

**DISSERTATION ON**

**“STUDY ON EPIDEMIOLOGY, CLINICAL AND  
SURGICAL ASPECTS ON INCISIONAL HERNIA”**

**M.S.DEGREE EXAMINATION  
BRANCH – I  
GENERAL SURGERY**



**THANJAVUR MEDICAL COLLEGE AND HOSPITAL**

**THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY**

**CHENNAI**

**MAY 2018**

## **CERTIFICATE**

This is to certify that dissertation entitled “**STUDY ON EPIDEMIOLOGY, CLINICAL AND SURGICAL ASPECTS ON INCISIONAL HERNIA**” is a bonafide record of work done by **Dr.A.DEEPA** in the Department of General Surgery, Thanjavur Medical College, Thanjavur, during her Post Graduate Course from 2015-2018 under the guidance and supervision in partial fulfillment for the award of M.S. **DEGREE EXAMINATION- BRANCH I (GENERAL SURGERY)** to be held in MAY 2018 under **The Tamilnadu Dr. M.G.R. Medical University, Chennai.**

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## **DECLARATION**

I declare that this dissertation entitled “**STUDY ON EPIDEMIOLOGY, CLINICAL AND SURGICAL ASPECTS ON INCISIONAL HERNIA**” is a record of work done by me in the Department of General Surgery, Thanjavur Medical College, Thanjavur, during my Post Graduate Course from 2015-2018 under the guidance and supervision of my unit Chief **DR. G. VENKATESH M.S.**, and Professor and Head Of the Department **PROF. DR. MELANGO VAN M.S., F.I.C.S** It is submitted in partial fulfillment for the award of **M.S. DEGREE EXAMINATION- BRANCH I (GENERAL SURGERY)** to be held in **MAY 2018** under the **Tamilnadu Dr. M.G.R. Medical University, Chennai**. This record of work has not been submitted previously by me for the award of any degree or diploma from any other university.

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HISTORY Major abdominal surgery developed rapidly during the later part of the last century and with it rose in the incidence of post-operative hernias. For more than 100 years, attempts have been made to develop successful methods for repairing them, but most attempts were followed by high incidence of complications and a high recurrence rate 1836

Gerdy - successfully repaired an incisional hernia. 1886 Maydl - closure of incisional hernia in layers. 1899 Mayo - described transverse overlapping technique for repair of umbilical hernia, adapted for repair of incisional hernia. 1900 Witzel Goepel - advocated use of a silver wire. 1912 Judd - method in which of flaps consisting of Peritoneum, muscle, fascia and scar tissue were overlapped over a similar flap on the opposite side. 1920

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## INTRODUCTION

An incisional hernia after open or laparoscopic surgery is defined as an abdominal wall defect that develops at the site of previously made incision through the abdominal wall thickness with or without a bulge, visible and palpable when the patient is standing and often requiring support or repair<sup>(1)</sup>.

It is a common complication of abdominal surgery reported in 4% to 11 % of patients generally<sup>(2-4)</sup>23% of those who develop postoperative wound infection. It is an important source of morbidity. A considerable proportion of patients present with incarceration and strangulation, requiring emergency abdominal surgery. Others may need to alter their lifestyle, or change or give up gainful employment, which results in an economic burden that has not been fully evaluated<sup>(5,6)</sup>.

Incisional hernia is the only abdominal hernia that is iatrogenic. Controversy exists regarding the ideal treatment of incisional hernia. Treatment involves further major surgery and the results may be poor, with recurrence rate of upto 49 % reported<sup>(7)</sup>. These high recurrence rates, prompted recommendations of a cautious attitude to surgical treatment of incisional hernia in the mid -1980's<sup>(8)</sup> Since then, in spite of the frequency of the condition and its potential morbidity, no consensus on the best treatment has been forthcoming<sup>(9)</sup>. A wide spectrum of surgical techniques has been developed and recommended, ranging from sutured techniques to the use of various types of prosthetic mesh.

Suture repair was the standard surgical treatment of incisional hernia until 1990's. Multiple retrospective studies in literature have demonstrated high recurrence rate (25-63%) of primary suture repair. This was supported by a large, prospective, randomized trial by Luijendijk and colleagues in a study comparing mesh and primary suture repair,

they found a recurrence rate of 46% in suture repair compared to 23% in mesh repair and hence recommended that suture repair should be completely abandoned. However an expert panel on incisional hernioraphy concluded that primary suture repair should be used only for simple small hernia <6cm diameter in both the axis and the repair is oriented horizontally with non absorbable, monofilament suture with a suture to wound length ratio of 4:1<sup>(9)</sup>

This has led to an increased application of prosthetic mesh for repair in all the complex incisional hernia defined as diameter >6cm size in either axis or multiple defects with defective abdominal musculature and even inmost of the simple incisional hernia. The use of non absorbable mesh may lead to seroma, fistula and infection in short term and to foreign-body reaction,chronic inflammation, pain, paraesthesia, stiffness and mesh shrinkage as long term complications<sup>(11-14)</sup>. Meshproperties (material, pore size, filament structure), mesh position (onlay, inlay, sublay, intraperitoneal). use of autodermal tissues and other factors (drainage. antibiotics) influence mesh safety.

Long term safety and improved outcome of preperitoneal retro rectus sublay technique of mesh placement has been shown in recent trials<sup>(15-22)</sup>.

However there is no randomized controlled study for comparison and validation of this useful technique with the other commonly done onlay technique.

This prospective study is meant to report the observations made on 109 consecutive cases of incisional hernia admitted and treated at Thanjavur Medical College hospital over a period between September 2016 and October 2017 and the comparison of short and long term outcomes between different open surgical techniques in a simple and complex incisional hernia repair and discuss it in the light of available literature.

## **AIM OF THE STUDY**

### **The objectives of this clinical study are**

1. Critical evaluation of the cases of Incisional Hernia to trace the obvious etiological factors  
identifying the risk factors for Incisional hernia occurrence,  
such that these can be eliminated.
2. Compare and contrast the various surgical modalities and management procedures available to evolve at a consensus for effective management of such cases based on type and size of incisional hernia.
3. To discuss the Post operative complications in mesh repair and suture repair in incisional hernia.

