

# A Clinical Study on Incisional Hernia: Anatomical Repair V/S Mesh Repair

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## Abstract

**Background:** The aim of the study is to compare the outcomes of anatomical repair of incisional hernia against open onlay mesh repair of incisional hernia.

**Materials and Methods:** This study is a non-randomized and prospective comparative study with 2 case series (i.e., open anatomical and mesh repair of incisional) hernia repair was conducted in 50 cases of incisional hernia admitted in the Surgical Department of Osmania General Hospital, Afzalgunj, Hyderabad, Telangana, from June 2014 to March 2016 and was randomly selected and subjected to open anatomical repair or by open mesh repair method. Results were analyzed.

**Results:** This study is a comparative study, non-randomized and prospective conducted in Osmania General Hospital, during June 2014–March 2016 Afzalgunj, Hyderabad, Telangana. Total cases in this study are 50 and, 2 patients (8%) out of 25 cases recurred in anatomical repair group and none in mesh repair. Post-operative pain was almost similar (mean analgesic use i.e., 7.52 days in anatomical repair method and 8.20 days in open repair group) in both groups. Wound complications are more in mesh repair group with 40% vs 20% in anatomical repair group.

**Conclusion:** Mesh repair is the almost the gold standard for the incisional hernias. Comparing with other techniques it has an excellent post-operative quality of life and better patient acceptability in terms of recurrence.

**Key words:** Incisional hernia, Mesh repair, Synthetic prosthetic material, Onlay mesh repair, Tension-free repair, Anatomic repair, Ventral hernia

## INTRODUCTION

Post-operative incisional hernia repair is one of the most common surgical procedures being performed in general surgery. The incidence of an incisional hernia, as reported in literature is 3–20%.<sup>[1–6]</sup> It is one of the most frequent long-term complications of abdominal surgery, and it continues to be a significant problem for patients as well as surgeons.

Unfortunately, attempts of repair these hernias have not been uneventful, with high rates of hernia recurrence, and considerable rates of morbidity and mortality, making

many surgeons hesitant to undertake incisional hernia repair.

On the other hand, however, delay in repair may have serious clinical consequences. Apart from discomfort and pain, incisional hernias may predispose to incarceration or strangulation of the primarily small bowel, which is almost certainly fatal if not promptly reduced. Furthermore, as a consequence of the impact on health, incisional hernias have enormous economic consequences.

At this time no consensus has been reached about whether, how, and when to operate on a patient with an incisional hernia. To solve the incisional hernia problem, first of all, methods of prevention are needed. Furthermore, once an incisional hernia has developed, ideally, and methods of repair that does not lead to recurrence or other complications should be available including open mesh and anatomical repair for an incisional hernia and recently laparoscopic repair for it.

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## MATERIALS AND METHODS

This study is a comparative study non-randomized and prospective with 2 case series (i.e., open anatomical and mesh repair of incisional) hernia repair conducted in Osmania General Hospital, Afzalgunj, Hyderabad, Telangana. This study is obtained from patients who consented to get operated for an incisional hernia involving 50 patients that presented in our department during June 2014–March 2016 in our institute and was randomly selected and subjected to open anatomical repair or by open mesh repair method. Patients admitted with incisional hernia are taken up for study with the help of relevant history, doing clinical examination and conducting appropriate investigations.

### Inclusion Criteria

The following criteria were included in the study:

- Age 20 years and above giving written valid consent.
- Medically fit patients to undergo the procedure.

### Exclusion Criteria

The following criteria were excluded from the study:

- Patients age <20 years and 60 years.
- Hernia defect size <1.3 cm and >10 cm.
- Patients with acute or subacute intestinal obstruction.

### Methods

#### *Pre-operative evaluation*

- All the patients are evaluated by proper history and detailed physical examination.
- All the patients underwent relevant hematology and biochemistry investigations.
- Ultrasound abdomen is done for all our patients to know the size of the defect, number of defects, contents and any other abdominal pathology.

#### *Pre-operative preparation*

- Patients were kept NPO for about 6–8 h and were on liquid diet the before the day.
- All patients received antibiotic prophylaxis half an hour before surgery.

#### *Procedure for anatomical repair*

- Almost all the patients were operated under spinal anesthesia.
- Foleys catheterization and nasogastric tube were occasionally used.
- Patients were placed in the supine position. Vertical or transverse incision was taken enclosing the previous scar.
- Abdomen was opened in layers. The hernia sac was identified and dissected.
- Adhesions between the contents and the sac were released. The contents of the sac were reduced after

adhesiolysis. The redundant sac wall was excised hemostasis was achieved. The peritoneum along with the rectus sheath was closed with Prolene No:1.

