

## A comparative study of operative management of incisional hernia

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**Introduction:** Incisional hernia is one of the common hernias in middle aged females. There are various studies conducted on risk factors, clinical presentation and different methods of surgical repair, whether these inferences hold good for our population is a pertinent question. In view of this, we need to study Incisional hernia in our setup. **Material and method:** This study aims at diagnosing, operating and following up cases of Incisional hernia in the department of General Surgery of our Hospital from October 2010 onwards. The study is performed by analyzing various operative methods used to manage Incisional hernias. **Result:** This study include 50 cases of Incisional hernias which presented to our opd and were repaired at our hospital from our hospital 2010 to august 2012.

**Keywords:** Incisional hernia, Ventral hernia, Shoelace repair, Onlay mesh repair

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## Introduction

"Hernia is a protrusion of a viscus or a part of viscus through normal or abnormal opening in the wall of its containing cavity" [1]. "Incisional hernia is abnormal protrusion of the viscus due to failure of line of closure of abdominal incisions" [2]. Incisional hernias, also often referred to as ventral hernias, may occur in the area of any prior surgical incision. No incision in the abdomen is immune to the development of Incisional hernias, as Incisional hernias of the perineum and coccyx have also been reported [2]. These hernias can vary in size from very small and uncomplicated, to very large and complex. Incisional hernias develop in up to 11 % of abdominal surgical wounds. Incisional hernias most commonly develop as the result of:

- Disruption along or adjacent to the area of abdominal wall incision closure.
- Tension, placed on the tissue as a result of suturing wound edges inadequately or under tension.
- Other inhibitors to adequate healing (infection, poor nutrition, long smoking history, obesity, or metabolic diseases such as diabetes)

Incisional (or ventral) hernias present as a bulge, or protrusion, at or near the area of the prior surgical incision scar. Although most commonly occurring along midline incisions, virtually any prior abdominal operation can subsequently develop an Incisional hernia. These include those from large abdominal procedures (intestinal surgery, vascular surgery) to small incisions (Appendisectomy, or even laparoscopy) [2]. Again Incisional hernia can occur at any incision, but tends to be larger and more complex along prior mid-line incisions. Mid-line Incisional hernias also have a higher rate of recurrence if required using a simple tissue-to-tissue or suture-only technique under tension (up to 44 %) [2]. It is advised therefore, that these hernias be repaired initially using the far more effective. Tension free repair method using mesh so as to significantly reduce the risk of future recurrence of hernia. Incidence of Incisional hernia ranges from 2 – 11 % [22]. Incisional hernia is more common in female patient with midline incision and any postoperative complication like wound infection, burst abdomen, straining etc. Any of the above mentioned complication present at the time of previous operation predisposes

The condition. Various methods of repair of Incisional hernia have been tried starting from anatomical suturing to modern laparoscopic repair but every modality has their merits and demerits. Difficulties in finding out single superior technique are due to multifactorial nature of Incisional hernia [22]. So genuine effort is made in this study of 50 cases of Incisional hernia to learn incidence, precipitating factor and type of incision related to development of Incisional hernia and to learn various methodology for repair of Incisional hernia and its post-operative complication.

## Aims and objectives

A study of 50 cases Incisional hernia is done with following aims and objectives.

1. To study etiology of Incisional hernia.
2. To study various modalities of treatment.
3. To study post-operative complications.

## Review of literature

**History:** The term hernia is probably derived from the Greek Epvoo, "Hernios"- meaning a bud, a branch or an off shoot, and this is descriptive of the swelling that the lesion produces. The earliest recorded mention of hernia and its treatment is found in Egyptian Ebers Papyrus in 1500BC. Celsus in first century AD was the first to be aware of Incisional hernias. He advised to the study and art of herniology. Major abdominal surgery developed rapidly during the latter part of the 19th century and with it raised the incidence of post-operative hernias. For more than 100Yrs. attempts have been made to develop successful methods for repairing them. Gerdy (quoted by Ponka, 1980) has recorded as having successfully repaired an Incisional hernia in 1836. Maydl (Ponka) [7]. Is credited with an Incisional hernia repaie in 1886. He identified the musculo-aponeurotic layers and closed them in layers. W. mayo (Ponka) [7] in 1889, described his famous transverse overlapping technique for umbilical hernias, this was adopted for Incisional hernia repair by surgeons. Witzek in 1990, Goepel also in 1990, Bartlett in 1903, and McGavin in 1909 advocated the use of silver wire filigree (Jack Abrahamson) [8] (McArthur in 1901) [9]. Described the repair of Incisional hernia from contiguous facial sutures from the external oblique in autoplasic suture of hernia (Allen, 1957)