## HISTORY

Major abdominal surgery developed rapidly during the later part of the last century and with it rose in the incidence of post operative hernias. For more than 100 years, attempts have been made to develop successful methods for repairing them, but most attempts were followed by high incidence of complications and a high recurrence rate

- 1836 Gerdy - successfully repaired an incisional hernia.
- 1886 Maydl - closure of incisional hernia in layers.
- 1899 Mayo - described transverse overlapping technique for repair of umbilical hernia; adapted for repair of incisional hernia.
- 1900 Witzel, Goepel - advocated use of a silver wire.
- 1912 Judd - method in which of flaps consisting of Peritoneum, muscle, fascia and scar tissue were overlapped over a similar flap on the opposite side.
- 1920 Gibson - relaxing incision in the mid portion of the anterior rectus sheath.
- 1927 Freeman - proposed hypothesis for wound disruption.
- 1929 Kuntz - used fascia and tantalum for repair.
- 1934 Wangenstein - used iliotibial tract as flap for repair.
- 1936 Cave Allen & Wallace - advocated abdominal drains to be delivered through stabwounds in the flank.
- 1942 Rees & Collier - strongly advocated the use of transverse incision.
- 1956 Usher - modern era of prosthetic (Polypropylene) hernia repair using Shoelace technique.
- 1973 -
- 1993 - Le Blanc reported first case of Laparoscopic repair using Synthetic mesh.

## **REVIEW OF THE LITERATURE**

### **ETIOLOGY**

Many factors singly or in combinations may cause failure of the wound to heal satisfactorily and may lead to the development of a postoperative hernia <sup>(23-24, 37)</sup>. Two main causes are poor surgical technique and sepsis. There are two types of incisional hernia early and late.

#### **EARLY HERNIA:**

The early occurring type that appears soon after the original laparotomy closure, often involves the whole length of the wound, get widened and become a large one.

#### **Causes:**

1. Poor Surgical Technique:

(a) Non anatomical incisions:

Vertical Para rectus incisions on the outside of the lateral border of the rectus sheath, which destroys the nerve and vascular supply to the tissues medial to the incision causing atrophy.

(b) Layered closures:

Layered closures are followed by a greater incidence of postoperative hernias than wounds that are closed by a single layer-mass closure technique. This may be owing to the fact that when many sutures are used, they are closely placed and sutures are taken close to the edge of the wound.

(C) Inappropriate suture material:

80% of the final wound strength is reached after 6 months. Healed wound its maximum strength after one year. Hence the wound must be supported for at least up to this time. The sutures are entirely responsible for the integrity of the wound for the first

6 months, so any material that does not survive and maintain its strength for this time is not suitable for wound closure.

Catgut and synthetic absorbable sutures should not be used for closure of Laparotomy wounds. Biologic sutures such as silk, cotton and linen disintegrate after 2 months and also should not be used. Furthermore, these sutures, especially silk are more prone for wound infection and sinuses.

The ideal suture material for abdominal closure in the past was monofilament stainless steel wire (28G). Nowadays monofilament polypropylene or polyamide (1 or metric 4) is the suture material of choice for abdominal closure.

(d) Suturing Techniques:

Great number of small sutures, which are closely placed and tightly tied, with each taking a small bite of tissue have led to incisional hernia. A small, tightly tied suture causes ischemia and necrosis of the tissue it contains and also of an area on each side of the suture. When these small, tightly tied sutures are placed close to each other, their ischemic areas merge and thus cause necrosis of a strip of tissue all along the edge of the incision, which separates with sutures, from the rest of the abdominal wall leading to wound gaping.

(e) Tension:

Closing the wound with tension leads to hernia. The lateral pull of the abdominal wall against the suture line tends to pull the edges in opposite directions and create an area of pressure necrosis where the suture meets the tissues. This pressure necrosis is a primary cause of wound dehiscence.

**2. Sepsis:**

Sepsis is the second major cause for delay in wound healing or failure of it. It may range from frank acute cellulitis with fasciitis and necrosis of the tissues to low-grade

chronic infection. The infection causes inflammation and edema of the tissues which become soft and weakened so that the sutures tear the tissues.

### **3. Drainage tubes:**

Drainage tubes brought out through the operation wound are a potent cause of incisional hernia. Since various layers of the wound along the track of the drainage are not sutured, an open and weak passage is present through all the layer of the wound through which a hernia may develop. Also the irritation caused by the drain causes edema or softening and tearing of the tissues and cutting out of the sutures.

### **4. Obesity:**

Cutting through large masses of fat and increased retraction needed may raise the infection rate in patients. Tissues infiltrated with fat are not able to hold the suture, especially since the excess intra or extra abdominal accumulations of many kilograms of fat may add enormous tension on suture lines causing the tissues to tear under strain and to bring about a defect in abdominal wall. In addition obese patients are tend to develop other post operative complications like wound infections and pulmonary complications.

### **5. General Conditions:**

The factors influencing the rate of incisional hernia are age, malnutrition. hypoproteinemia. Avitaminosis, diabetes mellitus, anemia, jaundice, irradiation, uremia and other co morbid conditions affecting wound healing.

### **6. Post operative complications:**

Prolonged post operative paralytic ileus and intestinal obstruction with abdominal distention which places enormous vertical tension on the wound by increasing the length and at the same time raising the lateral pull on the sutures by increased girth of the abdomen.

Chest complications such as chronic obstructive airway disease, pulmonary collapse, bronchopneumonia, emphysema and asthma are also factors.

#### **7. Type of operation:**

Certain types of operations have a tendency to be followed by incisional hernia, they include laparotomy for generalized or localized peritonitis, operation for intra-abdominal malignant disease and re-operation through the original wound within the first 6 months after initial operation. The cause of the wound failure is not in the operation itself but in the presence of many factors previously mentioned.

#### **LATE HERNIAS:**

It is due to tissue failure and collagen abnormalities.

#### **Tissue failure:**

The etiology of the late occurring hernia is not clear. The hernia develops in what apparently is a perfectly healed wound that has functioned satisfactorily for 5, 10 or even more years after operation. The incidence is not related to the method used for closing the original incision and is presumably the result of the failure of the collagen that has served well for a number of years should change its structure.

Rodriguez has recently shown a decrease in oxytalan fibers and an increase in the amorphous substance of the elastic fibers as a function of age. This may be the factor responsible for alterations in the resistance of the transversalis fascia and abdominal wall scar tissue. The ageing and weakening of the tissues and the raised intra-abdominal pressure associated with chronic cough, constipation and prostatism are cited as factors.