- A negative suction drain (Romovac) was kept over the rectus sheath and was brought outside through a stab incision in the anterior abdominal wall.
- Excess redundant subcutaneous layer was excised. The subcutaneous layer was closed with Vicryl No. 2.0 in an interrupted manner. The surgical site was painted with povidone-iodine lotion (5% strength).
- Closure of skin was done with Prolene No 2.0 in interrupted sutures. The drainage tubes were secured with purse string sutures.

#### *Procedure for open mesh repair*

- Almost all the patients were operated under spinal anesthesia.
- Foleys catheterization and nasogastric tube were occasionally used.
- Patients were placed in the supine position. Vertical or transverse incision was taken enclosing the previous scar.
- Abdomen was opened in layers. The hernia sac was identified, and dissected adhesions between the contents and the sac were released. The contents of the sac were reduced after adhesiolysis. The redundant sac wall was excised.
- Hemostasis was achieved. The peritoneum along with the rectus sheath was closed with Prolene No:1. Mesh 4–5 cm larger than the size of defect was placed over rectus sheath.
- The mesh is fixed with non-absorbable sutures all over. A negative suction drain (Romovac) was kept over the mesh and was brought outside through a stab incision in the anterior abdominal wall.
- Excess redundant subcutaneous layer was excised. The subcutaneous layer was closed with Vicryl No. 2.0 in an interrupted manner. The surgical site was painted with povidone-iodine lotion (5% strength).
- Closure of skin was done with Prolene No 2.0 in interrupted sutures. The drainage tubes were secured with purse string sutures.

#### **Post-operative Management**

- During post-operative period, all patients received same antibiotics and analgesic injections (injection Diclofenac sodium 75 mg) 12<sup>th</sup> hourly for 1 day unless contraindicated, and thereafter, oral analgesics are given on the patients demand.

#### **Post-operative Assessment of Pain**

The pain experienced by the patients in the post-operative period has been measured according to number of days requiring parenteral analgesics

All the patients are ambulated within 12 h of surgery and are encouraged for oral feeds. Nasogastric tube and Foleys catheter are removed after 12 h. Initially, the feeds were sips of liquids followed by normal diet in a gradual manner after the resolution of post-operative ileus (indicated by passing of flatus and normal bowel sounds on auscultation and return of appetite).

In patients with persistent ileus, they were kept NPO, and whenever required a nasogastric tube is passed only to be removed once the resolution of the ileus. The wounds were inspected for any seroma, hematoma, or any infection. In both groups, drains were removed when the collection was <10 ml for 2 consecutive days.

Patients were discharged after complete ambulation and tolerating normal diet.

All the patients were given abdominal support for 1 month.

### Follow-up Evaluation

After discharge, patients were encouraged to take normal diet and return to their normal activities as early as possible but asked to avoid straining. After the discharge, patients were followed up at 1 week, 1 month, 3 months, and 6 months intervals. In the initial follow-up, the patients were evaluated for short-term complications such as hematoma, wound infection, and wound dehiscence and seroma. During subsequent visits, chronic pain at the operated site, return to normal activity and recurrence were noted.

### End Points of the Study

The endpoints measured in both the groups are duration of surgery, duration of post-operative pain, post-operative local complications, length of hospital stay, and recurrence rates.

## RESULTS

- This study is a comparative study non-randomized and prospective with 2 case series (i.e., anatomical repair and mesh repair of incisional hernia).
- Total number of patients in the study is 50. 25 members in anatomical repair group and 25 in mesh repair group.
- The mean age for anatomical repair group was 42.08 years, for mesh repair group was 45.88 years. The difference is statistically significant among the two groups. The study shows that the majority of the patients are in between 40 and 50 years in both groups.
- Out of the 25 patients in anatomical repair group, 7 (28.0%) are male while 18 (72%) are females whereas in mesh repair group, out of the 25 patients 4 (16%) are males while 21 (84%) are females. Most of the patients in the study 78% were females and 22% were males [Table 1].

