Original Research Article

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Study of laparoscopic repair of abdominal incisional hernia

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ABSTRACT

Background: An incisional hernia is defined as any abdominal wall gap with or without bulge in the area of postoperative scar perceptible or palpable by clinical examination or imaging. It occurs in about 3 to 20 percent of patients undergoing laparotomy. Open hernia repair methods have an increased incidence of wound infections and wound-related complications. These problems have been overcome by laparoscopy. The placement of a large mesh by laparoscopy allows for an even distribution of forces along the surface area of the mesh, which account for the strength of the repair and the decreased recurrence rates associated with it. The merits of the laparoscopic approach are decreased rates of recurrence, reduced risks of wound complications. The aims and objective of this study were to evaluate etiological factors of incisional hernia, various techniques of laparoscopic repair of incisional hernia, and to investigate the influence of laparoscopic approach on hospital stay, complications associated with the procedure and recurrence rates.

Methods: In this hospital based prospective study, total 40 cases of incisional hernia were studied which were operated laparoscopically and followed up over period of two years.

Results: Incisional hernia occurrence was common in females (80%) with commonly observed risk factor was postoperative wound related complications (28 cases) and obesity (22 cases). Infraumbilical midline incision (67.5%) and supraumbilical midline incision (27.5%) was most commonly responsible for incisional hernia occurrence. LSCS was most commonly responsible for incisional hernia occurrence (45%) followed by laparotomy for various indications (27.5%). Intraperitoneal onlay mesh repair of single defect without anatomical repair was most common modality of laparoscopic repair (70%). Early postoperative pain (20%) and prolonged ileus (17.5%) was the most common complication observed. Average hospital stay was 4.22 days.

Conclusions: Postoperative wound related complications are important risk factor for incisional hernia. Laparoscopic repair of incisional hernia is better choice in view of reduced wound related complications, post-operative pain and hospitals stay.

Keywords: Incisional hernia, Intraperitoneal onlay mesh repair, Laparoscopic repair, Lower segment caesarean section, Midline incision

INTRODUCTION

An incisional hernia is defined as any abdominal wall gap with or without bulge in the area of postoperative scar perceptible or palpable by clinical examination or imaging.¹ Before the introduction of general anaesthesia by Morton in 1846, incisional hernias were rare. As survival after abdominal surgery became more common so did the incidence of incisional hernias. It occurs in about 3 to 20 percent of patients undergoing laparotomy,

with the incidence being less after laparoscopic surgery.² The true incidence of incisional hernia is often underestimated because majority of cases are asymptomatic. The probability of an abdominal incisional hernia occurring is significantly higher for longitudinal incisions than transverse incisions. Appropriate treatments are recommended (non-surgical/surgical treatments) because incisional abdominal wall hernias will not heal spontaneously.^{3,4}

Several hernia repair methods have been described but some required dissection of wide areas of soft tissue for mesh placement contributes to an increased incidence of wound infections and wound-related complications. These problems have stimulated a continuing search for new techniques for incisional hernia repair. The laparoscopic repair of incisional hernias is rapidly evolving since its first description by Le Blank et al.⁵ The technique is based on the principle of open, preperitoneal repair described by Stoppa and Rives.^{6,7} The placement of a large mesh in the preperitoneal location allows for an even distribution of forces along the surface area of the mesh, which may account for the strength of the repair and the decreased recurrence rates associated with it. The feasibility of laparoscopic incisional hernia repair has been clearly established with large series of patients and good long-term follow-up. The merits of the minimally invasive approach had been demonstrated with improved rates of recurrence, reduced risks of wound complications, and applicability of the technique for difficult patient populations.8

The present research was undertaken to study various etiological factors of incisional hernia and use of laparoscopic approach to repair it, to study different ways in which incisional hernia can be repaired laparoscopically, to study influence of laparoscopic approach on hospital stay and various complications associated with the procedure.