#### **Collagen Abnormalities:**

Abnormal collagen production and maintenance have been shown to be associated with recurrent hernias in certain patients. There is a deficiency of collagen and abnormalities in its physicochemical structure, manifesting in reduced

hydroxyproline production and in changes in the diameter of the collagen fibers. These changes have been demonstrated in these patients in other sites such as skin, lung and pericardium and may be associated with the imbalance between proteolytic enzymes and their inhibitors and the enzyme abnormalities found in patients with emphysema and those who smoke. These collagen mechanisms may play a part in the development of late postoperative hernias.

In Summary the various etiological factors can be classified as follows:

**PREOPERATIVE FACTORS:**

- Delayed wound healing due to comorbid conditions as enumerated.
- Conditions causing raised intra abdominal pressure like chronic cough, constipation, stricture urethra and prostate enlargement.
- Factors weakening the abdominal wall like steroids, nerve injury, prolonged stretching due to multiple scars.

**PROPYLACTIC FACTORS:**

- Type of incision.
- Type of surgery- emergency or elective; peritonitis, malignancy.
- Suture material used.
- Technical failure like inadequate hemostasis, repair under tension. presence of dead space, improper knots, drain tubes, inappropriate approximation, etc.

**POSTOPERATIVE FACTORS:**

- Wound infection and wound failure.
- General condition and complications.
- Drugs, etc.

## **SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL**

It is important to understand the anterior abdominal wall anatomy for better and safe access to abdominal organs and prevention of incisional hernia formation and importantly for proper repair of incisional hernia.

### **THE SKIN:**

The skin of anterior abdominal wall is capable of undergoing enormous stretching.

### **THE SUPERFICIAL FASCIA:**

The superficial fascia of the abdomen consists of a single layer containing a variable amount of fat; except near the groin where it is divisible into two layers namely the superficial fatty layer or fascia of camper and the deep membranous layer or the fascia of scarpa.

### **THE MUSCULO- APONEUROTIC LAYER:**

It can be divided into two parts: anterolateral and midline. The anterolateral part is composed of the external oblique, the internal oblique and the transverse abdominis muscle. The middle portion is composed of the rectus abdominis and the pyramidalis muscle.

### **ANTEROLATERAL PORTION:**

THE EXTERNAL OBLIQUE MUSCLE arises from the lower eight ribs. Its fibres downwards, forwards and medially and forms the aponeurosis mostly which attaches above to the xiphoid process, the lineaalba, the pubic symphysis, the pubic crest and pectineal line of the pubis and the lower fibres are inserted directly into the outer lip of iliac crest. The free lower border of the aponeurosis is folded upon itself as the inguinal ligament.

THE INTERNAL OBLIQUE MUSCLE takes origin from the thoracolumbar fascia, intermediate area of the anterior two third of the iliac crest and lateral two third of the

inguinal ligament. They are attached to the costal cartilage and become aponeurotic thereafter. Medially it splits to enclose the rectus abdominis and below the umbilicus the posterior lamella ends as the semicircular fold of Douglas or the arcuate line and passes in front of the rectus. Below, it arches and attaches to the pubic bone as the conjoint tendon along with the Transversus abdominis.

THE TRANSVERSUS ABDOMINIS MUSCLE takes origin from the inside of each costal cartilage interdigitating with the costal origin of the diaphragm and in continuity with the lower costal fibers, it arises from the lumbar fascia and from the inner lip of the anterior two third of iliac crest and from the lateral half of the inguinal ligament. The fibers become aponeurotic and pass behind the rectus to fuse with the internal oblique aponeurosis into the Linea alba. Below the arcuate line it passes in front of the rectus and below it gets inserted into the pubic bone as the conjoint tendon.

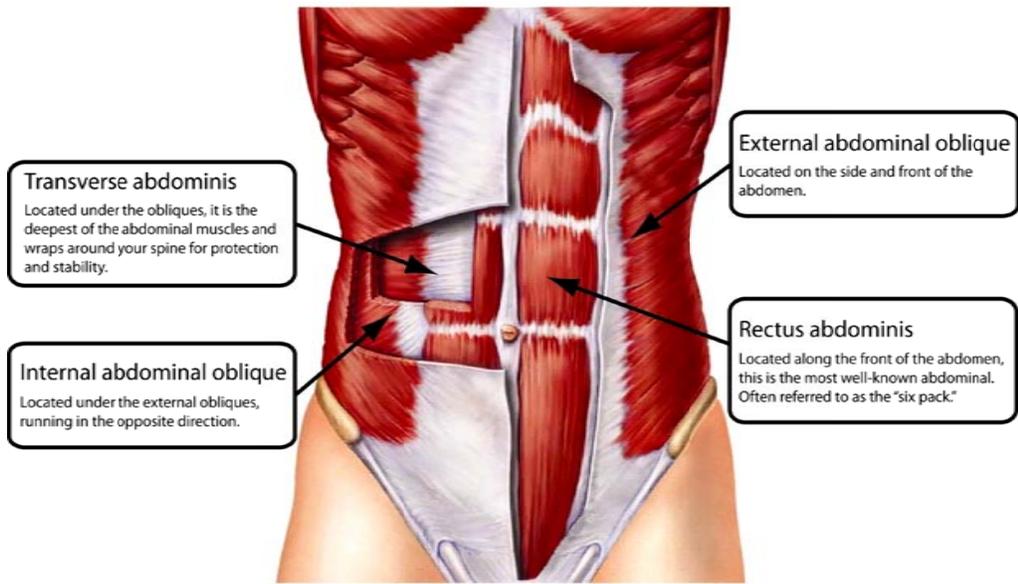
#### **MIDDLE PORTION:**

THE RECTUS ABDOMINIS MUSCLE takes origin as two heads. The medial end arises from the symphysis pubis and lateral head arises from the upper border of the pubic crest. It is inserted to the front of the fifth to seventh costal cartilages.