**Table 1: Distribution of the previous operation**

Previous operation	Anatomical repair group n (%)	Mesh repair group n (%)
LSCS	6 (24)	6 (24)
Peritonitis	6 (24)	6 (24)
Hysterectomy	6 (24)	7 (28)
Tubectomy	3 (12)	2 (8)
Intestinal obstruction	4 (16)	4 (16)
Recurrent hernia	0 (0)	0 (0)
Total	25 (100)	25 (100)

### Previous Operation

From the above data, it is found that in our study, most of the incisional hernias occurred below the umbilicus in the midline.

### Distribution of Clinical Presentation

According to the study, all the patients presented with swelling, i.e., 100% and 16 patients, i.e., 44.44% presented with pain in addition to swelling.

### Post-operative Stay

The mean duration of stay for anatomical repair group is 7.24 days, while in mesh repair group is 9.52 days.

### Distribution of Post-operative Pain

The pain experienced by the patients in the post-operative period has been measured according to number of days requiring analgesics. In this study, mean number of days requiring analgesics is 7.52 days in anatomical repair group and 8.20 days in mesh repair group.

### Distribution Post-operative Wound Complication

Five out of 25 cases, i.e., (20%), wound got complicated (seroma, infection, and flap necrosis) in the anatomical repair group and 10 out of 25 in the mesh repair group.

### Distribution of Recurrence

All the cases were followed for 6 months for recurrence and reappearance of swelling clinically or radiologically (sonographically).

Two out of 25 cases recurred in anatomical repair group and none in mesh repair.

## DISCUSSION

Incisional hernia is one of the most common long-term complications of abdominal operations, with an overall incidence of 3–20%.<sup>[1]</sup>

Before the introduction of mesh prosthesis for repair of an incisional hernia, only open suture repairs were used for its cure but with an unacceptable rate of recurrence of more than 50%.<sup>[2]</sup>

With the introduction of mesh prosthesis, the rate of recurrence has been brought down.

### Gender Distribution

In the present study which consists of 50 patients (25 patients in anatomical repair group and 25 patients in the open mesh repair group), the overwhelming majority of the patients were females in both the groups. In this study of 50 patients with an incisional hernia, the gynecological causes of laparotomy were most commonly associated with incisional hernia formation, and naturally, the incidence was found to high among females. The development of incisional hernias may also be influenced by factors such as BMI and post-cesarean complications including infection, that is, why it is found to be higher incidence in females. Similar results are observed in other studies.

### Age Distribution

Our study shows that the majority of the patients are in between 40 and 50 years in both groups. The incisional hernia occurrences were most commonly noted between the age group of 40–50 years in this study, which could be explained by a large number of gynecological procedures done at the younger age group.

Most (60%) of the hernias were located in the lower abdomen. This reflects the cesarean section and other gynecological operations as the prime etiology of incisional hernias in the Indian population.

### Previous Operation

- Midline incisions are used more frequently in emergency surgery and are more prone to develop an infection. The incisions, therefore, have a higher recurrence rate than transverse incisions.<sup>[3-5]</sup>
- Cesarean section was noticed as the most common individual operation associated with an incisional hernia (58%). The probable cause, other than the presence of comorbid conditions may be the use of absorbable suture during the fascial closure. Use of non-absorbable suture in the fascial closure of all laparotomy wounds is recommended to reduce the incidence of an incisional hernia.
- The suture material and suture technique used to close the fascia have been shown to affect the risk of an incisional hernia in midline incisions. A suture technique with continuous sutures placed 1 cm apart and 1 cm from the incision using a suture 4 times the length of the incision has been shown to prevent hernias.<sup>[6]</sup>
- Preventive aspects include a proper choice of incision, avoidance of tension on suture line, preservation of nerves, and proper closure of the abdominal wounds.

### Clinical Presentation

All of them presented with swelling over the abdomen and 34% of the patients presented with pain in the swelling site.

### Incisional Hernia Defect Size

- Defect size is one of the important factors that determine the outcome.
- In techniques for the repair of incisional hernias in which sutures are used, the edges of the defect are brought together, which may lead to excessive tension and subsequent wound dehiscence or incisional herniation as a result of tissue ischemia and the cutting of sutures through the tissues.<sup>[7]</sup> With prosthetic mesh, defects of any size can be repaired without tension. Hence, larger defects closed by anatomical repair were having high chances of recurrence.
- However, an expert panel on incisional herniorrhaphy concluded that primary suture repair should be used only for simple small hernia <6 cm diameter in both the axis and the repair is oriented horizontally with non-absorbable suture, monofilament suture with a suture to wound length ratio of 4:1.<sup>[8]</sup>
- Furthermore, the extent of the decrease in laxity of the tissue surrounding the hernia, which is influenced by retraction of muscle and scarification of tissues, may be more important than the actual size of the fascial defect.<sup>[9]</sup>

### Duration of Surgery

Mean operational duration was 84.32 min (range 45–150 min) and 96.4 min (range 45–150 min) in anatomical and mesh repair group, respectively. Operational duration was more in incisional hernia repair with mesh repair technique due to dissection of the abdominal wall to raise flaps and by keeping the mesh on defect so as to extend 2–4 cm beyond the edges of fascia and suturing it to the abdominal wall with interrupted sutures with polypropylene mesh.

