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Retromuscular prefascial mesh placement versus onlay mesh placement in the repair of incisional hernias: a prospective study

Ranganath M. Venkatarangaiah¹, Darshan A. Manjunath^{2*}, Amarnath V. Mudda³, Veerabhadra Radhakrishna⁴

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*Correspondence:

Dr. Darshan A. Manjunath,

E-mail: dr.darshan.am@gmail.com

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ABSTRACT

Background: An incisional hernia is a common complication of abdominal surgery with an incidence rate of two to 11%. Although there are various techniques described, the mesh repair has been the gold standard in the elective management of incisional hernias. But the best method of mesh placement is still debatable. Hence a study was conducted to compare the Retromuscular prefascial mesh placement with Onlay mesh placement in the treatment of incisional hernias.

Methods: A prospective study was conducted in the Department of General Surgery in a tertiary center from November 2010 to May 2012. All patients with an incisional hernia underwent either Retromuscular prefascial mesh repair or onlay mesh repair. The nature of the previous surgery, size of the defect, operative, and postoperative complications were recorded. Mann Whitney test and Fisher's exact test was used to evaluate the significance of the difference. A 'p' value <0.05 was considered significant.

Results: A total of 60 patients were studied with 30 patients each in the Retromuscular prefascial group and the onlay group. Forty (67%) cases of incisional hernia were secondary to lower midline incision and hysterectomy was the most common surgery [30 patients (50%)]. The Retromuscular prefascial mesh group had significantly lesser postoperative complications (2/30 vs. 12/30; p=0.002; Fischer's exact test) and seroma formation (1/30 vs. 8/30; p=0.02; Fischer's exact test) compared to the onlay mesh group.

Conclusions: Retromuscular prefascial mesh repair was equally effective but associated with fewer complications compared to onlay mesh repair.

Keywords: Incisional hernia, Onlay mesh repair, Retromuscular prefascial mesh repair

INTRODUCTION

An incisional hernia, also called as postoperative hernia, was defined Ian Aird as a diffuse extrusion of peritoneum and abdominal viscera through a weak scar of an

operation or trauma.¹ In the best centers, the incidence of postoperative hernia has been 10% as shown by long-term follow-up studies.² Two main causes of incisional hernia are poor surgical closure and sepsis.² There are various factors responsible, like the patient's

¹Consultant Surgeon, General Hospital, Sira, Tumkur, Karnataka, India

²Department of General Surgery, McGann Hospital, Shivamogga Institute of Medical Sciences, Shivamogga, Karnataka, India

³Department of Surgery, Basaveshwar Hospital, Gulbarga, Karnataka, India

⁴Department of Pediatric Surgery, Manipal Hospital, Kodihalli, Bengaluru, Karnataka, India

characteristics, the underlying pathological process and iatrogenic factors like type of suture material.³

These hernias enlarge over time leading to swelling, pain, intestinal obstruction, incarceration (6-15%), and strangulation (2%).⁴ It also causes skin necrosis and perforation, all of which markedly increase the risk to the patient's life. They are responsible for the considerable economic loss to the patient and family. Hence these patients need to be operated as early as possible.²

There are various surgical techniques developed for this challenging condition. But the mesh repair has been the gold standard in the elective management of most incisional hernias.² Mesh repairs can be categorized according to the way in which the mesh is placed as well as its relationship to the abdominal wall fascia.⁵

Hence a study was conducted to evaluate the etiology, risk factors, and presentation of incisional hernias. The Retromuscular prefascial mesh repair was compared to Onlay mesh repair in the treatment of incisional hernias.

METHODS

A prospective randomized control trial was performed in a tertiary from November 2010 to May 2012.

Inclusion and exclusion criteria

A total of 60 patients were studied. All adults with incisional hernias were included in the study. Patients with underlying anemia, immunosuppression, infection, associated with other abdominal hernias, pregnant women, age less than 15 years, and unfit for anesthesia were excluded.

The study was started after approval from "Institute Ethics Committee." The patients presenting with an incisional hernia to the Department of General Surgery were screened for eligibility. All eligible patients underwent preliminary investigations and pre-anesthetic check-up.

After obtaining consent from the patient, he/she was allocated randomly to one of the groups, Retromuscular prefascial mesh group or Onlay mesh group, by using a sealed envelope, opened by a person other than the operative team. The nature of the previous surgery, incision, suture material used to close the fascia, and history of wound infection was noted. Predisposing factors such as obesity, diabetes, multiparity, cough, and prostatism were noted.

