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Original Research Article

The clinical study of the incisional hernia and its management

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ABSTRACT

Background: Hernia is defined as abnormal protrusion of viscus through a normal or abnormal weakness in the wall of its containing cavity. Incidence of Incisional hernias is 60%. It is the most common complication after exploratory laparotomy followed by LSCS.
Methods: Data was collected for 30 cases of incisional hernia according to the proforma which included detailed history, clinical examination and investigation. Data was tabulated, analyzed and results interpreted.
Results: Incisional hernia was more common in females with the ratio 1.5:1. The incidence of incisional hernia was highest in the age group ranging from 30-50 years. Most of the patients presented with chief complaint of swelling (100%) followed by pain and swelling (24%). Incisional hernia was more common in patients of previous history of abdominal procedures (explorative laparotomy 53%) followed by gynaecological operations (23%). Out of 30 patients studied, 20 underwent only mesh hernioplasty (67%), 10 underwent sublay mesh hernioplasty (23%).
Conclusions: With prosthetic mesh, defects of any size can be repaired without tension. The polypropylene mesh, by inducing inflammatory response sets up scaffolding that in turn induces the synthesis of collagen. Thus, the superiority of mesh repair over suture repair can be accounted for.

Keywords: Hernioplasty, Incisional hernia, Ventral hernia

INTRODUCTION

Hernia is defined as the protrusion of any organ or tissue as a whole or part out of its boundary through an anatomical or acquired weak spot.[1] The development of abdominal surgery in the nineteenth century and the excision of an ovarian cyst by Mcdowell in 1809, partial gastrectomy by Billroth, cholecystectomy by Langenbuch have been followed by operations to manage the incisional hernias.[2]

The field of hernia repair has evolved as a result of surgical innovation and has benefited significantly from technologic improvements. The tension-free repair is one of the key concepts that have revolutionized hernia surgery. The use of mesh prosthesis to approximate the fascial defect has resulted in a decrease in recurrence rates for Ventral Hernias. More recently, laparoscopic approaches to the Ventral Hernia have extended the options and approaches for repairing the fascial defect.[3]

The mechanism of incisional hernia formation

Laparotomy wounds are totally dependent on suture until breaking strengths are achieved. Burst abdomens, or acute fascial dehiscence with evisceration, are an important extreme of acute wound failure.

Acute wound healing fails when there is a deficient quantity or quality of tissue repair.[4]

Inadequate hemostasis owing to platelet dysfunction or poor technique can result in hematoma formation with ensuing mechanical disruption of a provisional wound matrix. A delayed or deficient inflammatory response can result in wound contamination or infection with abnormal signaling for progression into the fibro-proliferative phase of acute tissue repair. A prolonged inflammatory response owing to the presence of a foreign material, like a mesh implant, or wound infection will delay the progression of acute wound healing into the fibro-proliferative phase, where rapid gains in breaking strength should occur.[4]

Overall tissue strength of a wound is essentially zero during the inflammatory phase, thus an excessive or prolonged inflammatory response as is seen with foreign bodies, like suture or mesh material, or infections predispose to wound failure. Steroids can reduce wound inflammation, but also inhibit collagen synthesis and wound contraction, synergistically impeding tissue repair. Finally, too little or too much tension across the laparotomy tendon repair may disturb the optimal set point of a normal mechano-transduction mechanism, again resulting in premature laparotomy wound fibroblast cell-cycle arrest. Different tissue heals at different rates. Tissue repair is an anabolic process that requires both energy and adequate nutritional building blocks. Patients, who are malnourished or actively catabolic, such as in the systemic inflammatory response syndrome, demonstrate impaired healing. Vitamins C, A, and B6 each are required for collagen synthesis and cross-linking.[4]

Incisional hernia is a common and often debilitating complication after laparotomy. Despite significant advances in many areas of surgery, correction of incisional hernias continues to be problematic, with recurrence rates ranging from 5% to 63% depending on the type of repair used.