METHODS

The present hospital based prospective study was conducted in 40 cases, who were presented with incisional hernia and who have diagnosis of incisional hernia with defect size of 9-225 sq. cm and who have negative pregnancy test. Extremely obese patients (Body mass index:>40), those having contraindications to general anesthesia, presence of local or systemic infection, bowel obstruction, strangulation, peritonitis or perforation, hernias with defect size less than 9 sq. cm or hernias with defect size greater than 225 sq. cm and nonconsenting patients were excluded from the study. A detailed history, thorough general and local examination and all relevant preoperative investigations were done for all the patients. Urine pregnancy test of female patients was done. Associated conditions like bronchitis, hypertension, and ischemic heart disease if any were properly controlled. Smoking was completely stopped to prevent post-operative cough. Prior to operative

procedure written inform consent was obtained from all the patients.

Intraperitoneal Onlay Mesh Repair (IPOM)

Under general anaesthesia patient was positioned in supine position. Veress needle was inserted in left hypochondrium, at Palmer's point. After creation of pneumoperitoneum with Veress needle, 10 mm camera port (Optical port) was inserted laterally as far away from hernial site as possible. Other working ports were inserted besides camera port depending upon the case. Or Hasson's open technique was used in which port was inserted as far away from hernial site as possible. Or for Upper abdominal hernia: Lateral and inferior ports were used. For Lower abdominal hernia: Lateral and superior ports were used. 30-degree scope provides better view for release of adhesions and hernia. After gaining intraperitoneal access important aspect was adhesiolysis which was important to look for any additional defects were there and for gaining space for mesh placement with adequate overlap. For hernias which were in supraumbilical position division of falciparum ligament may be necessary for proper adhesiolysis and getting adequate overlap. For hernias which were infraumbilical in position separation of bladder may be necessary from anterior abdominal wall for adequate mesh overlap. After adhesiolysis hernial contents were reduced. Any old mesh put during previous incisional hernia repair was removed. Removal of peritoneal lining of hernia sac helps in preventing post-operative seroma formation. Mesh was irrigated with diluted gentamicin and folded in one of the two ways, double barrel or cigar shaped. Edge of the defect was identified by either pushing the intraabdominal instrument against the palpating finger and marking the edge of the defect or passing needle through abdominal wall and confirming position of defect in relation to needle. Mesh was positioned such that it extends 5 cm from edge of the defect on all sides. Mesh was first unfolded on one half and transfascial sutures applied on that half side then other half of mesh was unfolded and transfascial sutures were applied on that half. (Figure 1 to Figure 6) In between the transfascial sutures mesh was tacked on each side with tackers at approximately 3 cm distance. Mesh was anchored with prolene sutures (prolene 2-0 R/B) in following ways (Figure 7).



Figure 1: Adhesiolysis.

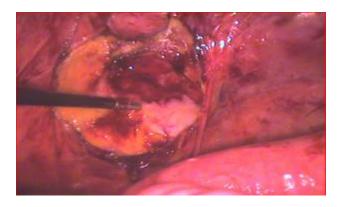


Figure 2: Removal of peritoneal lining of sac.

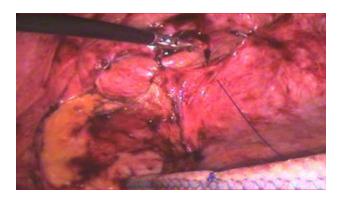


Figure 3: Mesh introduced intraperitoneally.

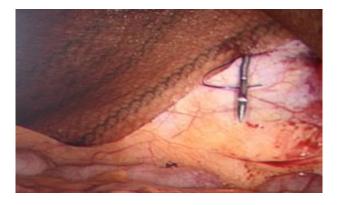


Figure 4: Securing mesh with transfascial sutures.

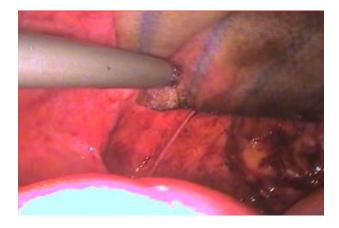
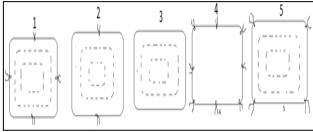


Figure 5: Tacker application.