In some cases, duration was lengthened due to larger defect size and interloop adhesions of the bowel which increased the duration of surgery to close larger defect and to separate the adhesions.

With respect to intraoperative complications, there were no inadvertent enterotomies in these cases.

### Wound Complications

Due to the amount of tissue dissection needed in open incisional hernia repair group wound-related complications such as seroma, hematoma, flap necrosis, and wound infection are higher than anatomical repair.

In our study, overall wound complications are 20% and 40% in anatomical and mesh repair group, respectively. There was no mortality in our study.



The most common complication noticed was seroma formation. Seroma formation is one of the most common complications associated with onlay mesh hernioplasty due to the wide undermining involved.<sup>[10]</sup> Extensive dissection for mesh placement and premature removal of the subcutaneous drain may contribute to this complication. The cases of seroma in our study were noticed between 3<sup>rd</sup> and 7<sup>th</sup> post-operative day, needed aspiration and resolved within a week with a pressure dressing. No case of wound hematoma was noticed. The incidence of tissue necrosis at the wound edge was 8% in mesh repair. The occurrence of wound edge necrosis is due to disturbance of the blood supply of the tissue at the wound margins due to the large size of skin and subcutaneous flap raised during the repair. This can be prevented by placing moist laparotomy pads over the edge of the wound and meticulous dissection of flaps.<sup>[11]</sup>

In our study, wound infections are significantly higher in mesh repair group 16% as compared to 8% in anatomical repair group. Most of the wound-related infectious complications were superficial and responded to local wound toilet and antibiotics. Control of mesh infection can be problematic though it has been documented that infection of polypropylene mesh can be controlled without removal of the mesh whereas in case of ePTFE mesh removal is usually required.<sup>[12]</sup>

One patient in open mesh repair developed severe prolonged mesh infection which responded to antibiotics and local wound toilet techniques which resulted in longer hospital stay.

The infection did not lead to the removal of mesh in this and most other series<sup>[9,12-15]</sup> but maybe a risk factor for recurrence. Therefore, the administration of broad-spectrum antibiotics at the induction of anesthesia is recommended.<sup>[16]</sup>

The most important point regarding the prevention of mesh-related infections is that foreign body reactions depend on the amount of the prosthesis (mesh) used. For this reason, surgeons should try to minimize the area of mesh that is introduced during the hernia operation, since the inserted foreign material is an ideal medium for bacterial colonization.<sup>[17]</sup>

In addition, four main approaches to the prevention of mesh infection have been used. First, the wound can be rinsed with an antibiotic-containing solution, starting immediately after the dissection of the hernia sac, and then intermittently until the skin is sutured. However, the effectiveness of lavage with solutions containing antimicrobial agents is controversial, since antibiotics

require a defined duration of contact with pathogens, while lavage is usually a more rapid process.

A second approach involves the use of material placed in front of the mesh to slowly deliver an antimicrobial agent locally. In a randomized trial, the use of gentamicin-laced collagen tampons was tested in 301 patients undergoing prosthetic groin hernia repair. The collagen tampons were placed in front of the mesh before the aponeurosis of the external oblique muscle was sutured. This new technique resulted in fewer post-operative infections in comparison with 294 patients undergoing surgical repair for the same hernia without the use of gentamicin-containing collagen tampons.<sup>[16]</sup>

Third, a mesh containing embedded antimicrobial agents can be used. Such a mesh is thought to help prevent bacterial adhesion and colonization when implanted in wounds, with a subsequent reduced likelihood of post-operative infections.

Finally, the traditional intravenous perioperative administration of antimicrobial agents can be used. Although hernia repair operations are classified as clean surgery, the administration of intravenous antibiotics perioperatively has been shown to be beneficial if a prosthetic material (mesh) is involved.<sup>[17,18]</sup>

All of the above-mentioned strategies seem to be beneficial in reducing the incidence of mesh-related infection after hernia repair. However, no definitive recommendation can be made in favor of any particular approach in the absence of comparative outcome data. The current standard preventive strategy for other types of surgery, i.e., the perioperative administration of appropriate intravenous antibiotics, may be used until new data regarding alternative preventive strategies become available.