Recurrence rates are likely underestimated because of a lack of long-term follow-up and objective criteria in the literature to determine true recurrence.[5]

The gradual enlargement of the hernia over time results in a relative loss of abdominal domain, with adverse effects on postural maintenance, respiration, micturition, defecation, and biomechanical properties, which have a profound impact on patients 'overall physical capacity and quality of life. As patients are forced to alter their lifestyle, their ability to work becomes impaired, which has negative economic consequences. Progressive enlargement of the hernia also results in a cosmetic deformity, which is detrimental to patients'self-esteem.[5]

Incisional hernias are the only abdominal hernias that are iatrogenic. Controversy exist regarding the ideal treatment of incisional hernias. Nowhere in surgery does the phrase 'if there are multiple ways of fixing a problem then there is not one good way' hold true more so than with incisional hernia repair.[5]

Etiology

Many patient-related risk factors have been implicated in the development of incisional hernias, including obesity, smoking, aneurismal disease, chronic obstructive pulmonary disease, male gender, malnourishment, corticosteroid dependency, renal failure, malignancy, and prostatism. Many of these risk factors may contribute to the development of an incisional hernia, but no single factor is so regularly associated that it may be declared as serving a truly etiologic role. Postoperative wound infection has been found to be the single most significant prognostic factor in the development of incisional hernia. Obesity often has been cited as a risk factor, with an incisional hernia rate of 15% to 20%. Aneurysmal disease also an independent risk factor in the development of incisional hernias.[6]

Closure under tension results in fascial strangulation and hernia formation. 50% of hernia recurrences are detected in the first postoperative year, 75% are detected at 2 years, and 90% are detected at 3 years, with continued failure rates of 2% per year thereafter. These findings implicate technical factors in early wound failure and patient-related factors in late wound failure. Controversy exists regarding the optimal closure material and technique used to avoid incisional hernias.[7]

Presentation and natural history

Patients typically present with a bulge in a portion of the healed surgical incision. Complaints of dull abdominal discomfort and associated nausea are common and are related to stretching of the bowel mesentery as it protrudes through the defect. Bowel obstruction may result from incarceration in the hernia sac but is more often caused by twisting of the bowel around adhesions at the lateral margins of the hernia defect.[7]

The abdominal wall has important functions in respiration. As the hernia defect widens, the diaphragm loses synergy with the abdominal wall, as evidenced by paradoxic abdominal respiratory motion. Trunk motion abnormalities are common in patients with incisional hernias.

The abdominal wall plays an important role in posture maintenance and support of the lumbar spine. Patients with large incisional hernias often have significant lumbar lordosis and disabling back pain. Dermatologic changes may occur as the hernia enlarges. As the overlying skin is stretched, the subcutaneous tissue atrophies and the skin at the apex becomes ischemic, which renders it susceptible to ulceration and infection.[7]

Types of prosthetic mesh repair

Many variations and combinations of mesh repair have been described. They are as follows,

- Underlay Graft: - A mesh may be sutured in place deep to peritoneum
- Inlay Graft: - Mesh is placed between peritoneum and abdominal wall and sutured to edge of the defect.
- Overlay/onlay Graft: - Larger mesh is placed over the defect and sutured
- Both Inlay and Overlay: - are used in combination
- Large Underlay Graft: - A large graft can be placed subperitonealy extending almost over the anterior abdominal wall and sutured in place
- Large Overlay Graft: - Graft is kept above the defect and surrounding muscles and sutured in place
- Both large underlay and overlay Graft: - Both large underlay and large overlay graft can be used together for very weak abdominal wall
- Reinforcing strips: - Onlay and Underlay strips can be used
- Wrap Around: - Reinforcement of wound edges with mesh. Two sheets of mesh sutured to abdominal wall then sutured to each other to draw together to the edge of the wound.[8]

METHODS

The prospective study included 30 adult patients of incisional hernias who were admitted to surgical wards of MMIMSR, Mullana (Ambala), Haryana, India Cases were enrolled on basis of random numbers. The patients were included in the study after taking well informed consent. These patients were thoroughly examined, investigated and evaluated preoperatively.

Patients fit for anaesthesia were taken up for surgery after written consent. Depending on the age, presentation, tone of the abdominal muscles and affordability of the patient for the operative procedures patients were subjected to the various surgical repairs. Data was collected by post-operative monitoring and follow up period of 6 months after discharge and was analyzed.

