



Combined Tissue and Mesh Repair for Midline Incisional Hernia (A Study of 15 Cases)

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ABSTRACT

Background: Midline incisional hernia is one of the most complex hernia to treat. A variety of repairs have been advocated. However no single repair can be called the best. A combination of repair methodologies is therefore the only hope for developing a repair which will have least recurrence rate.

Objectives: The present study aimed at evaluating a combined tissue and mesh repair for midline incisional hernias.

Materials and Methods: Fifteen patients undergoing a combined tissue and mesh repair were evaluated. The tissue repair comprised of creating flaps from the rectus sheath to create a new midline. This was followed by mesh reinforcement of the newly created midline.

Results: There were no recurrences in any of the patients at a mean follow up of 16.7 months.

Discussion: The pathophysiology and technical details are evaluated and discussed.

Conclusion: A combined tissue and mesh repair is an excellent and economical option for midline incisional hernias

Key Words: Incisional, Hernia, Open, Tissue, Mesh, Repair.

INTRODUCTION

Incisional hernia is one of the most morbid complications after abdominal surgery. [1] The etiology of incisional hernia may be variable. It depends upon variety of factors ranging from age to wound infection. Majority of these hernias develop within 3yrs of primary surgery. [1] Gross distortion of tissues accompanied with poor wound healing poses a challenge to successful repair. A wide variety of repairs ranging from open to laparoscopic have been proposed by surgeons from every continent of the world.[2] The choice of repair is a matter of individual experience and surgical outcome.

Objective

Developing a new method combining anatomical repair by creating flaps from local tissues with reinforcement by a mesh for midline incisional hernias.

Inclusion Criteria

All patients with midline incisional hernias with defect size of any length were included in the study. A period of 6 months was ensured to have elapsed after the primary surgery for every patient before contemplating repair of the hernia.

Exclusion Criteria

Hernias complicated by signs of obstruction and strangulation Patients with intra-abdominal pathology diagnosed by CT scan

Materials and Methods

On admission to hospital a detailed proforma was completed which included demographic details, details of primary surgery, post-operative complications, presence of comorbidities and treatment for the same. Control of comorbidities

like diabetes mellitus, hypertension and COPD were achieved prior to hernia repair. A contrast enhanced CT of the abdomen was performed in all patients in order to rule out any intra-abdominal pathology. The size of defect was assessed in order to determine the presence of loss of domain. All patients were admitted one day prior to surgery and operated by the primary author (K V) in order to maintain uniformity of surgical technique.

Technical Details

An elliptical incision was made encompassing the scar of previous surgery. Incision was deepened and extended laterally all around in order to avoid perforation of the sac and damage to underlying structures. The overlying scarred skin was excised. (Figure I) Dissection was carried laterally till neck of sac was reached. Same procedure was carried out superiorly and inferiorly. The entire circumference of fibrous ring was delineated. (Figure II) The sac was not opened in cases where there were no adherent loops, loculations or preoperative complications pertaining to hernia. The fat overlying the surrounding aponeurosis was cleared. Two vertical incisions were made approximately 1 inch lateral and parallel to fibrous defect. (Figure III) The flaps were created from the anterior rectus sheath and reflected medially on either side. These flaps were approximated in the midline in a tension-free manner by two rows of 1-0 ethilon sutures (figures IV, V & VI) Rectus abdominis muscle on either side was dissected free at the site of tendinous insertions thus creating a retro-rectus space on either side. A Polypropylene mesh was then laid extending from