All the surgeries were performed in a single surgical unit under controlled conditions. Patients who had hypertension, diabetes mellitus or cough were controlled pre-operatively. A day prior to surgery, shaving of the abdomen and genitalia was done. Patients were kept nil oral overnight and proctoclysis enema was advised once in the night and once in the morning the day of surgery. A nasogastric tube and Foley's catheter was placed. The procedure was done under general, spinal or epidural anesthesia in the supine position. Each patient received 1gm Cefotaxime intravenously as a prophylaxis at the time of induction.⁶ Polypropylene (Prolene®) mesh was used in both the groups.

In Retromuscular prefascial mesh repair, an elliptical incision was placed to excise the previous scar. Skin and subcutaneous flaps were raised, the sac was defined, opened, and the adhesiolysis was done (Figure 1). Excess of the sac was excised, and the peritoneum was closed in the midline with absorbable sutures. The mesh was placed in the plane behind the rectus muscles and lay onto the anterior aspect of the posterior rectus sheaths. The knowledge of anatomy and preparation of the 'fatty triangle' enables a mesh positioning according to the principles of Retromuscular mesh repair. The overlap can be achieved by incision of the posterior lamina of the rectus sheath on both sides close to the linea alba the incision opens the preperitoneal space and appears in the shape of a "fatty triangle". A sheet of knitted, Polypropylene (Prolene) mesh was cut longer than the length of the defect and wide enough to stretch from one lateral edge of the rectus sheath to the other. The sutures were passed through the lateral edges of the rectus sheath, from outside the sheath, and then along the edge of the mesh and knot placed superficial to rectus sheath (Figure 2). When the hernial defect reaches the upper part of the abdominal wall, the upper edge of mesh was passed down to lie under the diaphragm. In lower abdomen below the arcuate line, it was long enough to be laid into the pelvis and fixed back to pubis, and along the pectenial lines. Two vacuum drains are laid on the graft and brought out. The anterior rectus sheaths are then sutured together along their cut medial edges with non-absorbable monofilament suture.

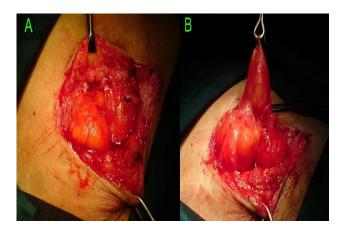


Figure 1: Intra-operative image: (A) Raised skin flap with hernia sac at the center; (B) Dissected hernia sac held with Babcock's forceps.

In Onlay mesh repair, the mesh was kept over the anterior rectus sheath without tension and excessive folding (Figure 3).

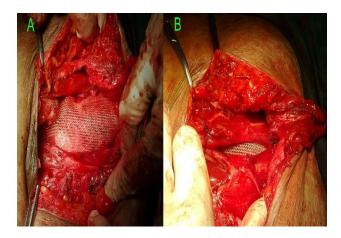


Figure 2: Retromuscualar prefascial mesh repair technique: (A) Mesh has been placed posterior to the rectus muscle; (B) Closure of rectus muscle anterior to the mesh.



Figure 3: Onlay mesh repair technique. Mesh has been placed superficial to the anterior rectus sheath and anchored to it.

The size of the defect was noted. In the postoperative period, nasogastric aspiration was done for first 24 hours. The nasogastric tube was removed once the patient passed flatus. Foley's catheter was removed on the postoperative day one. The suction drain was removed once the drainage stopped. Antibiotics were continued for five days.

Postoperatively, deep breathing exercises, movement of limbs in bed was advised as soon as patient recovered from anesthesia. Postoperative complications were tabulated. Early limited ambulation was done once the patient was able to bear the pain. Skin sutures removed on the 10th day and in few cases after the 10th day. At discharge, patients were advised to avoid carrying heavy weights and advised to wear an abdominal belt. Patients were reviewed after one month and three months in all cases and few cases up to two years, every six months and examined for any recurrence and symptoms.

Surgical site infection (SSI) was defined as per CDC (Center for Disease Control) guidelines. Infection occurring in an operative site within 90 days after the surgery having one of the following criteria was considered as SSI; A purulent drainage from the incision or aseptically obtained culture from the incision showed growth of a micro-organism or if the incision was dehisced or deliberately opened by the surgeon or attending physician or other designee and was culture positive or not cultured and the patient had at least one of the following symptoms or signs: erythema; localized swelling; pain or tenderness; or heat.

Statistical analysis

All the data were compiled in Microsoft Excel and was subjected to statistical analysis. Outcome assessor and analysts were kept blinded. Mann Whitney 'U' test and Fisher's exact test was used to study the significance of the difference between the two groups. A p-value <0.05 was considered significant.