Figure 6: Intraperitoneal onlay mesh placement completed.



1. Transfascial prolene sutures tied subcutaneously at all four edges of mesh with two rows of tackers; 2. Transfascial sutures along linea alba with two rows of tackers; 3. Tackers only without transfascial sutures; 4. Only transfascial sutures without tackers; 5. With transfascial sutures at four corners along with two rows of tackers.

Figure 7: Methods of mesh fixation.

Types of mesh used: Polypropelene Mesh with ORC Coating: Oxidised regenerated cellulose coating is present on visceral side and polypropelene encapsulated by polydiaxone is present on parietal side.

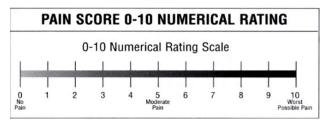
Polypropelene side promotes tissue ingrowth on parietal side and ORC coating prevents adhesions of bowel with mesh.

Polypropelene with Polygecaprone Composite Mesh: Composite mesh consisting of polyglecaprone and polypropelene.

Postoperatively patient positioned in propped up position with i/v analgesics given for 1st 24 hours followed by oral analgesics.

Postoperative monitoring was done for pulse, BP, fever, tachycardia. Patient was given abdominal belt and mobilized on the same day of surgery. Postoperative total blood counts and appearance of bowel sounds were checked for.

Patient's pain score was calculated using numerical pain scale as follows 9 (Figure 8) at the time of discharge, at 2 weeks, 6 weeks and 3 months.



No pain: 0; Mild pain: 1-3; Moderate pain: 4-6; Severe pain: 6-10

Figure 8: Numerical pain scale.

RESULTS

In the present study, most common age group having incisional hernia was 31-40 years (57.5%) followed by 41-50 years (32.5%) and 21-30 years (10%). Among the total cases, 32 (80%) were females and 8 (20%) were males. Maximum patients (55%) had body mass index 30-35, (obesity category 1) followed by body mass index 25-30 (Pre-obese category), (37.5%).

Table 1: Distribution of patients according to risk factors.

Risk Factors	No of Patients
Post Op wound related complications*	28
Obesity	22
Malnutrition [#]	10
Multiple surgeries	12
Post Op respiratory complications	07
Diabetes	06
Smoking	04

^{*}Post-operative wound related complications include wound infection, gaping or burst abdomen; #malnutrition includes: anaemia, hypoproteinemia which delays wound healing.

Most commonly observed risk factor was postoperative wound related complications followed by obesity (Table 1). Most of the patients had multiple risk factors.

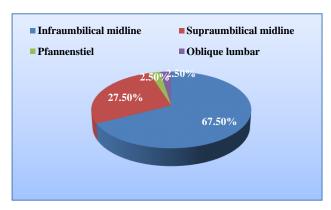


Figure 9: Types of incision responsible.

Types of incision responsible and types of surgery contributing to incisional hernia were shown in Figure 9

and 10. Infraumbilical midline incision was most commonly responsible for incisional hernia occurrence (67.5%) followed by supraumbilical midline incision (27.5%). Lower Segment Caesarean Section (45%) was most commonly responsible for incisional hernia occurrence followed by laparotomy for various indications (27.5%). Hysterectomy, tubectomy and pyelolithotomy were next in frequency.

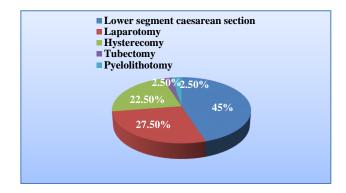


Figure 10: Type of surgery contributing.

In present study, total 4 patients were operated who had recurrence of previously repaired incisional hernia. Among these patients 3 patients had recurrence following open repair, (Table 2). All of these 4 patients had history of multiple surgeries through same incision and required more operative time due to presence of adhesions.

Table 2: Laparoscopic repair in recurrent incisional hernia.