the superior point to inferior point of newly created midline. This mesh was fixed in the midline with non-absorbable sutures. It was stretched uniformly on either side, passed under the rectus muscle on either side and fixed to the lateral cut edge of the anterior rectus sheath. (Figure VII) Utmost care was taken to ensure a well spread out tension-free mesh placement. Two negative suction drains were kept over the mesh and brought out through two separate stab incisions. Approximation of subcutaneous tissue was done by 2-0 Vicryl. Skin was approximated with staples. Precautions were taken to prevent wound infection. A perioperative course of antibiotics comprising of 1 gm Ceftriaxone and 500mg Amikacin were administered. Irrigation of subcutaneous tissue was done after its approximation, prior to skin closure. Skin approximated with staples. Topical Chloramphenicol powder was sprinkled over stapled suture line before applying a sterile dressing. The post-operative course of each patient was monitored. Ryle's tube which was introduced for all patients intraoperatively was removed after 24 hours. The per urethral catheter was also removed after 24 hrs. Drains were however left in situ. The criteria for removal of drains was drain volume output of less than or equal to 20 cc per day for two consecutive days. Post-operative complications in the form of development of seroma, hematoma, wound infection, other

complications related to comorbidities were observed and noted. Wound infection was defined as any redness of surrounding skin with or without discharge. Staples were removed on 12th post-operative day and the use of an abdominal corset was advised for a period of 3 months after hernia repair.

RESULTS

15 consecutive patients who underwent combine repair for incisional hernia were studied prospectively. (Table 1) The mean age was 47 yrs. +/- S.D of 8.3. There were 13 female and 2 male patients in the study. Nine patients had predominantly upper midline defects. Five had predominantly lower midline defects and one had a combination of both. The mean duration for removal of drains was 3.7 days. None of patients developed seromas. Three patients developed superficial hematomas which did not necessitate any further intervention. One patient developed superficial infection in the form of redness and was administered a short course of antibiotics. Four patients developed ileus in post-operative period and one developed exacerbation of COPD which was controlled by medications. None of patients required ICU support. The mean hospital stay of patients was 6.2 days. The median follow up of patients was 12 months with a range of 6 to 15 months. There were no recurrences.

Table 1 Results of the Case Study.

Sr No	Age (yrs.)	Sex	Type of incision	Drain removal (Days)	Seroma	Hemato ma	Infection	Other complications	Duration of stay (Days)	Follow up (months)
1	45	F	LM	4	-	-	-	-	5	6
2	52	M	UM	5	-	-	-	ILEUS	7	12
3	39	F	UM+LM	3	-	-	-	ILEUS	5	11
4	43	F	UM	3	-	-	-	-	5	14
5	56	F	UM	4	-	-	-	-	5	12
6	40	F	UM	3	-	-	-	-	5	8
7	35	F	LM	3	-	-	-	-	5	14
8	59	F	LM	5	-	-	-	ILEUS	8	9
9	62	F	LM	3	-	-	-	COPD	7	6
10	36	F	LM	3	-	+	-	ILEUS	7	9
11	45	F	LM	4	-	+	+	-	9	15
12	44	M	UM	5	-	-	-	-	7	12
13	56	F	LM	4	-	-	-	-	7	13
14	45	F	LM	3	-	-	-	-	6	7
15	49	F	LM	4	-	+	-	-	6	13

(LM is lower midline, UM is upper midline)

DISCUSSION

Incisional hernia repair is the biggest surgical challenge to the general surgeon. The entire science of surgery is based on the assumption that the patient has good healing powers. However in the context of incisional hernia, extensive damage to the regenerative elements of the affected tissues leading to excessive formation of scar tissue has already occurred. [1] These hernias usually arise from wounds which developed partial dehiscence. A hernia sac is formed and grows rapidly due to continuous exposure to high pressure. The defect also widens rapidly with time giving rise to herniation of a large volume of abdominal contents into the hernia sac. Neglect of the lesion and haphazard use of irregularly fitted abdominal corset leads to more complications developing in the hernia. Development of loculations with superimposed adhesions within the sac predisposes to obstruction and strangulation. [3] Strangulation by virtue of a narrow neck is

uncommon in incisional hernias as the defect is quite large in majority of cases. However strangulation of contents may be a common occurrence in longstanding hernias with internal loculations and adhesions. Loss of domain is another issue which needs to be recognized. Loss of continuity of the musculo-aponeurotic structures leads to shortening of contractile elements of the structures thereby increasing the size of the defect. [3] This poses a great anatomical challenge for repair. Having understood the natural history of incisional hernia the surgeon needs to take into consideration anatomical, physiological, and pathological factors individually in every patient before deciding the technique for the repair. [4]

Increasing age is associated with weakening of tissues thereby predisposing to weakening of wound healing process, inadequate scar tissue formation and poor tensile strength of the head

tissues. [1] All these factors predispose to development of incisional hernias. In the present case series the mean age of patients was 47 +/- SD of 8.3 suggesting that the incidence increases with advancing age.

