Original Article

Clinical Profile of Incisional Hernia and Minimally Invasive Approach Using Larger Mesh for Repair

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Context : Incisional Hernia repair is commonly performed worldwide. Minimally invasive approach for repair using composite Mesh covering the entire previous incision can significantly reduce its most dreaded complication ie, recurrence.

Aims : To study the patient variable factors in correlation with the etiopathogenesis of incisional hernia and the clinical outcome of Incisional Hernia repair with Mesh covering the entire previous incision.

Settings and Design : Prospective study.

Methods and Material : 40 patients with incisional hernia who visited the Department of Surgery, Acharya Shri Chander College of Medical Sciences and Hospital (ASCOMS), over a period of one year were enrolled in this study. Patient variable factors were analysed and minimally invasive approach for repair was done using a composite Mesh intraperitoneally covering entire previous incision. Patients were then followed up Postoperatively.

Statisticalanalysis : Student t –test and Chi square ($\chi 2$) test . SPSS 21 software.

Results : Incidence of incisional hernia was highest in the age group of 40-50 years with female predominance (85%) Obesity was the most common risk factor. Majority of hernias followed Gynaecological procedures (65%) with lower midline incision being the commonest (40%). 75% patients developed hernia within 2 years of previous surgery. Mean length of incision was 13.90 ± 3.16 cm and the size of Mesh used was 300 cm^2 in majority of the patients. 6 patients had haemorrhage during fixation and 2 underwent limited conversion. Wound complications were observed in 20% cases. No recurrence noted in a mean follow up period of 21.625±1.97 months. All patients had a good quality of life and a satisfactory body image.

Conclusions: Minimally invasive approach with defect closure and intraperitoneal placement of composite mesh covering entire incision using dual fixation for repair of incisional hernia after optimising the risk factors, is recommended to prevent recurrence and morbidity.

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Key words **: Incisional hernia, Etiopathogenisis, Intraperitoneal Onlay Mesh Repair, Recurrence, Large Composite Mesh.**

Hernia is a general term used to describe a bulge or protrusion of an organ through the structure or muscle that usually contains it. Either congenital or acquired. 80% of these acquired hernias result from previous surgery. It's repair is one of the most common operation performed. Reported in 11 to 20% of laparotomy incisions[1]. Laparoscopic approach has revolutionized the treatment of incisional hernia repair. Recurrence is the most important clinical outcome of the Incisional Hernia Repair. Two technical details can minimise recurrence - sufficient overlap of the Mesh and the mesh fixation. Further, larger Meshes have been advised covering the whole previous incision site as it has been observed that recurrence post repair occurs due to disregard for the principle that the entire incision – not just the hernial defect has a potential for hernia development[2].

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Editor's Comment :

- We recommend closure of the defect because of the inherent benefits of reduced recurrence, seroma and good body image.
- Combination of transfacial delayed absorbable sutures and tacks should bepreferred for fixation of composite mesh.
- To reduce further incidence of recurrence, we recommend use of composite mesh covering the whole incision and not just the hernial defect.

This study was undertaken in which larger Meshes addressing the complete fascial scar was used to determine its clinical outcome along with prospective study of various risk factors influencing the development of incisional hernia which need optimisation.

Aim and Objectives

(1) To study the patient variable factors in correlation with the etiopathogenesis of incisional hernia.

(2) To study the clinical outcome of Incisional Hernia repair with mesh covering the entire previous incision.

Materials and Methods

This prospective study of 40 patients suffering from incisional hernia was conducted in the postgraduate Department of Surgery, ASCOMS, Jammu for a period of one year.

Following inclusion and exclusion criteria were taken into consideration:

Inclusion criteria : Patients suffering from incisional hernia of either sex, more than 18 years of age who were fit for G/A

Exclusion criteria : Patients with age <18 years, hernial defect size >15cm. obstructed hernia/ strangulated hernia, very large hernias (where there is no place for working trocars), morbid obesity with large apron of fat (requiring Abdominoplasty), densely scarred abdomen, Ascites, Skin infection, Enterocutaneous fistula and those not fit for G/A.