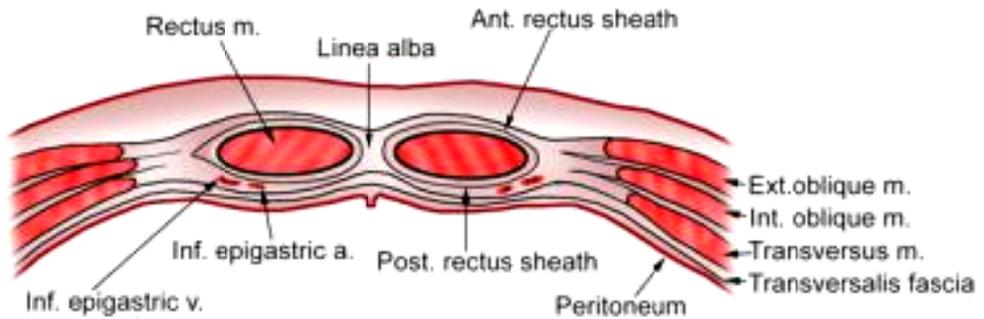
THE PYRAMIDALIS MUSCLE is a small muscle taking origin from the pubic crest and it converges with its fellow into the Linea alba 4 cms above its origin

THE RECTUS SHEATH is formed by the aponeurosis of the above three muscles. The internal oblique aponeurosis splits into anterior and posterior layers to enclose the rectus muscle. The external oblique aponeurosis fuses with the anterior layer, where as the transversus abdominis aponeurosis fuses with the posterior layer. Below the arcuate line all the three-aponeurosis pass in front of the muscle and hence the posterior wall is deficient below the arcuate line

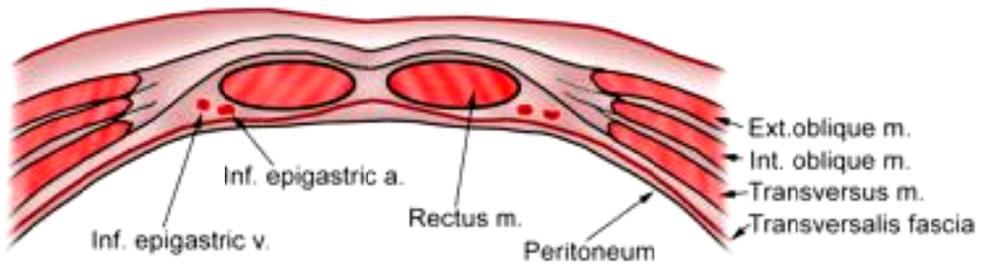
# ANATOMY OF ANTERIOR ABDOMINAL WALL



## Above Arcuate Line



## Below Arcuate Line



The tendinous insertions in the rectus muscle gains attachment to the anterior rectus sheath as well as to the lateral edge of the Linea alba. The site of attachments of the lower tendinous insertion is a critical spot and may be torn in severe contractions of the lower part of abdomen as in straining resulting in hernia at a later date.

The skin above the umbilicus is attached to the Linea Alba by fibrous bands. The absence of these bands below the umbilicus allows the formation of an obese pendulous belly below. These bands may exert a harmful traction downwards to the Linea Alba resulting in herniation. The linea alba is relatively avascular but it is perforated by blood vessels from below to the skin superficially. It is through these perforations hernia occurs.

#### **BLOOD SUPPLY OF THE ANTERIOR ABDOMINAL WALL;**

Anterolateral part is supplied superficially by three branches of the femoral artery namely; from lateral to medial superficial circumflex iliac artery, the superficial epigastric artery and the superficial external pudendal arteries which anastomoses with the deep arteries which lie between the transverse abdominis and the internal oblique muscles.

The deep arteries are posterior intercostal arteries 10 and 11, the anterior branches of the four lumbar arteries and the deep circumflex iliac artery. The rectus sheath is supplied by two arteries namely the superior epigastric artery from internal thoracic artery and the inferior epigastric artery from the external iliac artery. The veins follow the arteries.

#### **NERVE SUPPLY TO THE ANTERIOR ABDOMINAL WALL:**

Both the anterolateral portion of the abdominal wall and the rectus abdominis muscle are supplied by the anterior rami of the 7th to 12th thoracic nerves and the 1<sup>st</sup> lumbar nerve.

**CLINICAL MANIFESTATIONS:**

- \* Unsightly bulge in the operated scar
- \* Pain and discomfort
- \* Heavy, Sickening, dragging sensation aggravated by Coughing and straining.

**Complications:**

- Intestinal obstruction.
- Strangulation.
- Ulceration, Rupture.
- Cosmetic disfigurement.

## **PRE OPERATIVE PREPARATIONS**

The following pre operative measures may be of considerable benefit in achieving an excellent degree of success in repair of hernias.

1. Optimal skin hygiene
2. Weight reduction
3. Management of intercurrent disease
4. Repair of nutritional and vitamin deficiencies
5. Therapeutic pneumoperitoneum

### **Optimal Skin Hygiene:**

Optimal skin hygiene is extremely important when the patient is obese or has intertigoor diabetes mellitus. Twice daily showers with hexachlorophene soap or cream and application of organic iodine containing lotion four times daily will help to reduce skin flora and facilitate intra operative skin asepsis. If an ulcer is present the patient should be kept at bed rest. The ulcer should be debrided. The fungal infection should be controlled with a bland fungicidal cream.

### **Weight Reduction:**

Weight reduction is one of the most difficult yet highly important step insuccessful incisional hernia repair.

### **Management of Intercurrent Disease**

It includes control of chronic obstructive airway disease, chronic bronchitis, and cessation of smoking for a minimum of 2 weeks before the operation. Hypertension and Diabetes mellitus should be controlled adequately.

**Correction of Nutritional and vitamin deficiencies:**

Hypoproteinemia should be corrected. Vitamin deficiencies should be corrected either by oral (or) parental supplements.

**Therapeutic pneumoperitoneum:**

In case of long standing large incisional hernias, the viscera are said to have lost right of domicile because of prolonged period of stay outside the peritoneal cavity, within the hernial sac. The hazards attendant on an operation for such giant hernias centered about the profound changes in ventilator capacity and the reduced venous return occasioned by the forcing of a large volume of intestine and omentum back into the abdominal cavity. It was a common experience in the past to operate on such patients. encountering severe cardio respiratory failure within 6-8 hours post operatively.

This hazard can be avoided by creating therapeutic pneumoperitoneum. This procedure stretches the abdominal wall, allows pre operative adjustment to increased intra abdominal volume, increases diaphragmatic tone, and prepares the abdomen for the reduction of a large bulk of viscera.