Previous method of incisional hernia repair	Number of recurrences	Number of patients
Open repair of incisional	Once	2
hernia	Twice	1
Laparoscopic intraperitoneal onlay mesh repair	Once	1

In most number of patients (57.5%) defect size was between 9 to 25 sq. cm. followed by 25-100 sq. cm (35%) and 100-225 sq. cm (7.5%). Intraperitoneal onlay mesh repair of single defect without anatomical repair was most common modality of laparoscopic repair (70%) used followed by anatomical closure with intraperitoneal onlay mesh repair (25%). In two patients (5%) multiple defects were found, in them intraperitoneal onlay mesh placement without anatomical closure was done. In most patients type of mesh fixation was with transfascial sutures at linea alba with tackers, (30%), next in frequency was transfascial sutures at sides of mesh with tackers, (25%), Table 3.

Most of the patients [(17), (42.5%)] were operated with intraperitoneal onlay placement of composite polypropelene plus polyglecaprone mesh and polypropelene with oxidised regenerated cellulose coated mesh was used in 15 patients (37.5%). Polypropelene mesh was used in only 8 (20%) patients. In maximum

number of patients operative time was between 90 to 120 minutes, with mean operative time of 98.25 minutes. In two patients in whom anatomical closure of defect was done more operative time was required (>120 mins) and in patients who had history of multiple previous surgeries required longer operative time.

Table 3: Methods of mesh fixation.

Methods of mesh fixation	No. of patients	Percentage
1	10	25
2	12	30
3	7	17.5
4	5	12.5
5	6	15.0

Most common complication of the study was early postoperative pain (20%) followed by prolonged ileus (17.5%), fever (12.5%), trocar site infection (10%), seroma (7.5%) and prolonged pain (7.5%). None of the patients had chronic postoperative pain. No recurrence was observed over two years of observation period. At the time of discharge 32 patients had pain score between 0-3 and 8 patients had pain score between 4-6. They were followed at 2 weeks and 6 weeks. At 2 weeks 3 patients had pain score between 4-6 and at 6 weeks only 1 patient had pain score between 4-6. On subsequent visits pain score in patients was between 0-3. Table 4 shows the distribution of patients according to postoperative hospital stay. The mean hospital stay was 4.22 days.

Table 4: Methods of mesh fixation.

Post-operative stay	No. of patients	Percentage
3 days	06	15
4 days	25	62.5
5 days	06	15
> 6 days	03	7.5

DISCUSSION

In the present study, total 40 patients were enrolled, among them maximum number of patients (57.5%) were in the age group of 31-40 years with female preponderance. Higher incidence in female population is explained by gynaecological surgeries as a leading cause of incisional hernias. Mean age of patients was 37.8 years which was comparable to study by Shukla et al. 10 Many patients had multiple factors; most common risk factor responsible was post-operative wound complications such as wound infection gaping or wound dehiscence (28 patients). Other risk factors were obesity (22 patients), multiple surgeries (12), postoperative respiratory complication (7 patients), diabetes (6 cases) and smoking (4 cases). The risk factor responsible for incisional hernias in present study were compared with previous studies. 11-16

The most common previous incision leading to incisional hernia formation was infraumbilical midline incision (67.5%) followed by supraumbilical midline incision (27.5%) together contributing 95% of incisional hernias, this was correlated with other studies. 17-19 The maximum number of incisional hernias followed gynaecological surgeries (70%). Higher incidence in most of these procedures is because most of these procedures are carried out in emergencies and infraumbilical midline incision is commonly used which is more vulnerable for incisonal hernia formation. Laparotomy through midline incisions was responsible for 27.5% of incisional hernia occurrence which was comparable to study by Shukla et al. 10

