

Narayan Singh (1993) claimed that recurrence free repair of midline ventral abdominal wall hernias continues to challenge the general surgeons, despite the abundance of described techniques. Based on the observation that spontaneous herniation through the rectus abdominus muscle is unknown, therefore recurrence rate after Rectus repair theoretically becomes zero; he advocated rectus repair (with only one recurrence in 12 years follow up in his study).

The method of Rectus repair (as used in our study) involves the basic principle of approximation of the two recti in the midline to close the hernial defect, without creating tension over the suture line. This method is superior than Mayo's repair because in Rectus repair the integrity of the repair depends on the natural strength of the rectus abdominis and its sheath. Muscle is dynamic tissue capable of maintaining an isometric state with varying levels of load. On the other hand, linea alba is fibrocollagenous and lacks this ability so that over a period of time it becomes stretched beyond its elastic limit, predisposing to herniation. The relative weakness of linea alba is underlined by the fact that incisional hernia occurs most commonly after midline incisions, while herniation through muscle-cutting abdominal incisions is much less common<sup>12</sup>

As midline ventral abdominal wall hernias are common in daily routine of a surgeon, therefore one should try to find an efficient procedure, which minimizes the risk of recurrence. The procedure of Rectus repair seems to fulfil the above mentioned criteria. This is proved by the results of our prospective study consisting of 100 patients, 50 each of Rectus repair and Mayo's repair. Duration of operation was short in Rectus repair as compared to Mayo's repair, mean duration of operation for Rectus repair was 39.2 minutes as compared to Mayo's repair which was 60.06 minutes. It is more beneficial for patients who are old and frail as they were kept under general anaesthesia for shorter duration. After Rectus repair bowel sounds appeared within 12-24 hours whereas after Mayo's repair the bowel sounds appeared within 24-

48 hours thereby prolonging hospital stay. Post-operative complications were higher after Mayo's repair as compared to Rectus repair (68% vs 28%) as was the hospital stay (2.85 days vs 1.39 days). No serious complication occurred per operatively or post operatively in both procedures and there were no deaths/ mortalities.

Our study confirms that the procedure of Rectus repair is more cost effective with zero recurrence rates and should be the standard repair for midline ventral abdominal wall hernias. However, need for longer follow up cannot be overemphasized.

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