## OPERATIVE TECHNIQUE

### 1. Anesthesia:

Spinal anesthesia (or) General anesthesia provides excellent muscle relaxation.

### 2. Incision and Excision of the previous Scar:

The choice of the incision is governed by the orientation of the defect. Our aim of closure should be suturing without tension. The previous scar should be excised

### 3. Dissection of flaps and Isolation of healthy fascia:

The skin and subcutaneous tissues overlying the hernia sac are initially dissected in the plane external to the sac and deep to the subcutaneous fat until the musculofascial borders of the hernia reached and identified. This dissection is then continued on the surface of the fascia, elevating the full thickness of overlying skin and fat to a depth of 8-10cm (or) more if needed from the margin of the hernia orifice.

### 4. Excision of the sac:

The peritoneum is now opened and the adherent intra abdominal contents are carefully separated. The hernia sac is then excised leaving sufficient peritoneum for easy approximation. However this is not necessary, in 'keel's' technique hernial sac is dissected and simply reduced without dissection of the sac and its contents and repair is done above it.

### 5. Choice of Repair technique:

Judgements about closure techniques need to address the strong musculofascial tissues at the truly resistant margins of the hernial orifice. The first issue to decide is whether or not the hernia defect can be closed primarily without tension and then to assess defect size and the strength of tissues at the hernial margins.

Kocher clamps are placed into strong musculofascial tissue at the midpoint of margins of hernial orifice and then pulled towards each other.

If the tissues can be coapted with less than 3 lbf of force, primary repair will succeed.

If the tissues can be coapted primarily without excessive tension but the strength of the hernial margin is weak or if the hernia has previously been repaired reinforcement using prosthetic repair technique is indicated.

The types of various suture repair and prosthetic or mesh repair and its principles techniques are described below.

## **SUTURE REPAIR**

In suture repair, sutures are inserted 1-2cm apart and 2.5 to 3cm from the free margin of the hernia using heavy monofilament polypropylene or nylon material.

Redundant skin and subcutaneous fat are excised. If the patient is obese, a subcutaneous suction drain brought through a remote stab wound should be placed before skin closure.

The various techniques of suture repair are as follows

### **1. ANATOMICAL REPAIR:**

#### **(a) Layer by layer reconstruction (Three layered closure):**

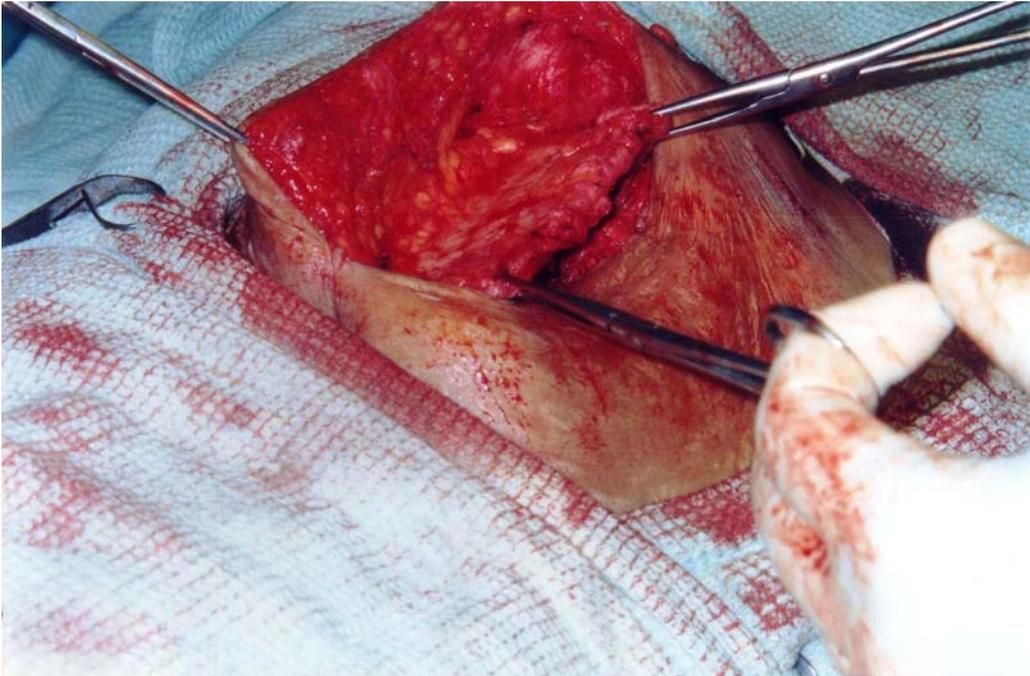
This is recommended for small or moderate sized hernias and for those in which gap between the opposing muscles is relatively narrow in its transverse plane.

The ideal method is to excise all scar tissues until the normal structures are exposed and to reconstruct the abdominal wall by stitching together the individual layers. The incision usually used is a low waist incision and the abdominal skin apron is raised well above the umbilicus. The sac is isolated and the neck of the sac is dissected out from the abdominal muscles. Now, the sac is opened carefully and the adherent omentum and intestines are released and reduced.