Clinical assessment and investigation

Detailed history of the patients and findings of clinical examination were recorded and following investigations were done in all patients.

- Haematological investigations: HB, TLC, DLC, BT, CT
- Biochemical investigations: RFT, LFT, Viral markers
- Radiological investigations: USG Abdomen
- ECG.

Pre-operative preparation

- The patients were admitted one or two days prior to the surgery
- Pre Anaesthetic Checkup was performed in all patients and fitness for surgery was taken
- Informed consent was obtained
- On preoperative night, the patients were given the pre anaesthetic medication. The patients were kept fasting after midnight. On next day morning, a broad spectrum antibiotic shot was given to the patient and preoperative medication given as advised by the anaesthetist
- Patient was asked to void immediately before being shifted to the operation theatre. All cases were operated under appropriate anaesthesia.

Operative procedure

Type of repair that was done in the patients depending on the size of defect. A standard protocol for various techniques was adapted to remove the disparity of bias toward the procedure.

Post-operative evaluation

Type and amount of drain content was noted in cases where intra operative drains were placed. Regular dressings were done and condition of wound was monitored regularly and noted. Sutures were removed accordingly depending on the condition of wound.

Follow up for 6 months

Complication of the procedure was noted after detailed physical examination and condition of the wound.

Statistics tool/ technique

Data was collected and entered in Microsoft excel and analysed by SPSS version 20 for windows. Data was expressed in No. / % and significance of any difference in the variables were checked by Chi square and Fischer exact test. P value of < 0.05 was considered significant.

RESULTS

Among incisional hernia, majority of cases were females (19 of 30 cases) (63%) and males comprised 11 of 30 cases (37%) (Table 1).

Table 1: Sex incidence.

Hernia	No of cases	Sex		Percentage	
		Male	Female	Male	Female
Incisional hernia (IH)	30	11	19	37%	63%

Maximum distribution of age in incisional hernia was found in 5th decade (33%) followed by 4th decade (30%) and 6th (13.25), 7th (13.25%). 3rd (7%) decade respectively (Table 2). In 15 out of 30 cases (50%) of incisional hernia, patients gave history of wound infection following previous surgery. In 2 cases (7%) there was abdominal distention following previous

surgery. 5 cases (17%) gave history of chronic cough secondary to COPD.

Table 2: Age distribution of incisional hernia.

Age in years	No. of cases	Percentage
18-30	2	7
31-40	9	30
41-50	10	33
51-60	4	13.25
61-70	4	13.25
71-85	1	3.5

2 cases each (7%) of obstructive uropathy and diabetes presented as a risk factors. 11 patients (37%) were obese (Table 3).

Table 3: Factors in the development of incisional hernia.

Factor	No.	Percentage
Wound infection following previous surgery	15	50
Abdominal distension	2	7
Obesity	11	37
Chest infection/ COPD	5	17
Obstructive uropathy	2	7
Diabetes	2	7

Among previous surgeries preceding to incisional hernia, laparotomy was commonest in 16 cases (53%) followed by Lower Segment Caesarian Section in 8 cases (27 %) (Table 4).

Table 4: Types of previous surgery in incisional hernia.

Name of surgery	No.	Percentage
Hysterectomy	2	7
Lower segment caesarian section	8	27
Explorative laparotomy	16	53
Lap. cholecystectomy	1	3
Open cholecystectomy	1	3
Rt. pyelolithotomy	1	3
Previous hernial repair	1	3

Table 5: Time of presentation of hernia after surgery.

Time of presentation of hernia after surgery	No. of patients	Percentage
0-3 months	0	0%
3months-1 year	11	37%
1-3 years	12	40%
>3 years	7	23%
Total	30	100%

11 out of 30 cases (37%) of incisional hernia presented within 1st year of pervious surgery whereas 12 cases (40%) presented within 1-3 years of previous surgery and 7 patients (23%) after 3 years respectively (Table 5).

Among 30 cases of Incisional Hernias, 20 underwent Onlay Mesh Hernioplasty (67%) and in 10 patients Sublay Mesh Hernioplasty (23%) was done (Table 6).

Table 6: Treatment of incisional hernia.