[8]. Judd in 1912 [38]. (Ponka) and Gibson in 1916 both described repair techniques based on extensive anatomical dissection of the scar and adjacent tissues. Gibson again in 1920 [39]. reported having repaired successfully (quoted Ponka, 1980 [40]. Cases of large Incisional hernias using lateral relaxing incisions in the anterior rectus sheath, parallel to the midline. Burtoin described his fingered fascia lata graft repair in 1959. Hamilton used mattresses on lay graft of fascia lata in 1968 [15]. In 1937 [40] Nuttel from Liverpool, (role and carless, 1952) detached the recti muscles from their insertions, crossed them over one another and reinserted them on the other side. In 1929, Dixon of the Mayo clinic (quoted Jack Abrahamson) [8]. described his operation, which was named Dixon's repair. He reconstituted the strong new midline anchor for the flat muscles by reconstructing a new linea Alba by suturing together a strip of fascia from the medial edge of each anterior rectus sheath. Rodney Maingot from London described his famous operation for large Incisional hernias in 1940, which was named "keel repair" by his registrars. Allen and Wallace (Ponka) [7] in 1942, pointed out, drainage tubes brought out through the operation wound are a potent cause of Incisional hernias. In 1948 Ab el [9]. reported his initial experiences with closing abdominal incisions and repairing Incisional hernias with monofilament stainless steel wire. In Lahay's practice of surgery 1950, R.B. Cattell [11]. Described the cattell's repair in five layers for moderately large Incisional hernias. Well's (11). described a method of repair using reflected flaps of anterior rectus sheath. Koontz and Throckmorton, each in 1948. [12] (quoted Allen g, 1957) used tantalum gauze. Kimberly [12]. Reported a large series of cases in which tantalum mesh was used. However tantalum mesh began to lose favour with reports of "work fracture" with fragmentation of the mesh resulting in a weakened repair and associated pain in some patients. Thomson in 1948 used pliable plastic sheets in the repair of large Incisional hernias. Schofield and his co-workers, in 1955, (quoted by J.J. Abrahams, 1957) [2]. In an experimental study, showed that, polyvinyl alcohol sponge meets all the requirements of a foreign material for use in the repair of abdominal wall defects. Abrahams J.J. and Jonassen [13] in 1957 successfully repaired recurrent Incisional hernias with polyvinyl alcohol sponge. The technique of introducing a pneumo-peritoneum preoperatively to regain abdominal domain was reported

In 1947. In more recent years, this technique has rarely been used because of the frequent use of tension free mesh repairs. Nonetheless, a number of authors still content that selected patients will benefit from progressive pneumo-peritoneum, regardless of the repair utilized [14]. The modern era of prosthetic hernia repair began in 1958, when F.C. Usher and Wallace, reported their experience with the use of a high density polyethylene (Marlex) mesh for repairing hernias and other body wall defects F.C. Usher again in 1963 [13] reported his experience with the use of knitted polypropylene version of marlex mesh, (prolene mesh) for repair of large Incisional hernias. Usher again in 1967, reported a recurrence rate of 10 % in 98 patients with Incisional hernias repaired with marlex mesh. Drainer and Reid in 1972 (quoted Ponka, 1980) [1] found marlex an effective implant but reported an infection rate of 22.2 %. In 1979 Usher, again described a technique of repair using marlex mesh in which the mesh was placed deep to the muscle and musculofascial sutures closed completely over it. In 1979, Norman Browse and Paul Hurst [16] described a method of repair using Marlex mesh as an onlay fascial approximation. To prevent the development of a chronic seroma in the abdominal wall after Incisional hernioplasty with a prosthetic material, Usher, in 1971, recommended the routine use of large hemovac drains, and the post-operative application, in 1974 [17], also advocated into the wound. Abdul-Husn, [18] in 1974 first used a synthetic mesh of polyester fibres (mersilene, Dacron) Durden and Pemberton [17], also reported their experience with the use of Dacron mesh for Incisional hernia repair in 1974. New and more innovative ways of dealing with large, complex or recurrent Incisional hernias include the use of full thickness abdominal skin, (reported by Marchac and Kaddoura in 1983), muscle and myocutaneous flaps (reported by Ger and Duboy's in 1983) [19]. Polymeric silicone (silastic) and polyglycolic acid mesh (reported by Jenkin's et. Al, in 1983) [20] or combination of mesh and an aponeurotic graft, (reported by Adloff and Arnaud, in 1987) [21]. Stone and associates, namely, a lower incidence of post-operative wound sepsis and fewer bowel fistulae. Hamer Hodges D.W. and Scott N.B. [22] in 1985 reported their successful use of PTFE mesh for repair of abdominal wall defects. Stanley D. Berliner [23] in 1989 found the expanded weave PTFE mesh satisfactory for groin hernias and currently he is studying the use of expanded PTFE