In the present study 13 were females and 2 were male patients. Women who have had previous pregnancies usually have a weakened abdominal wall. Any of the common operative procedures ranging from a laparoscopic tubal ligation to hysterectomy in the female population have a high predilection to develop incisional hernias. Excessive stretching of the tissues especially the musculo-aponeurotic component predisposes to herniation. In the series presented all the thirteen female patients had previous pregnancies and all these patients had hernias developing following gynecological procedures which included tubal ligation, caesarean section and hysterectomy. Whereas a previous laparotomy for a septic lesion was seen in the two males who had undergone surgery for perforation peritonitis.

Type of incision has a great impact on development of incisional hernias. Upper midline incisions (UM) are usually made for septic conditions whereas lower midline (LM) incisions are made for pelvic surgeries. There is no specific predilection for herniation with respect to the upper midline or lower midline. Midline incisions are more predisposed to development of hernias as compare to a paramedian or a transverse incision. The midline of the abdomen comprises the linea alba which is an aponeurotic intersection of fibers of the rectus sheath from either side. It is a relatively avascular line as compared to the

surrounding tissues. The decussation of aponeurotic fibres by itself is an anatomically weak area and is always a potential site for herniation when exposed to transient rise in intra-abdominal pressure as compared to other structures. Suturing of the linea alba therefore has to be done meticulously with a strong nonabsorbable suture material with bites to be taken at least 1cm from the edge on either side in order to prevent cut through and ensure firm approximation of the cut edges. Sparse blood supply of the linea alba limits strong healing and scar tissue formation as compared to other areas of the body. Lower abdomen has a precarious anatomical configuration wherein the linea alba continues to remain same but posterior rectus sheath ceases to exist midway between the umbilicus and the pubic symphysis. Even the linea alba is weaker infraumbilically as compared to supraumbilical portion. Maximum point of weakness in the linea alba is usually in the periumbilical region. It is this area where herniation takes place. Subsequently the defect enlarges in the direction of the line of least resistance. Therefore it is of utmost importance during the course of repair of midline incisional hernias to reconstitute a strong midline which is pivotal for a successful long lasting outcome.

In the technique presented as there was a deficiency in the midline, approximation of the edges would be futile as it would put a lot of tension on the suture line thus violating the basic doctrine of tension free repair.

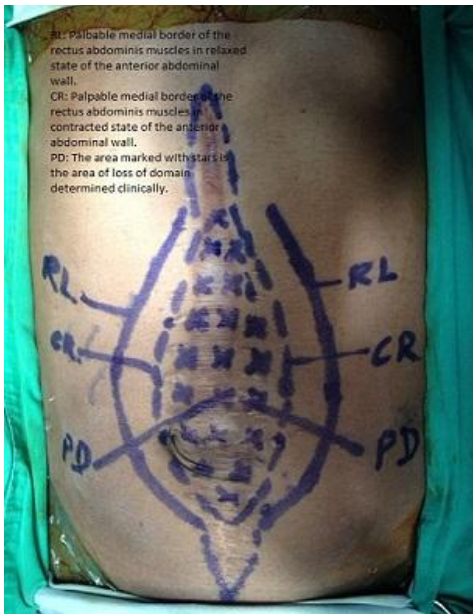


Figure I:(RL is the border of the rectus muscle in resting state of the abdomen while CR is medial border of the rectus muscle on contracting the anterior abdominal wall. PD is the defect which exhibits loss of domain)

(Figure I) It is very important therefore to create an aponeurotic tissue cover. Advantage is taken of the anterior rectus sheath.