Type of repair	Hernia
Anatomical repair	0
Mayo's repair	0
Onlay mesh hernioplasty	20
Sublay mesh hernioplasty	10

Complications of incisional hernia

5 patients developed surgical site infections (17%), 9 patients (30%) were found to have post-surgical respiratory infections. There was no death and no recurrence found in present study.

DISCUSSION

Maximum cases of incisional hernias were presented in 5th and 4th decade. Bhamre et al found maximum patients in 6th (23.2%) and 7th (20.9%) followed by 5th (18.6%) and 4th decade (16.2%) of life respectively (Table 7).[9]

Table 7: Age distribution of incisional hernias.

Age in years	Bhamre et al [9]		Present study	
	No. of cases	Percentage	No. of cases	Percentage
18-30	4	9.3	2	7
31-40	7	16.2	9	30
41-50	8	18.6	10	33
51-60	10	23.2	4	13.25
61-70	9	20.9	4	13.25
71-85	5	11.6	1	3.5

The maximum no. of patients of incisional hernia was females (63%) in the present study which is comparable to Bhamre et al who also found female's predominance in his study (Table 8).[9]

Table 8: Sex distribution in incisional hernia.

Sex	Bhamre et al[9]		Present study	
	No. of patients	Percentage	No. of patients	Percentage
Male	13	30	11	37
Female	30	70	19	63

In 30 cases of Incisional Hernia, 26 cases (86.6%) presented with swelling and 4 cases (13.4%) presented with pain and swelling respectively. Bhamre et al found pain and swelling (55.9%) in 24 cases out of 43 cases as

presenting complaint followed by swelling (44.1%) in 19 cases. This is comparable with present study. (Table 9).[9]

Table 9: Presenting complaints of incisional hernia.

Symptoms	Bhamre et al[9]		Present study	
Swelling	13	44.1	26	86.6
Pain and Swelling	24	55.9	4	13.4
Pain alone	0	0	0	0

The maximum number of patients gave a history of wound infection following previous surgical procedures (50%).

This is similar to the Bose SM study where 53.63% had a wound infection as predisposing factor in incisional hernias and Thakore AB et al study of 46.05 % incidence of wound infection following previous surgery respectively (Table 10).[10,11]

Table 10: Predisposing factors of incisional hernia.

Predisposing	Bose SM et al[10]		Thakore AB et al[11]		Present study	
Factors	**No.**	**Percentage**	**No.**	**Percentage**	**No.**	**Percentage**
Wound infection following previous surgery	59	53.63	35	46.05	15	50
Abdominal distension	19	17.27	1	1.3	2	7
Obesity	33	30	-	-	11	37
Chest infection/ COPD	23	20.90	10	13.15	5	17
Obstructive uropathy	10	9.09	2	2.63	2	7
Diabetes	9	8.18	-	-	2	7

In present study 37 % of incisional hernias developed within 1 year. 40% developed between 1-3 years, 23% after 3 years. Viljanto J and Vanttinen E said incisional hernia usually develop within 1 year of operation and rarely after 2 -3 years.[12]

In 10 years prospective trial involving 537 patients Mudge et al showed that of the 62 patients who developed Incisional hernia, 56% did so within 1st post-operative year.[13] This study is comparable to above series with respect to time of onset of incisional hernias (Table 11).

Table 11: Time of onset of hernia.

Time of presentation of hernia after surgery	Bhamre et al[9]	Present study
Within 1 year	51.25%	37%
After 1 year	48.75%	63%

From the below table, it is found that 16 patients (53%) underwent explorative laparotomies patients and 8 patients (27%) underwent Lower Segment Caesarian Section respectively. Other surgeries were hysterectomy, cholecystectomy, pyelolithotomy. Bhamre et al also found high incidence of Incisional hernia following Explorative Laparotomy (Table No 12).[9]

This means patients who had undergone surgeries with midline incision developed incisional hernia more as compared to other surgeries. This may be because of the following features, first, Intra-abdominal hydrostatic pressure is higher in lower abdomen compared to upper abdomen in erect position i.e., 20 cm of water and 8 cm of water respectively. Second is the absence of posterior rectus sheath below arcuate line.

Third, this incision is used in gynecological surgeries who have poor abdominal wall musculature. The present study is comparable with above studies.