### Post-operative Pain

In our study, we found that post-operative pain was almost similar (mean analgesic use i.e., 7.52 days in anatomical repair method and 8.20 days in open repair group) in both groups.

Diclofenac sodium, i.e., (100/150 mg) used initially in injectable form and later converted to oral form. Most of our patients in both groups were subjectively more comfortable in the post-operative period and were ambulant on the 1<sup>st</sup> post-operative day.

In our study may be due to increased post-operative complications such as seroma and wound infection in mesh repair which resulted in increased post-operative pain than anatomical repair group. Post-operative pain in mesh repair

group, mainly due to the dull aching pain and induration, which were due to the foreign body reaction to the mesh. A few patients, however, suffered a foreign body sensation following mesh repair which subsided over a couple of months. To our experience, reassurance is more effective than pain-killers in these patients.

### Post-operative Stay

The mean hospital stay was shorter in anatomical repair group (7.24 days) as compared to open mesh repair group (9.52 days) which was significant. Hospital stay was more in mesh repair than anatomical repair due to more wound complications in mesh repair group. In our study, it was found out that patients with suture repair had significant shorter hospital stay compared to mesh repair. This may be due to less complication rate in suture repair.

### Recurrence

At a mean follow-up of 6 months, 2 out of 25 cases recurred in anatomical repair group and none in mesh repair group.

In techniques for the repair of incisional hernias in which sutures are used, the edges of the defect are brought together, which may lead to excessive tension and subsequent wound dehiscence or incisional herniation as a result of tissue ischemia and the cutting of sutures through the tissues. With prosthetic mesh, defects of any size can be repaired without tension. In addition, polypropylene mesh, by inducing an inflammatory response, sets up a scaffolding that, in turn, induces the synthesis of collagen. Our study establishes the superiority of mesh repair over suture repair with regard to the recurrence of the hernia.

Primary suture repair has been widely used but has a reported recurrence rate of 12–54%. The technique is stated to predispose to excessive tension and subsequent wound dehiscence due to tissue ischemia and cutting of the sutures through tissue. Surgical complications such as wound infection, prolonged ileus, and dehiscence are established causative factors for recurrence.<sup>[19]</sup> All 4 patients who had wound infection during the initial suture repair developed recurrence within 1 year.

In our study, mesh repair was found to be significantly better for large defects and multiple defects. There was no mortality in our study. None of the cases showed recurrence. Recent trend is to use the prosthetic mesh judiciously. There was no recurrence in our study through the period of follow-up was not adequate to make a correct assessment of recurrence. In short follow-up, it is difficult to comment on recurrence. However, the short-term results indicate a significant improvement in the repair of an incisional hernia by the use of prosthetic mesh compared with conventional repairs.

In our study, 2 out of 25 cases recurred in anatomical repair group and none in the mesh repair group. Due to wound infection and larger defect size recurrence occurred in cases of anatomical repair of an incisional hernia.

The limitations of this study were as follows:

1. There was no randomization of the patients done in this study.
2. It was limited in its validity due to small sample size and short follow-up period.
3. As it was an unblinded study, there was a chance of observational bias.

The suggestion from this study was the need for a large randomized controlled trial comparing the anatomical technique and onlay technique of mesh placement in incisional hernia repair.

## CONCLUSION

- In a small simple incisional hernia defect <2 cm, onlay mesh repair of an incisional hernia carried a high risk of infections and local wound-related complications and pain in the current study.
- In a small, incisional hernia, suture repair had similar outcomes in terms of recurrence rates. The incidence of other complications was less compared to onlay mesh repair in a small, simple hernia. Hence, in a small, simple incisional hernia, repair by conventional suture repair still has a role if proper technique is used and other factors for recurrences are taken care of.
- In large and complex incisional hernia, the use of synthetic prosthetic material provides the tension-free repair and less rate of recurrence. Good pre- and post-operative antibiotics and wound care are essential.
- Mesh repair is the almost the gold standard for the incisional hernias. Comparing with other techniques, it has an excellent post-operative quality of life and better patient acceptability in terms of recurrence.
- In conclusion, mesh repair with polypropylene mesh is superior to suture repair with regard to the recurrence of the hernia.

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