RESULTS

A total of 60 patients met eligibility criteria. They were randomized into Retromuscular prefascial mesh group and Onlay mesh group, with 30 patients in each group. The youngest person was aged 22 years whereas the elder most was aged 60 years. Majority of the patients belonged to 41-50 years age group (67%).

The mean age of study population was 41.63 ± 10.52 years. Fifty-two (87%) patients were females. Majority of the patients weighed 51 to 60kg. A lower midline incision was the most common incision which led to an incisional hernia [40 (67%) patients] (Table 1).

Thirty (50%) patients developed an incisional hernia following a hysterectomy (Table 2). Wound infection was the most common risk factor for an incisional hernia [8 (13%) patients]. The other risk factors found were obesity [4 (7%)], Diabetes [4 (7%)], Chronic obstructive lung disease [2 (3%)], and multipara [4 (7%)] (Table 3).

The swelling was the universal presenting symptom [60 (100%) patients] and six (10%) patients presented with pain in the swelling. All cases in our series were reducible hernias. Eighteen (30%) patients presented within one year of previous surgery whereas 42 (70%) patients presented after one year of previous surgery. Seventeen (28%) patients presented ten years after the initial surgery. The defect was less than 5 cm in 44 (73%) patients. Significant hemorrhage was found in 8 (13%) patients. Fourteen (23%) patients developed postoperative complications with seroma being the most common complication [9(15%)] (Table 4). One recurrence was found, which occurred following Onlay mesh repair.

Table 1: Type of incisions causing incisional hernia.

| Type of incision | Retromuscular prefascial mesh group (n=30) | Onlay mesh group (n=30) | p (Fischer's exact test) | Total |
|------------------|--|----------------------------|-----------------------------|------------|
| | Number (%) | Number (%) | exact test) | Number (%) |
| Lower midline | 20 (67) | 20 (67) | 1 | 40 (67%) |
| Upper midline | 2 (7%) | 2 (7%) | 1 | 4 (7%) |
| Pfannensteil | 6 (20%) | 4 (13%) | 0.7 | 10 (17%) |
| Transverse | 2 (7%) | 2 (7%) | 1 | 4 (7%) |
| Grid iron | 0 (0%) | 2 (7%) | 0.5 | 2 (3%) |

Table 2: Nature of surgeries causing incisional hernia.

| Nature of previous surgery | Retromuscular prefascial mesh group (n=30) | Onlay mesh group (n=30) | p (Fischer's exact test) | Total |
|----------------------------|--|-------------------------|-----------------------------|------------|
| | Number (%) | Number (%) | | Number (%) |
| Hysterectomy | 14 (47%) | 16 (53%) | 0.6 | 30 (50%) |
| LSCS* | 8 (27%) | 8 (27%) | 1 | 16 (27%) |
| Tubectomy | 2 (7%) | 2 (7%) | 1 | 4 (7%) |
| Bowel perforation | 4 (7%) | 2 (13%) | 0.4 | 6 (10%) |
| Appendicectomy | 2 (7%) | 2 (7%) | 1 | 4 (7%) |

^{*}Lower segment cesarean section

Table 3: Risk factors associated with incisional hernia.

| Risk factors | Retromuscular prefascial mesh group (n=30) | Onlay mesh group (n=30) | p (Fischer's | Total |
|-----------------|---|-------------------------|--------------|------------|
| | Number (%) | Number (%) | exact test) | Number (%) |
| Wound infection | 2 (7%) | 6 (20%) | 0.3 | 8 (13%) |
| Obesity | 4 (13%) | 0 (0%) | 0.1 | 4 (7%) |
| Diabetes | 2 (7%) | 2 (7%) | 1 | 4 (7%) |
| COPD* | 0 (0%) | 2 (7%) | 0.5 | 2 (3%) |
| Multipara | 4 (13%) | 0 (0%) | 0.1 | 4 (7%) |

^{*}Chronic obstructive lung disease

Table 4: Postoperative complications.

| Risk factors | Retromuscular prefascial mesh group (n=30) | Onlay mesh group (n=30) | p (Fischer's exact test) | Total |
|---------------------------|---|-------------------------|-----------------------------|------------|
| | Number (%) | Number (%) | | Number (%) |
| Respiratory complications | 0 | 0 | 1 | 0 |
| Postoperative ileus | 0 | 1 (3%) | 1 | 1 (2%) |
| Seroma | 1 (3%) | 8 (27%) | 0.02 | 9 (15%) |
| Hematoma | 0 | 0 | 1 | 0 |
| Wound infection | 1 (3%) | 2 (7%) | 1 | 3 (5%) |
| DVT* | 0 | 0 | 1 | 0 |
| Bowel obstruction | 0 | 0 | 1 | 0 |
| Chronic pain | 0 | 0 | 1 | 0 |
| Recurrence | 0 | 1 (3%) | 1 | 1 (2%) |
| Death | 0 | 0 | 0 | 0 |
| Total | 2 (7%) | 12 (40%) | 0.002 | 14 (23%) |