Selected patients suffering from incisional hernia were taken up in this study. Cessation of smoking was advised well in advance before the surgery. All the patient variable factors - Age, Sex, Risk factors, mode of presentation and previous operation were analysed. Other risk factors - obesity, hypertension, Diabetes Mellitus, COPD, Malignancy. These patients were made to undergo routine and special radiological investigations ie, CT scan/MRI were done to assess the exact defect size, contents and adhesions. Regarding the size of the Mesh, whole of previous incision was measured keeping a 5-7 cm overlap of defect and length of incision.

Operative Procedure — Intraperitoneal Onlay Mesh Repair with defect closure (IPOM PLUS) was done. After administering general anaesthesia pneumoperitoneum was created using closed technique by means of veress needle inserted at palmers's point (below left costal margin along mid clavicular line) in most cases 10 mm telescope was inserted which was followed by placement of three trocars (5/10mm) forming one arc utilizing the "encirclement strategy". Adhesiolysis was carried out to visualize hernial defect by using endo-scissors or ultracision followed by reduction of contents. In case of difficult adhesiolysis , hybrid technique which a limited incision was made over the hernia site only large enough to allow dissection of the hernial sac was used (Fig 1).The hernial defect was closed by continuous sutures at an interval of 1-2cm with 3-4 sutures in the retrograde manner using one number Polydioxanone (PDS). Composite Meshes (polyester on the parietal side and collagen layer on visceral side) were used. The Mesh was centre aligned to overlap the incision intraperitoneally by 5-7cm circumferentially. Mesh fixation was carried out by using combination of

Fig 1 — One case in which limited coversion was done

transfascial sutures and tackers (placed 4-5cm at the periphery of Mesh). We used our own innovative technique for transabdominal fixation every 3-5 cm on the margins of the Mesh. Two Touhy (epidural No 16) needles were used : one was used for making an endoloop of one number polypropylene and passed at the proposed site of fixation through a 1mm-2mm incision over the abdominal wall piercing through the Mesh and the second needle carrying one number polydioxanone was passed through the same incision into the abdomen, keeping a distance of 1-2 cm between the two needles and then was passed through the loop made by the first needle with sufficient length of 7-10cm with the help of needle holder and then both needles was withdrawn outside and both ends of polydioxanone suture were tied in 5-6 knots securely (Figs 2&3). Fascial closure was done using PDS suture and skin closed with polyamide sutures.

Postoperatively — Oral fluids were started on first post operative day and ambulation was allowed. Patients were followed up for Postoperative complications and were advised to wear abdominal binders for a minimum of 1 month. Pain was assessed post operatively and on follow up using Visual Analog Scale (VAS) asking the patients to score their pain from 0 (no pain) to 10 (severe pain) . Quality of life of the patients was assessed using Carolinas Comfort Scale (Fig 4) which is a preformed questionnaire and each parameter in it is given a score of 0 to 5 with a maximum overall score of 115. Higher the score , poorer the quality of life .

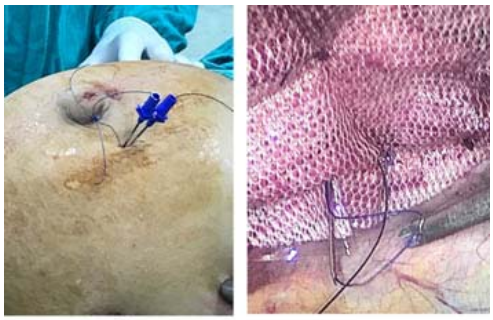


Fig 2 — Showing 2 needle technique

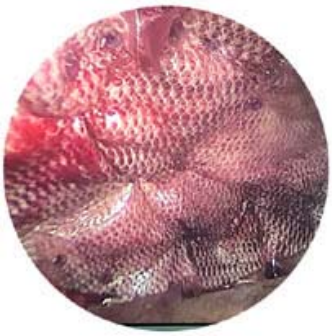


Fig 3 — Complete closure with Mesh

Results

Forty patients suffering from incisional hernia were admitted, examined and subjected to Laparoscopic Hernia Repair. With maximum patients in the range of 40-50 years. There were 34 females (85%) and 6 males (15%) in our study. Obesity being the most common risk factor was seen in 29 patients (72.5%) with a BMI above 30 kg/m^2.