Mesh for repair on Incisional hernias. Jayanth Sharma ET al [23], in their study have stated that Incisional hernia occurring through lower midline incision was the most common variety requiring prolene mesh repair (7.5 %), prolene mesh is an excellent synthetic material incorporating with the body tissue for the repair of the hernia. Repair of giant ventral hernia becomes technically easy with the use of mesh and given good results if asepsis is ensured. Polypropylene mesh has been used extensively because it has the greatest tissue ingrowth of all the mesh products available with least complication rate [25-28]. Retrorectus placement of mesh more commonly known as Stoppa technique became more popular during the 1990s [29]. This technique keeps the hernia sac as a buffer between the mesh and the intra-abdominal contents. Laparoscopic repair of Incisional hernia came into picture in 1990s. And the use of composite mesh has promoted the interest towards laparoscopic repair.

#### Anatomy of abdominal incision:

“Technical skills and tons of antibiotics will not prevent complications, if the discipline to ensure safety is ignored’ The choice of incision and correct methods of making and closing such wounds are factors of great importance. Any mistake, such as badly placed incision, incorrect methods of suturing or ill-judged selection of suture materials, may result in serious complications such as hematoma formation, infection, such as abscess, an ugly scar, an Incisional hernias or worst of all, complete disruption of the wound.(22). Therefore to prevent such complications certain essentials should be achieved (Harold Ellis).

1. Accessibility: The incision must give ready and direct access to the anatomy to be investigated and must also provide sufficient room for the required procedure to be performed.
2. Extensibility: The incision should be extensible in a direction that will allow for any probable enlargement of the scope of the operation, but it should interfere as little as possible with the functions of the abdominal wall.
3. Security: The closure of the wound must be reliable and ideally should leave the abdominal wall as strong after the operation as before.
4. Incision placed against the lines of tension is

Prone to post-operative complication of dehiscence or hypertrophic scars. Sutures hold best when and where they pull across tissue fibers. This can be accomplished only by making the incisions so that it runs parallel to the tissue fibers. The muscle must be split in the direction of their fibers rather than cut across.

5. The incision must traverse the muscle rather than fascia as the scar left in the peritoneum is best protected.
6. Incisions placed across the blood and nerve supply are prone to post-operative complications of dehiscence.
7. Parallel incisions are generally undesirable because of compromise in circulation and denervation of muscle.
8. The rectus muscle may be cut transversely without seriously weakening the abdominal wall as such a cut passes between two adjacent nerves without injuring them. The rectus has a segmental nerve supply so that there is no risk of a transverse incision cutting off the distal part of the muscle from its nerve supply.
9. The opening made by the cut through the different layers of the abdominal wall must as far as possible not to be superimposed.
10. Re entry into the abdomen should preferably be performed through previous incisions, as there is a distinct risk that a second incision placed alongside the previous wound, would cut off the blood supply of the skin between the two incisions, resulting in necrosis of the skin bridge. Also denervated muscle may not hold sutures well.
11. In children, the skin incision should continue to Langer’s lines otherwise the scar becomes hypertrophic and unsightly with age.