^{*}Deep vein thrombosis

Retromuscular prefascial mesh repair vs. Onlay mesh repair

The age, gender, and weight distribution were similar in both the groups. There was no difference in the mean age between the Retromuscular prefascial group and the Onlay mesh group [40±11.42 years vs. 43.27±9.67 years; p=0.7; Confidence Interval (CI)=95%; Mann Whitney 'U' test]. The mean weight of patients in Retromuscular prefascial mesh group was similar to that of Onlay mesh group (53.93±7.04 kg vs. 54.26±6.79 kg; p=1; CI=95%; Mann Whitney 'U' test). Type of incision in previous surgery (Table 1), nature of previous surgery (Table 2), the diameter of the defect, and risk factors associated (Table 3) were similar in both the groups.

None of the patients in either group had a significant hemorrhage. The overall postoperative complications significantly lesser in Retromuscular prefascial mesh group (2/30 vs. 12/30; p=0.002; CI=95; Fischer's exact test) compared to the Onlay mesh group. The Onlay mesh group had 8 (27%) cases of seroma formation which was significantly higher than that in the Retromuscular prefascial mesh group [one patient (3%); p=0.02; CI=95%; Fischer's exact test]. There were no significant differences between both the groups regard to other postoperative complications such as postoperative ileus, hematoma, wound infection, and bowel obstruction (Table 4).

DISCUSSION

An incisional hernia is a frequent complication of abdominal surgery and an important source of morbidity. The incidence of an incisional hernia after laparotomy varies between 2% to 11%.² A wide spectrum of surgical techniques has been developed to repair an incisional hernia, which ranges from suturing techniques to the use of various types of prosthetic mesh repair.^{2,4} The use of Retromuscular prefascial mesh repair technique showed reduced number of postoperative complications and recurrence compared to other techniques of incisional hernia mesh repair.^{2,7,8}

Two main causes of an incisional hernia are poor surgical technique and sepsis.² Recurrence rates of up to 33% after first repair and 44% after the second repair have been reported, most occurring within three years of the repair.⁹

In the present study, age ranged from 22 years to 60 years and with peak incidence in 41 to 50 years (33.3%) age group with a mean age of 41.6±10.5 years. As per the Maingot's study, mean age was around 45 years.² Both groups were comparable with respect to age. There was female preponderance (87%). A study Bhutia WT et al. also found the female preponderance (84%) in an incisional hernia.¹⁰ This may be due to the weaker muscles in females as compared to the males. There was no difference in gender and weight distribution among the two study groups.

Present study showed over 83% (50 patients) of cases occurred following obstetrics and gynecological operations, and around 17% (5 patients) following general surgical operations (Table 2).

Eight (13%) of our patients had a wound infection in the postoperative period, which was a significant risk factor for an incisional hernia. In Ponka series, it accounted for 24%. Bucknell et al. in them of 1129 laparotomy closures, found that 48% of their patients with an incisional hernia had previous wound infection and those with wound infection developed hernias almost four times more often. Hence measures to prevent wound infection is must in all laparotomy cases.

The overall postoperative complications were less in the present study (23%). Present study found that the Retromuscular prefascial placement of mesh had 7% postoperative complications compared with Onlay mesh repair which had 40% complications. Seroma formation was more in Onlay mesh repair [8(27%)], possibly due to more dissection and more tissue reaction of mesh in this plane.

In present study, we had followed up all the patients after discharge for 15 days, one month, three months, six months, 12 months and 18 months of duration. There was no recurrence of incisional hernia noticed in the present study with the Retromuscular prefascial placement of mesh and the recurrence rate of 3% with Onlay mesh repair. Luidendi JK et al reported a recurrence rate of 46% with suture repair technique and 23% with mesh repair technique. ¹³ de Vries Relingh TS et al. reported a recurrence rate of incisional hernia following different techniques of mesh repair as follows: In Onlay technique it was 28.3%, inlay technique 44%, and underlay technique 12%. ¹⁴ Macharias A et al. reported a recurrence rate of 9% when an incisional hernia was repaired by Onlay mesh repair. ¹⁵

CONCLUSION

An incisional hernia is a morbid condition following a laparotomy. It was most commonly seen in females and following obstetric or gynecological procedures. The swelling was the most common presentation. Retromuscular prefascial mesh repair technique was superior to Onlay mesh repair technique regard to postoperative complications.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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