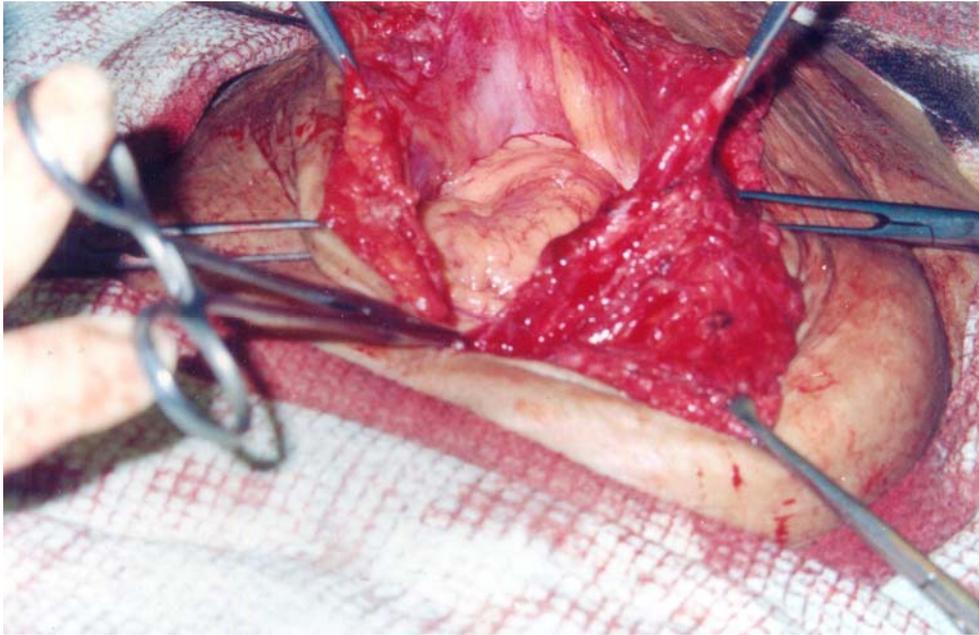
EXCISION OF SCAR TISSUE



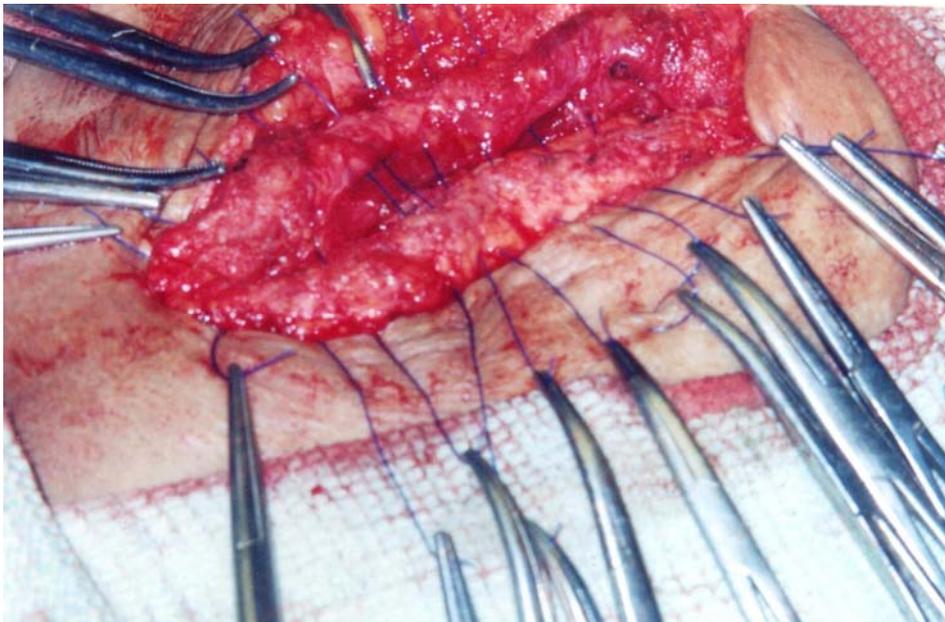
DISSECTION OF FLAPS



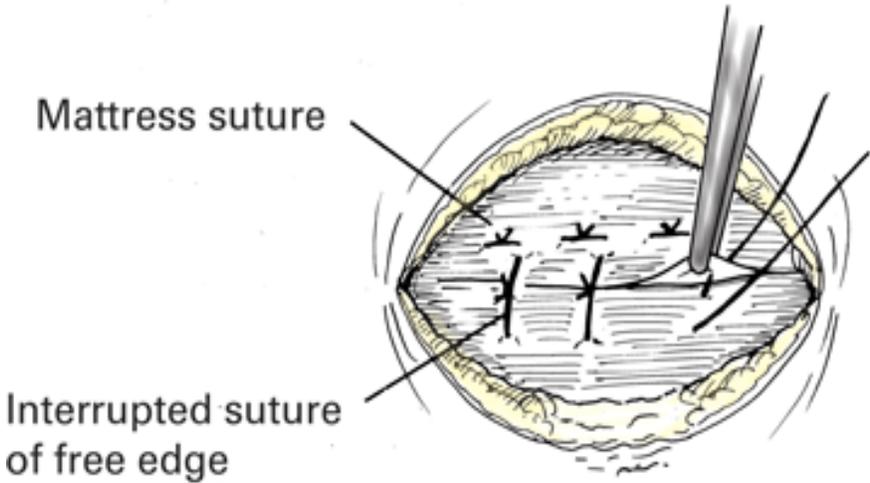
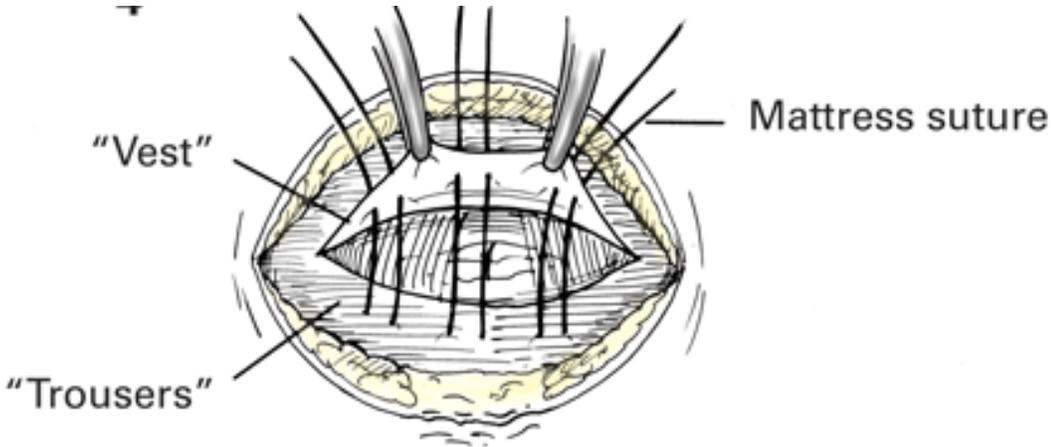
OPENING AND EXCISION OF THE SAC



CLOSURE OF THE MUSCULOFASCIAL LAYER



MAYO'S REPAIR



Now the medial most end of the rectus sheath is incised and isolated so that closure of this layer is easy later on. The scar tissues are all excised until normal structures are exposed.