Total 4 patients were operated who had recurrence of previously repaired incisional hernia. Among these patients 3 patients had recurrence following open repair, 1 patient had recurrence twice after previous open repair of incisional hernia. And other two had recurrence once following previous incisional hernia repair. 1 patient had recurrence following laparoscopic onlay placement of mesh. That patient had mesh migration into defect which was found intra operatively. All of these 4 patients of recurrent incisional hernia had history of multiple surgeries through same incision. Most of the patients operated belonged to defect size group 9 cm² to 25 cm². In 28 patients there was single defect in which onlay intraperitoneal mesh placement was done without anatomical closure. In 10 patients anatomical closure along with onlay intraperitoneal mesh placement was done. 2 patients had multiple defects (two in either) in whom onlay intraperitoneal mesh placement was done without anatomical closure. Type of procedure adopted was decided by surgeon's preference. 12 out of 40 patients were operated with transfascial sutures along linea alba, with two rows of tackers. In 10 patients mesh was fixed with transfascial sutures along all sides with two rows of tackers. In 7 patients only, tackers were used for mesh fixation. In 5 patients only transfascial sutures were used to fix mesh. In 6 patients transfascial sutures were used to fix the mesh at each four corners with two rows of tackers. Different types of mesh fixation were adopted randomly depending on surgeon's preference to study impact of different mesh fixation methods on postoperative pain. In 17 patients polypropelene with polyglecaprone composite mesh was used. In 15 patients polypropelene with oxidised regenerated cellulose coated mesh was used. Polypropelene mesh was used in 8 patients. Choice of mesh was decided randomly depending on surgeon's preference.

The mean operative time in present study was 98.25 minutes; this was compared with the study by Kohler et al.²⁰ Operative time was more in patients in whom anatomical closure with intraperitoneal onlay mesh placement was done. Also, more time was required in patients who had history of multiple previous surgeries including recurrent incisional hernias.

Three patients had seroma as a complication all of them were observed. Seroma was confirmed on ultrasound.

Spontaneous resolution of seroma was observed by six weeks postoperatively, these patients did not require any aspiration of seroma. It happens to be one of the complications inherent to this procedure. Most seromas resolve with time some requiring 8 to 12 weeks for complete resolution. ^{21,22} In 4 patients trocar site infection was observed all of them responded to local wound dressing all of them had postoperative fever. Symptomatic improvement was observed after infection was controlled. In laparoscopic incisional hernia repair the incidence of surgical site infection is low. Mesh infection as a complication was not observed in present study.

In all patients, appearance of bowel sounds was checked postoperatively. In 6 cases bowel sounds appeared on 4th postopearative day and in 1 patient it appeared on 5th day postoperatively. Mechanical cause of bowel obstruction was ruled out by ultrasound abdomen and X-ray abdomen erect. Post-procedure adhesive intestinal obstruction increases morbidity of surgery and may require reoperation.

Postoperative pain is an important aspect of laparoscopic repair of incisional hernia which leads to readmission increasing morbidity and increasing cost of the procedure. In present study, more pain was experienced by patients in whom transfascial sutures were used for mesh fixation. Early postoperative pain usually gets resolved in one or two weeks. In present study 8 patients had early postoperative pain. Numerical pain score calculated in them at the time of discharge was between 4-6. All patients were kept on oral analgesics and followed postoperatively and assessed for postoperative pain by measurement of numerical pain score and other complications. 3 of those patients had prolonged pain when they were assessed at the time of 2 week follow up, rest got relieved of pain. 2 of these patients responded to local injection of bupivacain and did not complain of pain on subsequent visits. 1 patient required repeated injection of bupivacain locally and responded to it. None of patients in this study complained of chronic pain beyond 3 months. According to type of mesh fixation method early postoperative pain was observed in all types of mesh fixation methods involving transfascial prolene sutures except tackers only method of mesh fixation method. None of patients had recurrence of incisional hernia. These finding of current study were compared with previous studies.^{23,24} Average hospital stay in present study was 4.22 days. None of the laparascopic procedure was converted to open surgery.

CONCLUSION

The present study concluded that the incisional hernia occurrence is common in females in their thirties. Postoperative wound related complications like wound infection and wound dehiscence, obesity, malnutrition and respiratory complications are important risk factors, so proper asepsis during primary surgery is important for

prevention of incisional hernia. Similarly, weight control measures should be adopted and anaemia and hypoproteinemia should be corrected before surgery. Laparoscopic repair of incisional hernia is better choice in view of reduced wound related complications, post-operative pain and hospital stays.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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