#### Incidence of Incisional hernia:

- The incidence of Incisional hernia varies. In 1987 John Himans of Boston (quoted by Ponka) [6] reported an incidence of 10 % of Incisional hernias in 184 cases of laparotomies. In 1933, Cave (quoted by Zimmerman in 1967) found an incidence of 6 % of Incisional hernias in laparotomy wounds.
- Rodney Maingot states that, Incisional hernia occur in 1 – 1.4% of patient

- undergoing trans peritoneal abdominal operations. According to Acman, who studied hernias for 15 years, the incidence of Incisional hernia was 1.6%.
- Goligher and colleagues in 1975, at the Leeds General Infirmary, noted that not even a single patient out of 108 laprotomies developed incisional hernia when they were closed by all coats interrupted wires.
- Donaldson and colleagues in 1982, at Str.James's Hospital, Leeds, using the lateral paramedian incision, found only a single Incisional hernia in 231 laparotomies. Buknall and colleagues in 1982, detected 84 cases of Incisional hernias (7.4%) in 1129 major laparotomy wounds, 12 months after operation, Pollock in 1981, reviewed 961 patients, 6 months after laprotomy and detected 96 cases of Incisional hernias (10 %).

## Materials and Methods

This study aims at diagnosing, operating and following up cases of Incisional hernia in the department of General Surgery of our Hospital from October 2010 onwards. The study is performed by analyzing various operative methods used to manage Incisional hernias.

A detailed clinical study and management of 50 cases of Incisional hernia has been personally made. The cases have been selected at random. All patients of primary Incisional hernia with previous history of laprotomy are selected at random.

### Inclusion criteria

1. Only those patients who are willing to participate in study will be included.
2. Patient referred to the general surgery department for swelling per abdomen, and found to have positive finding, will be included in this study.
3. Already diagnosed cases of Incisional hernia which either need operative management or follow up and are referred to our general surgery department will be included in study.

### Exclusion criteria

1. Patient presenting to general surgery department already being operated for Incisional hernia in past and are cured completely or partially will be excluded from the study.

2. Patients with strangulated or incarcerated hernias, and pts with severe co morbid conditions (severe cardio-pulmonary disease, uncontrolled ascites) and pregnant women with Incisional hernias are excluded from the study. No other criteria have been adopted in selection of cases.

## Results and Analysis

This study include 50 cases of Incisional hernias which presented to our opd and were repaired at our hospital from our hospital 2010 to august 2012.

- In present study maximum no of patients are in age group 31 – 40 and 41 – 50, each having 13 patients. Age (21 – 30) = 6, (31 – 40) = 13, (42 – 50) = 13, (51 – 60) = 9, (61 – 70) = 9.
- In this study of 50 patients, 39(78 %) were female and rest 11(22 %) were male. Male to female ratio is near 1:4. Study conducted by Le and J.S. Bender also showed similar age distribution in their study of 150 cases.
- In present study swelling was the most common presenting symptom and was present in 47((94 %) patients, followed by pain in 39(78 %), heaviness in 12(24 %), vomiting in 6(12 %) and abdominal distension in 4(8 %) patients.
- The present study showed 16(32 %) patients presented early that is within one year of the primary operation and the rest presented late 34(68 %) that is more than one year of primary operation.
- Out of 50 cases, 29(58 %) patients had undergone some obstetric and gynecological procedure of which L.S.C.S. comprised of 16(32 %), Hysterectomy 8(16 %) and T.L. 5(10 %) patients. Of the remaining, Exploratory laparotomy comprise of 11(22 %) patients and other includes open Appendisectomy in 3(6%), Gall bladder and CBD surgery 4(8 %), laparoscopy in 2(4 %) and anterior resection 1(2 %).
- Out of 50 cases observed in our study 30(60 %) of patients had undergone elective surgery and only 20(40 %) patients required some emergency surgery.
- Out of 50 cases midline vertical incision was present in 39(78 %) patients out of which 28(56 %) had low mid line incision. Other includes Kocher's incisions in 3 (6 %),