The following anatomical layers are now identified and sutured

- i) Peritoneum and the posterior rectus sheath: The redundant sac is excised and the peritoneal edges are sutured with a continuous suture using absorbable suture material. Above the Arcuate line the posterior rectus sheath can also be incorporated to provide additional strength
- ii) The rectus abdominis: The recti are just approximated without the tension using absorbable suture material.
- iii) Anterior Rectus sheath: After excision of the scar tissues the edge of the aponeurosis are approximated using non-absorbable suture material like prolene by interrupted figure of eight stitches.

**(b) Vertical overlap of Rectus sheath: (two layered closure)**

Here, the sheath of the rectus muscle are liberally freed both longitudinally and laterally and are double-breasted thus providing additional strength to the repair.

The skin edges are approximated with a number of vertical mattress sutures with a suction drain subcutaneously.

**(c) Single layer mass closure.**

Here, the entire anterior rectus sheath, rectus muscle, posterior rectus sheath and peritoneum are closed in a single layer by interrupted non-absorbable sutures.

**2. W.J. MAYOS REPAIR:**

Mayo's operation or some modification of the procedure can be employed successfully for selected cases of incisional hernias. The hernia sac and its contents are dealt with anatomical repair. The defective linea alba or defective aponeurosis is

repaired by overlapping it across a transverse axis. For the first stage of overlap a series of five mattress stitches are employed so that they will draw the free edge of one flap for distance of 4 cm, under cover of the other flap.

In order to promote ready adhesion between the two flaps, the aponeurosis of the deeper is carefully cleared of all fatty tissues. Suturing the free edge of the superficial flap against the deep flap completes the overlapping. All dead spaces are obliterated by sutures if possible.

This repair has an advantage over any other repair in obtaining a satisfactory degree of overlapping without tension. This allows the patient to be nursed in a propped up position from immediate post operative period as sitting up brings about relaxation of the sutured aponeurosis and is also more comfortable for the patient.

### **3. MAIN GOT KEEL OPERATION:**

The term "keel" was coined by the resident surgical staff of the Southern General Hospital in 1940. This because of wide inversion of the sac and aponeurosis of the rectus muscle the finished effect in some respects resembled the keel of a ship.

After excising the scar and excess skin; the skin and the subcutaneous tissues must be mobilized extensively to display the healthy aponeurosis below, above and on each side of the neck of the sac. The fibro fatty tissue over the hernia sac is removed fully to facilitate the insertion of the sutures and to encourage firm fibrous union.

Any button holding or opening of the peritoneal sac should be avoided when the skin and the scar tissue are being dissected. Should the sac be accidentally opened, the visceral or omental adhesion to the sac should not be inspected or freed, and such apertures in the peritoneum should be carefully closed before proceeding with the surgery.

After the sac is firmly depressed and the fibroaponeurotic margins clearly defined, the rectus fascia is sutured together with a series of closely applied mattress sutures. When all the sutures have been inserted, a continuous right-angled Cushing's stitch is introduced from above downwards thus inverting the sac. This process is continued until the fibroaponeurotic margin of the defect becomes approximated to each other. These sutures are introduced with great care to avoid puncturing any coil of intestine. It is advisable to make judicious longitudinal relaxing incisions 10 cms. Lateral to the fibroaponeurotic margins to relieve tension on the suture line. Two vacuum drains are placed longitudinally under each skin flap.

#### 4. **CARDIFF HUGHES REPAIR:**

This method of repair was put forward by Dr. Hughes of Cardiff, England.

The principles of this repair are,

- a) The fibro aponeurotic hernial ring should be retained and should not be excised.
- b) All the sutures should pass extraperitoneally.
- c) The most important stitch in this repair is the far near stitch. Here when the far stitches are pulled apart due to straining or abdominal distention, the near stitch tightens holding together the edges.
- d) Non-absorbable sutures are used-usually 2/0 or 3/0 prolene.

#### 5. **CATTELLS OPERATION (SHOELACE DARN REPAIR):**

In this operation the hernia sac is dissected out opened and the contents reduced. The repair starts from the inside margins of the sac. The peritoneum is approximated at the neck including all the layers of the abdominal wall that are adherent to hernia ring. An incision is made on the sac around the hernia ring and the cut edges of base of the sac are approximate with non-absorbable sutures creating a new strong line. Another elliptical incision is made 2 cms lateral to the previous suture line. The medial borders of this

incision are approximated. The lateral edges of the fascia are freed from the overlying muscles and this fascial layer is approximated with interrupted suture the upper, lower ends and the remaining fascial layer and muscles are approximated by alternating stitches. Tension relaxing incisions if necessary are placed well laterally. After perfect hemostasis skin and subcutaneous layers are approximated. This procedure is not followed nowadays.

### **MESH REPAIR**

The ideal mesh must have the following characteristics <sup>(11-22)</sup> -

- Biologically and chemically inert
- Easily sterilizable
- Pliable
- Immediate and permanent strength.
- X-ray transparency.
- Free availability
- Low cost
- Fabricated in the form required.
- No inflammatory (or) foreign body reaction.
- Should elicit good Fibroblastic activity
- Permeable for tissue in growth
- No carcinogenic risk
- No allergy.

Current synthetic biomaterials in use are :

1. Polyester mesh
2. Polypropylene mesh
3. Expanded polytetrafluoro Ethylene mesh

POLY PROPYLENE MESH



#### 4. Composite mesh.

##### **Polyester mesh:**

They are supple, Elastic, grainy texture and grip the surrounding tissues and prevent slippage. They induce rapid fibroblastic activity and are hydrophilic. Knitted multifilament polyester has been available as MERSILENE and DACRON.

##### **Polypropylene mesh:**

These meshes are made of monofilament. They are loosely woven, more supple easy to handle and are hydrophobic. Heavy weight polypropylene is available as MARLEX and PROLENE, which are the most commonly, used types. Lightweight is available as ULTRAPRO

##### **Expanded Poly tetra fluoroethylene:**

They are soil tissue patch of 1 x 2 mm thickness. Microscopy shows laminated structure with different porosity for tissue in growth. They are coated and is commonly for Intra peritoneal placement of mesh.

##### **Composite mesh:**

They have a combination of Marlex mesh and expanded polytetrafluoro ethylene. Marlex is directed to the wall side and ePTFE to the bowel side.

##### **Dual mesh with ePTFE:**

A two Layered mesh; on one side pores of 3 micrometer. which acts as barrier to tissue incorporation and other 17-22 micrometer for in growth of fibroblast and collagen.