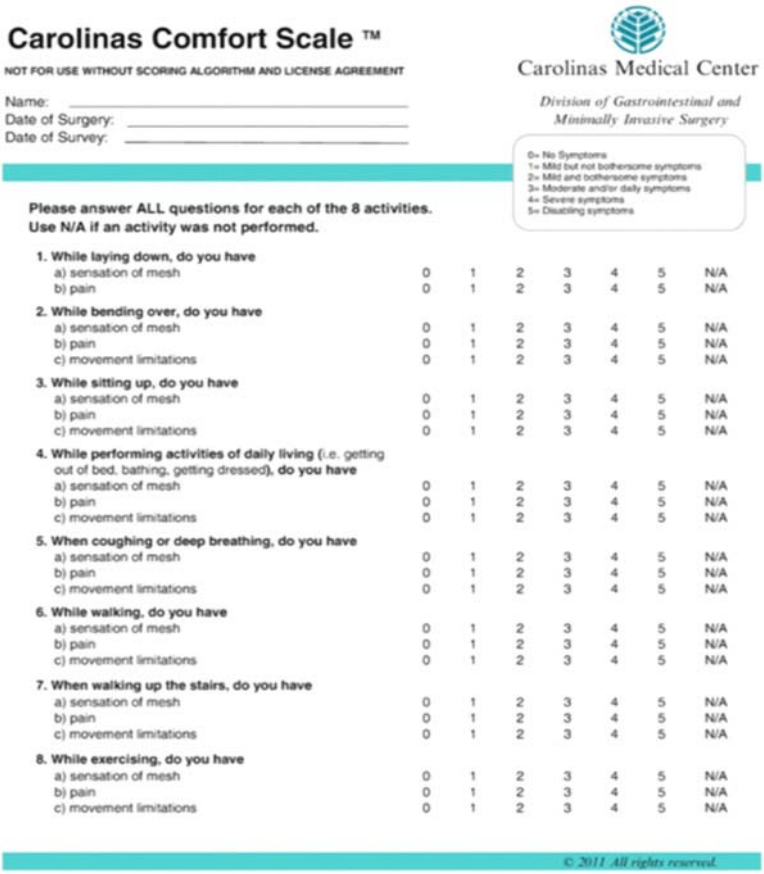
4 of the 6 males in our study were chronic smokers. 12 patients had associated co-morbid conditions out of which 8 patients had hypertension only, 2 patients had both hypertension and diabetes out of which one had associated Ischemic Heart Disease and 1 patient had Diabetes Mellitus only, 3 patients had Chronic Obstructive Pulmonary Disease and 1 patient had history of Hypothyroidism with Recurrent Hydatid Cyst in the Liver.

Incisional hernias were observed mostly in patients with history of obstetric and gynaecological procedures. In 26 patients (40% cesarean section 25% hysterectomy) followed by open cholecystectomy and laparotomy in 5 patients Lower midline incision was the commonest site for development of incisional hernia (40%) followed by transverse incisions (25%) and upper midline incision (7.5%). In 75% of the patients developed hernia within 2 years of the previous Surgery (Table 1). History of wound infection was seen in 9 patients out of which 2 had wound dehiscence.

The size of hernial defects ranged from 2.5 cm to 10 cm in greatest dimension as identified on imaging (Ultrasonography and CT Scan). Mean length of incision was 13.90 ± 3.16 cm with hernial defect size ranging from 3 to 10 cm measured in greatest dimension.

Intraoperatively, 80% patients were found to have adhesions of omentum with anterior abdominal wall whereas in 7 cases (17.5%) had adhesions of omentum with small gut and one patient had adhesions of omentum with transverse colon. Mean size of the composite Mesh used for covering the entire previous incision was 347.50 ± 125.32 cm^2. The mean operating time was 109.17 ± 30.02 mins (60-170mins). A combination of tacks and delayed absorbable transfascial sutures were used for fixation. No conversion to open procedure was required in any case. 2 patients (5%) out of forty needed limited conversion because of adhesions of the gut to the skin Intraoperatively, 15% patients had haemorrhage while applying transabdominal sutures for Mesh fixation which was managed. No other intraoperative complication was seen.