Table 12: Type of previous surgery in case of incisional hernia

	Bhamre et al[9]	Sharath et al[14]	Present Study
Name of Surgery	**No.**		**No.**
Hysterectomy	11	3	2
Lower segment caesarian section	5	3	8
Explorative laparotomy	12	4	16
Cholecystectomy	0	1	2
Rt. pyelolithotomy	0	0	1
Previous hernial repair	5	0	1
Appendectomy	2	3	0
Tubal ligation	6	16	0
Laparoscopy	2	0	0

Operative procedures in incisional hernia

Knight R, Fenoglio ME found that in techniques for the repair of Incisional hernias in which sutures are used, the edges of 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 suture through the tissues. With prosthetic mesh defects of any size can be repaired without tension. In addition, prolene mesh may, by inducing inflammatory

response, sets up scaffolding that in turn induces the synthesis of collagen.[15]

Raj Siddharth et al stated that small hernias less than 2.5cm in diameter are often successfully closed with primary tissue repairs.[16] However, large ones have a recurrence rate of upto 30-40% when a tissue repair alone is performed. Primary tissue repair is associated with higher unacceptable recurrence rate, nowadays; tension free mesh repair is ideal hernia repair technique.[16]

In present study polypropylene mesh and the suture material of the same type was used to repair the incisional hernias and the technique of the repair was decided by the size of the hernia defect, abdominal muscle tone, whether hernia defect could be approximated without tension and general condition of the patient. In present study we had no recurrence, however the follow-up period was variable and short to comment upon. Usher reported zero percent recurrence in 48 patients who were treated by polypropylene mesh repair.[17] The recurrence rate thus varies in different studies but all studies favor mesh repair to decrease the recurrence rate.

Complications of incisional hernia

In present study, 5 developed wound infection and there were respiratory infections in 9 patients. There was no mortality. All complications were treated appropriately. Post-operative pulmonary complications increase the incidence of herniation because of strain placed on the wound closure or straining. Robert J Baker18 stated that wound tensile strength patterns are grossly abnormal and ultimate wound integrity is usually less than satisfactory in malnourished patients.[18]

Luijendijk et al found that post-operative wound infection was the primary complication followed by haematoma, seromas, pneumonia and paralytic ileus.[19] Recurrence was 43% in suture repair and 24 % in mesh hernioplasty with no death. Korenkov M et al also found wound infection as main complication followed by haematomas and seromas.[20] Recurrence was 12.12 % in suture repair followed by 7.6% in mesh hernioplasty with no death.

With thorough patient evaluation, pre-operative skin preparation, meticulous operative technique, use of non-absorbable sutures for muscular-aponeurotic tissue, use of suction drain, use of peri-operative broad-spectrum antibiotics, nasogastric aspiration, early ambulation and chest physiotherapy, complication rates in present study were minimized

CONCLUSION

Female predominance was seen in Incisional Hernias with ratio of 1.5:1. Most of the Incisional hernias presented in 4th to 5th decades. Swelling was the most common complaint in all the cases, followed by pain and swelling both. Previous surgery or trauma was the single most crucial factor for ventral (incisional) hernias. Other etiological factors were obesity, COPD, obstructive uropathy, diabetes mellitus. Post-operative wound infection was crucial factor for development of Incisional hernias.

Mesh repair is the technique of choice for most of Incisional hernias and for all ventral hernias with large defect. Though Onlay/Sublay Mesh Placement was done according to the surgeon's choice. There were no recurrences; however, the follow up period was variable and short to comment upon. Surgical site infections and post-surgical respiratory infections were the main complications found in the present study.

With thorough patient evaluation, pre-operative skin preparation, meticulous operative technique, use of non-absorbable sutures for musculo-aponeurotic tissue, use of drains, use of peri operative broad spectrum antibiotics, nasogastric aspiration, early ambulation and chest physiotherapy, complication rates in our study were minimized.

With prosthetic mesh, defects of any size can be repaired without tension. The polypropylene mesh, by inducing inflammatory response sets up scaffolding that in turn induces the synthesis of collagen. Thus, the superiority of mesh repair over suture repair can be accounted for.

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