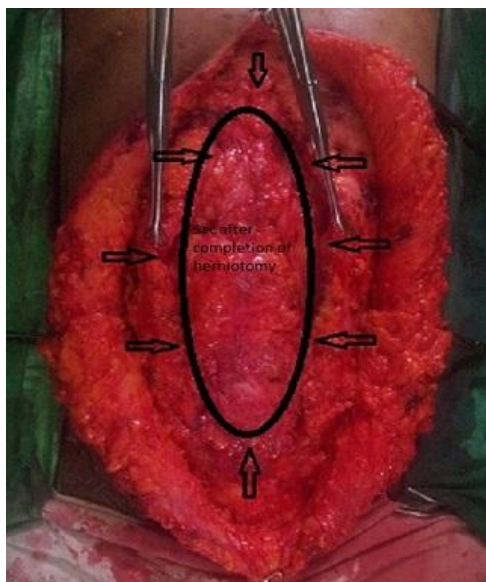


Figure II (The black arrows point towards the edge of the defect after completion of herniotomy)

[5] A vertical incision made 1 to 1.5 inch lateral and parallel to the edge of the defect on either side provides aponeurotic flaps. Approximation of the

medial cut edge of these flaps of the anterior rectus sheath yields a tissue gain of approximately 3 inches in the central deficient portion of abdomen.

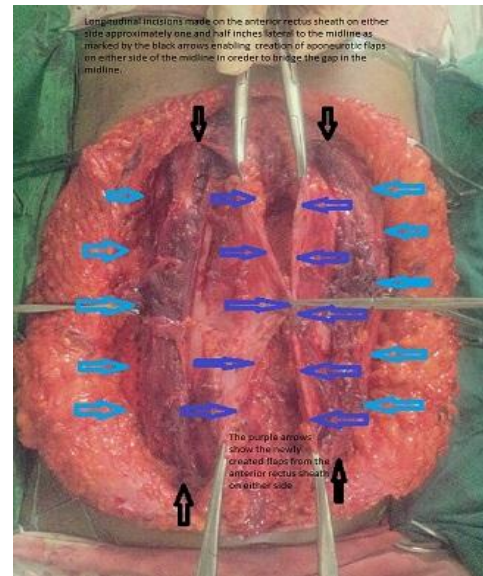


Figure III: (The black arrows indicate the site of longitudinal incisions made on the anterior rectus sheath on either side. The purple arrows point towards the medial cut edges of the anterior rectus sheath flaps. The blue arrows point towards the lateral cut edge of the anterior rectus sheath)

(Figure III) Since adequate tissue is now available by virtue of creating flaps from the anterior rectus sheath, the approximation of these flaps in the midline is tension free with very low chances of cut through or give way. In the technique presented a double suture line in the midline was achieved by two different types of approximations. The inner suture line was taken with horizontal mattress suture using nonabsorbable suture material. This was approximately taken 1cm from the cut edge.

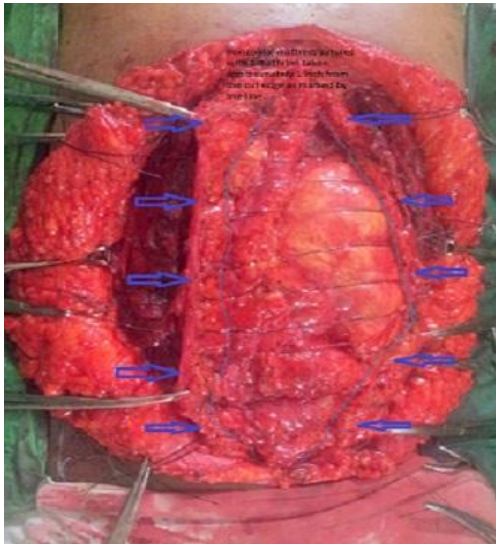


Figure IV:(The medial edges of the anterior rectus flaps reflected medially marked by purple arrows are approximated with horizontal mattress sutures taken approximately 1 cms from the edge marked by the faint black line)

(Figure IV). Finally the free cut edge was approximated with continuous running suture of non-absorbable material.