On Postoperative pain assessment using Visual analog scale, 33 patients (82.50%) had moderate pain in the immediate postoperative period while others complaint of mild pain only. Only 13 patients continued to experience moderate pain after 2 days on mobility



Carolinas Comfort Scale ™

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Carolinas Medical Center

Division of Gastrointestinal and Minimally Invasive Surgery

Name: _____

Date of Surgery: _____

Date of Survey: _____

0= No Symptoms
1= Mild but not bothersome symptoms
2= Mild and bothersome symptoms
3= Moderate and/or daily symptoms
4= Severe symptoms
5= Disabling symptoms

Please answer ALL questions for each of the 8 activities. Use N/A if an activity was not performed.

1. While laying down, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
2. While bending over, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
3. While sitting up, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
4. While performing activities of daily living (i.e. getting out of bed, bathing, getting dressed), **do you have**							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
5. When coughing or deep breathing, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
6. While walking, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
7. When walking up the stairs, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A
8. While exercising, do you have							
a) sensation of mesh	0	1	2	3	4	5	N/A
b) pain	0	1	2	3	4	5	N/A
c) movement limitations	0	1	2	3	4	5	N/A

Fig 4 — Carolina Comfort Scale

Table 1 — *Distribution of Patients According to Time of Onset of Hernia after Surgery (months)*

Time of onset of hernia (months)	No of patients	Percentage
≤6 months	7	17.5
7-12 months	11	27.50
13-18 months	7	17.5
19-24 months	5	12.5
> 24 months	10	25.0
Total	40	100

or straining while the others complaint of mild pain Most of the patients (77.5%) were made ambulatory on 1st POD .There was one patient who suffered from respiratory Tract Infection (consolidation) during the hospital stay requiring ventilatory support for two days following which she recovered and 4 patients suffered from Urinary Tract Infection diagnosed during the first week managed conservatively, all of whom had suprapubic hernias and were catheterized prior to Surgery. The average postoperative hospital stay for patients was 3.3 ± 0.83 days.

In 4 patients (10%) developed Seroma at the site of hernial repair which completely resolved spontaneously within 6-8 weeks. Wound infection and port-site cellulitis was observed in 1 patient each managed with local debridement + oral antibiotics (Table 2).

Upto 3 weeks, 22 patients complaint of mild pain at suture site which resolved spontaneously whereas 2 patient complaint of moderate pain managed with oral analgesic. No Mesh infection seen. In 37 patients resumed their routine activity by 14th postoperative day out of which 17 were able to start their normal activity by 7th day. Majority of the patients (33) were satisfied with body image at 3 weeks, remaining patients were not satisfied due to presence of wound complications like Seroma and Cellulitis. However, at 3 months postoperatively all the patients were satisfied with their body image. At 3 weeks postoperatively, majority of the patients (80%) had a score less than 30 corresponding to relatively good quality of life using Carolina Comfort Scale (Table 3). Only one patient (2.5%) who developed wound infection requiring repeated dressings had a score more than 60. Quality of life assessment at 3 months, showed all patients had a score of 0 which means good quality of life. The mean follow up period was 22.625 ± 1.97 months ranging from 18-26 months and we did not observe any recurrence during our follow up.

Table 2 — *Distribution of Patients According to Wound Related Complications*

Wound related complication	No of patients	Percentage
Seroma	4	10.00
Wound infection	1	2.50
Port site cellulitis	1	2.50
Abdominal wall ecchymosis	2	5.00
No wound related complication	32	80.00
Total	40	100

Discussion

The repair of incisional hernia has been a challenging problem for which different techniques have been described. Various series of study have shown the superiority of laparoscopic approach over the open approach for Incisional Hernia Repair in terms of quicker recovery time and less postoperative pain and it is now widely accepted[3,4].