- Mcburney's in 3(6 %), paramedian in 2(4 %) and Pfannenstiel in 1(2 %) patients.
- Out of 50 cases, 9(18 %) patients had history of wound infection at the time of their previous surgery out of which 4(8 %) underwent resuturing for wound gaping. Other complications include post op straining in 5(10 %) and distension of abdomen in 4(8 %) patients.
- Out of 50 cases, 15(30 %) patient had associated hypertension, 8(16 %) patients were diabetic. Other associated medical disease includes 5(10 %) patients.
- Study shows out of 50 cases, 20(40 %) patients had straining as a precipitating factor either due to constipation 12(24 %), chronic cough 6(12 %), or difficulty in maturation 4(8 %). Smoking was associated in 10(20 %) of patients and alcohol in 2(4 %).
- In our study obesity is taken weight more than 70 kg in women and 80 kg in men. Out of 50 cases 20 (40 %) were obese and 6 (12 %) were anemic.
- Out of 50 cases 41 (82 %) had reducible hernia and 9 (18 %) had irreducible.
- Out of 50 cases 17 (34 %) had good abdominal tone and rest 33 (66 %) had poor abdominal muscle tone.
- Out of 50 cases 19 (38 %) had intestine, 16 (32 %) had intestine and omentum, 11 (22 %) had only omentum and in 2 (4 %) patients sac was empty.
- Method of repair done 5 (Anatomical), 4 (Shoe Lace repair), 16 (On Lay mesh), 21 (In Lay mesh), 3(Intraperitoneal), 1 (Laparoscopic repair).
- Post-operative complications, wound infection in 4, Seroma in 2, Pulmonary complication in 2, Recurrence in 4, Retention of urine in 1, Sub acute intestinal obstruction in 1, Mortality in 1.
- Out of 9 patient suture repair 2 had recurrence, 1 patient by Shoe Lce repair and one with intraperitoneal mesh had recurrence.

## Discussion

It is a common complication of abdominal surgery. Reported in upto 11 % patients in general and

Up to 23.3 % of those who develop post-operative wound infection. Incisional hernia may present develop immediately after operation but presentation may be later on.

More than half of all Incisional hernia develop within first two years of primary operation. However Incisional hernia may present later and becomes symptomatic even after ten years of primary operation.

Risk factors for development of Incisional hernia include:

- Age greater than 65 years.
- Hypoproteinemia in malnourishment
- Anaemia and co-morbid disease.
- Obesity
- Wound infection is the most significant independent risk factor for Incisional hernia. The risk increases up to 25 % after wound infection.
- Increase post-operative intra-abdominal pressure in conditions like paralytic ileus, cough, vomiting, retention of urine can cause increase chances of Incisional hernia
- Technical factor like type of incision, method of closure and type of suture used.
- Smokers have a 4 fold increased risk of Incisional hernia. In this clinical study

In this clinical study, 50 patients with Incisional hernia were admitted and operated from December 2010 to april 2012.

The same group of patients was studied for various risk factors in causation of Incisional hernia and its clinical presentation.

Table 1: Comparison of previous operation

Preoperative Operation	No. of patients in present study	No. of patients in Bhat Mahabaleshwar G study
L.S.C.S.	16	78
Exploratory Laprotomy	11	15
Hystrectomy	8	22
T.L.	5	23
GB and CBD operation	4	12
Open appendisectomy	3	8
Laproscopy	2	7
Anterior resection	1	5

Out of 50 cases 29 (58 %) patients had undergone some obstetric and gynecological procedure pf which L.S.C.S. 16, Hystrectomy 8, and T.L. 5 patients.

Table 2: Comparison of post-operative complication

Complication	No. of patients in present study (n=50)	No. of patients In study conducted by Bhat Mahabaleswar G et al (N=130)	No. of patients in study conducted by Z.S. Matar (N=68)
Wound infection	4	18	7
Seroma	2	8	5
Haematoma	0	6	2
Pulmonary complication	2	6	3
Recurrence	4	20	3
Retention of urine	1	9	1
Sub-acute intestinal obstruction	1	0	0
Mortality	1	0	0

Most common complication includes wound infection in 4(8 %) patients and seroma in 2(4 %).Bhat and Mahabaleswar study also showed a wound infection rate to be 10 %. Z.S.

Matar study also showed seroma rate of 7.35 % in their patients.