Figure VI : (The newly created midline marked by purple arrows)

(Figure VI) In cases where one anticipates undue tension on suture line a single suture line approximating the cut edges of the anterior rectus sheath flaps will suffice. The rectus muscle on either side is freed of the tendinous intersections posteriorly as well thereby creating a space behind it.

As discussed previously the repair of incisional hernia is based on assumption of weakened tissue with presumably poor healing properties therefore as a safeguard it is prudent on the part of surgeon to reinforce anatomically repaired defects.[6,7,8] This is based done by use of polypropylene mesh which can safely be placed on the repaired rectussheath. Placing the mesh as an inlay over the peritoneum can prove to be dangerous as it has propensity to cut through the peritoneum and project into the peritoneal cavity. This can led to extensive adhesions predisposing to obstruction. Hence it is best to avoid the inlay technique.

Placing the mesh on newly created midline is the safest method as the mesh can be securely fixed medially and laterally as well as avoid the chances

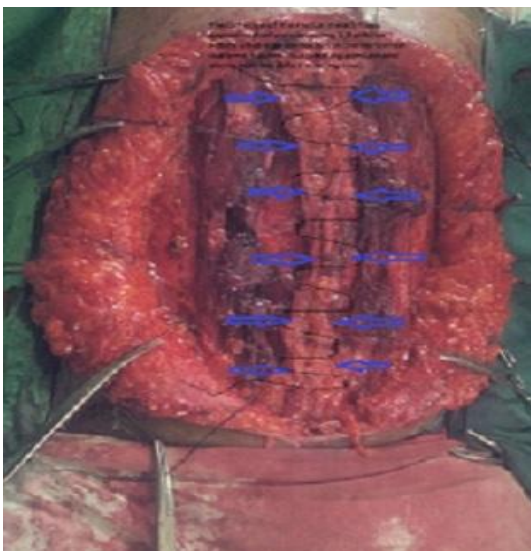


Figure V: The free medial edges of the flaps marked by purple arrows are approximated with a running suture after tightening the horizontal mattress sutures held by artery forceps.)

(Figure V) The end result of this surgical exercise was a strongly reconstituted midline.

of peritoneal intrusion. The rectus muscle on either side lies on the surface of the mesh thereby reducing the exposed area of the mesh significantly.

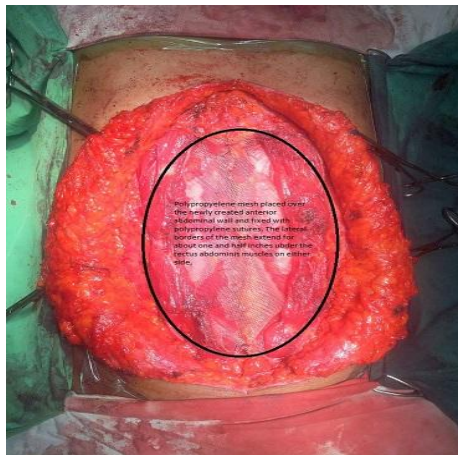


Figure VII : (Polypropylene placed over the newly created anterior abdominal wall extending into the newly created retro rectus spaces on either side and fixed to the lateral cut edges of the anterior rectus sheath)

(Figure VII) The central portion of the mesh only gets exposed to the subcutaneous tissues of the anterior abdominal wall. The lateral edge of the cut anterior rectus sheath serves as an excellent site to fix the mesh on either side. Thus effectively the mesh is spread all across the newly created aponeurotic tissue cover thereby aiding its reinforcement.