In our study the mean age of the patients was 52.30 years similar to findings in various studies in the past[5-7]. This occurrence at an older age has been explained by decreased Reticulin Fibres and Hyaline degeneration of Collagen Fibres from the skin causing delayed and impaired wound healing.

Moore M, *et al*[8] observed there were 75.55% females similar to 85% females in this study. In a study by Bhamre SD *et al* incidence of incisional hernia was twice more common in females as in males[9]. Mean body mass index of the patients in our study was 32.37kg similar to that observed by Chelala E, *et al* [10].

In our study 2 of the 3 diabetic patients with IH, had history of wound infection following previous surgery making diabetes a strong risk factor for IH. 22.5% of cases in our study had history of wound infection similar to 20% noted in studies conducted by Suhas, *et al*[11].

Considering risk factors, BMI>30 kg/m^2 was found in 72.25% patients. Among other risk factors observed in our study hypertension was the commonest in 10 patients (25%), Diabetes in 3 patients (7.5%), COPD in 3 patients (7.5%%) and smoking seen in 2 patients (6.66%). In a study by Khandra H, *et al*[12] 50% had risk factors: Hypertension being the commonest (43.33%), Chronic Cough (10%) and Diabetes Mellitus (10%).

Most patients (40%) in our study had previous surgeries using lower midline incisions most of whom underwent Obstetric and Gynaecological procedures similar to findings in studies where more than 50% of patients had lower midline incisions[11,12]. This may be because intra-abdominal hydrostatic pressure is higher

Table 3 — *Distribution of Patients According to Quality of Life Assessment at 3 Weeks Postoperatively Using Carolina Comfort Scale*

Quality of life	No of patients	Percentage
≤10	13	32.50
11-20	10	25.00
21-30	9	22.50
31-40	4	10.00
41-50	2	5.00
51-60	1	2.50
>60	1	2.50

in lower abdomen compared to upper abdomen in erect position ie, 20 cm of water and 8 cm of water respectively and posterior rectus sheath is also absent below arcuate line.

Majority of the patients (75%) developed hernia within first 2 years of the previous surgery. 80% of patients developed incisional hernia within 1 year of previous surgery and only 3.8% after 2 years in a study by Sharma VM *et al*[13].

In order to cover the whole of previous incision site in our study, the length of previous incision was taken into regard for deciding the Mesh size keeping in view an overlap of at least 5 cm all around the defect. Most of the studies advocate an Mesh overlap of a minimum of 5 cm around the hernial defect[14,10] and we advocated the same. Only a few studies available in the literature advocated covering the whole of previous incision only when they noticed recurrence following their earlier repairs of hernial defect and later did not find any recurrence in their follow up[2,17]. It is recommended to access the abdomen off the midline, to avoid areas with potential bowel adhesions. Regarding port placement, it is desirable to have the working ports as far lateral as possible to expose midline hernias and to be able to place a large piece of Mesh without interference. In our study too, initial access to the abdomen could be accomplished by closed technique – inserting Veress needle in left hypochondrium (palmer's point) away from the hernia defect similar to the technique used in various studies[18,19], as we did not have any case of hernia in left hypochondrium or any contraindication for left hypochondrium access.

We carried out an additional step of closing the defect in our patients before placing the Mesh. We used composite Meshes with its peritoneum side made of polypropylene or polyester giving structural strength and promoting tissue ingrowth and visceral side having polyester lined by collagen forming bowel-protective anti-adhesion barrier similar to the Mesh used in a few studies[7,20]. On the contrary some studies used expanded Polytetrafluoroethylene Mesh (ePTFE)[18,19] and Chowbey PK, *et al*[6] used Polypropylene Mesh. However, we did not use either due to its lack of memory making it difficult to work with and tendency to produce more fibrosis and adhesions .

Van't Riet M, *et al*[21] noticed 2.5 times greater tensile strength of suture in transabdominal suture than that of tacks with reduced recurrence in Laparoscopic ventral Hernia Repair. Therefore, we used a combination of tacks and delayed absorbable snugly tight transfascial sutures for Mesh fixation.