Table 3: Comparison of recurrence and mortality in various types of mesh repair

Author	Type of repair	No. of cases	Recurrence	Percentage	Mortality
Rodney	Keel	115	5	4.3	Zero
Abrahamson	Shoe Lace	300	6	2.0	Zero
Adloff	Intraperitoneal	130	6	4.5	1.5 %
Usher	Two layer	96	10	10.4	Zero

In our study, recurrence was found in 4(8 %), out of which 2 (4 %) were repaired by anatomical closure, 1 (2 %) by shoe lace repair, and 1 (2 %) by open intraperitoneal mesh repair.

Recurrence rate after mesh plasty is 2 %, which coincides with the world literature.

In our study mortality rate was 2 % and the cause was pulmonary failure with septicemia.

Mortality rate was 0.6 % in Harry et al study and was 1.5 % in Adoff et al study.

Table 4: Comparison of recurrence in open mesh repair

Author	Year	No. of patients	Type of mesh	Technique	Recurrence
Mc Carthy et al	1981	25	Polypropylene	Intraperitoneal	8 %
Matapurkar et al	1991	60	Polypropylene	Extraperitoneal	0 %
Temudon et al	1996	50	Polypropylene	Extraperitoneal	4 %
Gillion et al	1997	158	PTFE	Extraperitoneal	4 %
Mclanahan et al	1997	106	Polypropylene	Extraperitoneal	4 %
Balen et al	1998	45	PTFE	Extraperitoneal	2 %
Turkcapar et al	1998	45	Polypropylene	Extraperitoneal	2 %
Arnauld et al	1999	250	Dacron	Intraperitoneal	3 %
Bauer et al	1999	98	PTFE	Extraperitoneal	10 %
Utera Gonazalez et al	1999	84	PTFE	Intraperitoneal	2 %
Chrysos et al	2000	52	PTFE	Intraperitoneal	8 %
Luijendijk et al	2000	84	Polypropylene	Extraperitoneal	23 %
Burger et al	2004	84	Polypropylene	Extraperitoneal	32 %
Martin – Duee et al	2001	152	Polypropylene	Extraperitoneal	1 %

Most of the studies conducted on open mesh repair of Incisional hernias shows a recurrence rate ranging between 1 % to 4 %. Recurrence rate after open meshplasty in our study is 2 % which coincide coincides with the world literature.

Table 5: Comparison of suture repair Vs mesh repair

Type of repair	No. of patients in present study	Recurrence in present study	No. of patients in study conducted by Kalpan And Meier	Recurrence in study conducted by Kalpan And Meier
Suture repair	9	3 (6 %)	97	54 (29.8 %)
Mesh repair	41	1 (2 %)	84	27 (14.9 %)
Total	50	4 (8 %)	181	81 (44.7 %)

- Overall recurrence rate in our study was 8 %.
- Whereas recurrence rate in study conducted by Kalpan and meier was 44.7 %.
- Kalpan observed a recurrence rate of 29.8 % when Incisional hernia was repaired using sutures and 14.9 % when repaired using mesh.
- Low recurrence rate in our study might be because of the reason that a lot more patients were operated using mesh.

## Conclusion

In this study of 50 cases of Incisional hernia we conclude that:-

- Incisional hernia is more common in females of reproductive age group.
- Most of the females undergoing obstetric or a gynec operation with low line incision.
- Regarding etiology, previous wound complication and post-operative straining are the main important factors responsible for Incisional hernia.
- Other associated medical conditions which predisposes to the condition are obesity, anaemia and diabetes.
- Poor muscle tone and Smoking also predisposes and leads to Incisional hernia.
- Recurrence rate for sutures repair is much higher than mesh repair.
- Mesh repair is the ideal method of repair.
- In our study most of the patients 40 (80 %) were repaired by open mesh plasty which showed very good results with a recurrence rate of only 2.5 % and complication rate being 20 %, most of which were minor complications like mild wound infections, seroma etc.
- As far as mesh required is considered onlay technique is easier to perform but have more post-operative complications.
- In lay repair has its limitations of higher rate of recurrence due to tension between the edge and the mesh.
- Underlay repair is the preferred repair because of posterior protection of bowel by the posterior rectus sheath and anterior buffering by the rectus muscle and the anterior rectus sheath.
- Preperitoneal and intraperitoneal technique is a technically easier procedure but carry a higher rate of complications because of contact of mesh with bowel.
- Laparoscopic repair has all the advantages of minimally access surgery but cost factor limits its use in every patients.

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