Mesh being a foreign material, always elicits a foreign body reaction leading to the development of a seroma. These seromas are sterile to begin with, but may develop infection at a later date. Repeated aspiration of these seromas can lead to disastrous complication of infection. Once a hernia repair gets infected it leads to an absolute failure of surgery necessitating removal of the mesh. The best way to obviate this complication is

by using a negative suction drain at the time of surgery. [9, 10] It prevents accumulation of tissue fluid and blood at the operative site thereby preventing hematomas and seromas. By virtue of a vacuum created at the site of operation dead space gets obliterated quickly due to tissue approximation. Absence of dead space prevents fluid collection and enhances the healing process as well. Negative pressure or vacuum stimulates the growth of excellent granulation tissue at the site of surgery. [11] A good volume of granulation tissue leads to exuberant fibrosis leading to the formation of thick and strong scar tissue. The drain is kept till it has served its purpose. There is no fixed time frame for removal of drain. The amount of drain fluid depends on every individual patient. The criteria of drain removal followed in present case series was a serous drain output of less than 20cc on 2 consecutive days.

The subcutaneous tissue was approximated with absorbable suture material. After approximation a saline lavage was given to the subcutaneous tissue and mopped dry. Skin was approximated specifically with staples. Skin suturing was avoided as multiple suture puncture predisposes to superficial skin infection leading to stitch abscesses. These stitch abscesses at times can prove to be detrimental to the repair. If undetected or mistreated the infection from this source can find its way up to the mesh thereby leading to infection of mesh. Therefore it is a safe practice as was followed in present study of doing a check dressing after 72 hrs. There was redness and a small collection in one of the patients which was

detected and aggressively treated with complete resolution without any complications.

The use of topical antibiotics has always been criticized by researchers. However our experience with the use of topical antibiotics was very good. Topical use of injectable chloramphenicol powder yielded excellent results with no wound infection at all. Even in the solitary case which was reported to be infected, there was no purulent collection but only a small volume of blood stained fluid which was drained and resolved immediately. The wound was classified as infected only by virtue of redness at the surgical site and not by virtue of any purulent collection. Of the 15 patients operated 4 had a short duration of ileus which resolved spontaneously. Ileus is usual accompaniment of bowel handling at the time of adhesiolysis. It is a safe practice to have a Ryle's tube in all patients especially those in whom bowel handling has taken place. Ryle's tube can safely be removed after 24 hrs. One of the patients developed severe exacerbation of COPD warranting aggressive medical treatment. Development of exacerbation of comorbidities can serve as a deterrent to successful outcome in incisional hernia repair. [12] Rigorous control and monitoring of blood sugar levels, bronchodilators in diabetics and COPD patients respectively is of utmost importance. It is safe to keep high risk patients with comorbidities under observation for 48 hrs in ICU in order to prevent any untoward event from developing.

The mean duration of stay in hospital in our study was 6.2 days. The criteria for discharge from hospital was based on absence of wound

complication, passage of stools and complete control of comorbidities. It is safe to send the patients home as soon as possible in order to prevent development of resistant nosocomial infections. At the time of discharge all patients were trained to use an abdominal corset. Every patient was advised to use an abdominal corset for a period of 12 weeks compulsorily. An abdominal corset has many advantages in patients of midline incisional hernia repair. It provides a firm counter support to the repaired structures against intra-abdominal forces. It causes excellent realignment of subcutaneous tissues thereby leading to a smooth contour of anterior abdominal wall. 12 weeks is enough a period for the process of fibrosis to have begun followed by commencement of maturation. Abdominal corset greatly aids quick recovery or rehabilitation as it provides a psychological feeling of a secured support to the newly repaired abdominal wall. The mean follow up in the present study was 16.7 months. None of the patients have developed a recurrence till the last follow up as recorded in the charts. Though cost implications were not studied in the present study yet cost is an important factor which deserves special attention especially in the developing world. Tissue repair by itself has less expenditure as compared to mesh repair. However as the recurrence rate of pure tissue repair is high it requires another surgery in the form of mesh repair. [13] This puts a great strain on the financial resources of the patient. Laparoscopic repair is the costliest with no proven advantage. Therefore a combination of tissue and mesh repair is the most cost effective method for repair.

CONCLUSION

Based on the surgical outcome of our study we advocate the technique of combination of anatomical reconstruction of the anterior abdominal wall using the rectus apparatus alongwith mesh reinforcement for midline incisional hernia.

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