The mean operating time in our study was 109.17 mins which was similar to 110 minutes in the defect closure group in a study by Palanivelu C, *et al*[22]. Longer operating time was attributed to using larger Meshes. We had two cases (5%) of limited conversion (hybrid technique) wherein gut was adherent to skin, so to avoid enterotomy we had to make a small 8 cm incision over the skin and did adhesiolysis followed by closure of fascial defect and laparoscopic placement of mesh similar to rate of limited conversion observed by LeBlanc KA, *et al*[5]. No conversion to open surgery was observed.

Most patients in our study 33 (82.50%) experienced moderate postoperative pain at 24 hours and during a follow up period of 3 weeks, pain at suture site responded to oral NSAID except in 2 cases (5%) where postoperative pain at suture site persisted beyond 3 weeks and subsided by 6 weeks with the use of oral paracetamol and diclofenac tablets. No patient in our study required long acting local aesthetic. To prevent ischaemic pain associated with transabdominal suture fixation we used Polydioxanone suture which were tied snugly. Pain at operated site has also been reported when tacks alone were used[6].

We had 4 patients (10.00%) who developed Seroma at the site of hernial repair which resolved spontaneously within 6-8 weeks. Low incidence of Seroma could be attributed to defect closure prior to Mesh placement since it provides a lattice made by viable tissue for Mesh placement and reduces dead space[22].

Wound infection was seen in 1 patient who underwent limited conversion (2.5%) which was managed with local dressings and oral antibiotics. In another patient we had port site Cellulitis managed with oral antibiotics whereas Heniford BT, *et al*[21] observed five patients with trocar site infection who were treated successfully with oral or intravenous antibiotic. Mesh infection was noted in a few studies where the Mesh had to be removed[6,18]. We did not notice any Mesh related complication in our series.

We observed that 42.5% patients resumed their normal routine activity by 7th postoperative day while only 2 patients resumed their work by third week because of prolonged suture site pain. Khandra H, *et al*[12] observed that 46% patients in their study resumed daily work within 6-10 days.

In our study the follow up period ranged from 18 to 25 months which included physical examination, follow up Ultrasound and assessment of quality of life. There was not a single case of recurrence in our study with a minimum follow up of 21.625 months suggesting that until now there is no technical failure in our study. Le Blanc KA, *et al*[22] observed a 9% recurrence rate over a mean follow up of 36 months, one of which developed at a site other than the previous repair, following which they started the practice of covering the entire incision that contains the hernia rather than

only the site of the hernia itself to reduce recurrence. Koehler RH, *et al* observed recurrence in 3 patients (9%), one of which developed in a section of previously intact scar just above the original mesh placed 15 months previously[17].

Fixation of Mesh may significantly impact the rate of recurrence. Recurrences upto 3-4% have been reported in various studies where only tacks were used for Mesh fixation[4,19,25]. Insufficient Mesh overlap over the defect was believed to be a major cause for recurrence in various studies[7,10]. The observations from studies by Wassenaar EB *et al*. suggest recurrence occurrence due to disregard for a well accepted principle - that the whole incision not just the hernia must be addressed after observing recurrences in another part of the previously intact original scar. No recurrences after repairing the recurrences by placing a larger mesh over entire incision and not just the hernia[2]. Keeping this in view, we covered the whole incision with the mesh ensuring an overlap of atleast 5 cm all around the defect.

Carolina comfort scale was used for assessment of quality of life and patients were questioned about their postoperative body image. At 3 weeks, 33 patients (82.5%) were satisfied with their body image and at 3 months all the patients were satisfied. Vorst AL, *et al*[23] suggests that Carolinas comfort scale is hernia specific and assesses pain, limitations in movement and Mesh sensation for eight daily activities. There was no mortality in our study.

Conclusion

Based on our observations we conclude that incorporating few technical modifications in minimally invasive approach for incisional hernia repair like prior defect closure, using larger Mesh that covers the whole incision not just the hernial defect, dual fixation of Mesh and pre-operative optimisation of risk factors results in reduced incidence and morbidity associated with incisional hernia. As we have not found any recurrence in our follow up, we believe that the whole incision and not just the hernia must be addressed.

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