#### **METHODS OF SECURING THE MESH:**

Repairs that use permanent prosthesis differ based on the anatomical placement

1. Onlay (superficial) technique,
2. Inlay (patch) technique,

3. Sublay (extra peritoneal yet intramural) also called as modified RivesStoppa technique.
4. Underlay (intraperitoneal) technique.

**1. ONLAY SINGLE LAYERREPAIR:**

The onlay technique is popular among surgeons because it avoids direct contact with the bowel and imparts less tension on the repair.

The disadvantages are that it requires wide tissue undermining, which may predispose to wound related complications, and the pressure required to disrupt the mesh from the anterior abdominal wall is less than other repairs. The technique of onlay mesh placement is as follows:

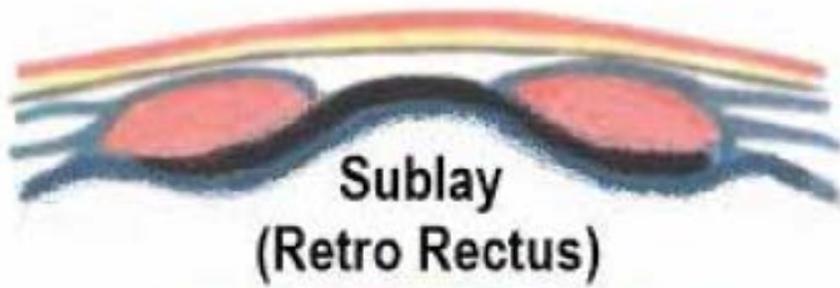
1. After mobilizing adequate flaps, a series of 1-0 monofilament nylon or polypropylene mattress sutures are placed through the full thickness of the fascia 5 to 6cm from the margin of the hernia defect encompassing 1-1.5 cm of tissue, in 1.5 to 2 cm gap.
2. The hernia defect is then closed primarily with interrupted sutures.
3. A piece of mesh 1cm wider than the circle of mattress sutures is cut.
4. The ends of all sutures are brought through the prosthesis and tied
5. Suction drains are placed and brought out through remote stab wounds.

**INLAY REPAIR TECHNIQUE:**

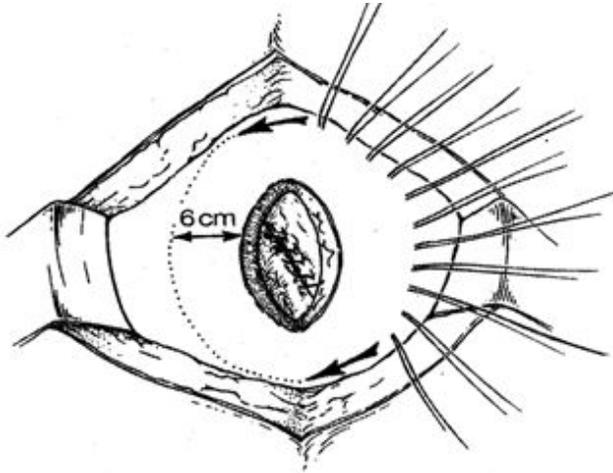
The Inlay technique involves excision of the hernia sac and identification of healthy fascial margins. This technique provides for a tensionless repair at the time of surgery and avoids the wide undermining of the Onlay repair. Without the overlapping support of the anterior abdominal wall, activities that increase intra-abdominal pressure impart significant tension to the mesh-fascial interface, which is the weakest point of the repair. High recurrence rates of 10-20 % have resulted in use of other techniques to optimize

# MESH REPAIR

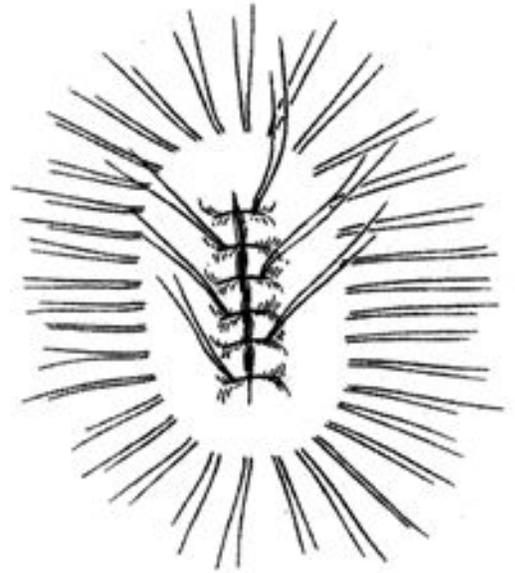
Various Techniques of Mesh placement



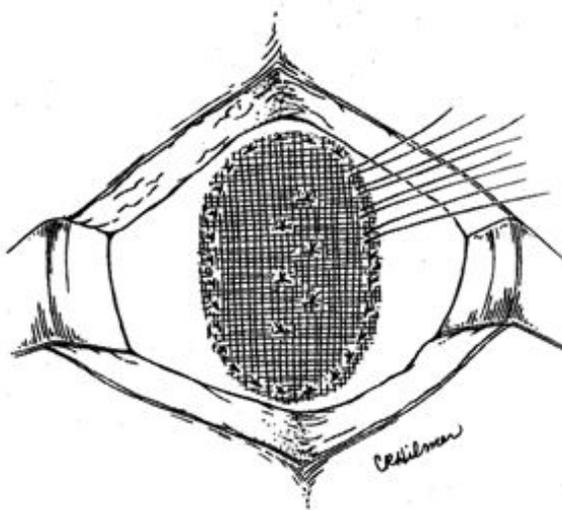
# OPEN ONLAY MESH REPAIR



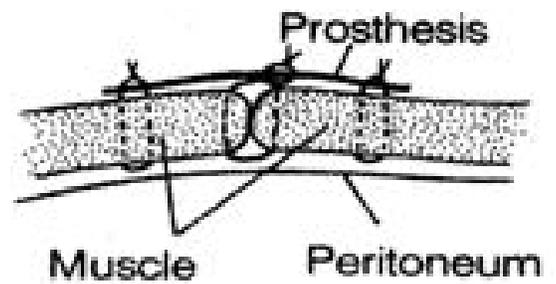
Sutures Place in Abdominal Wall for Mesh Placement



Hernial Sac Closed before Mesh Placement

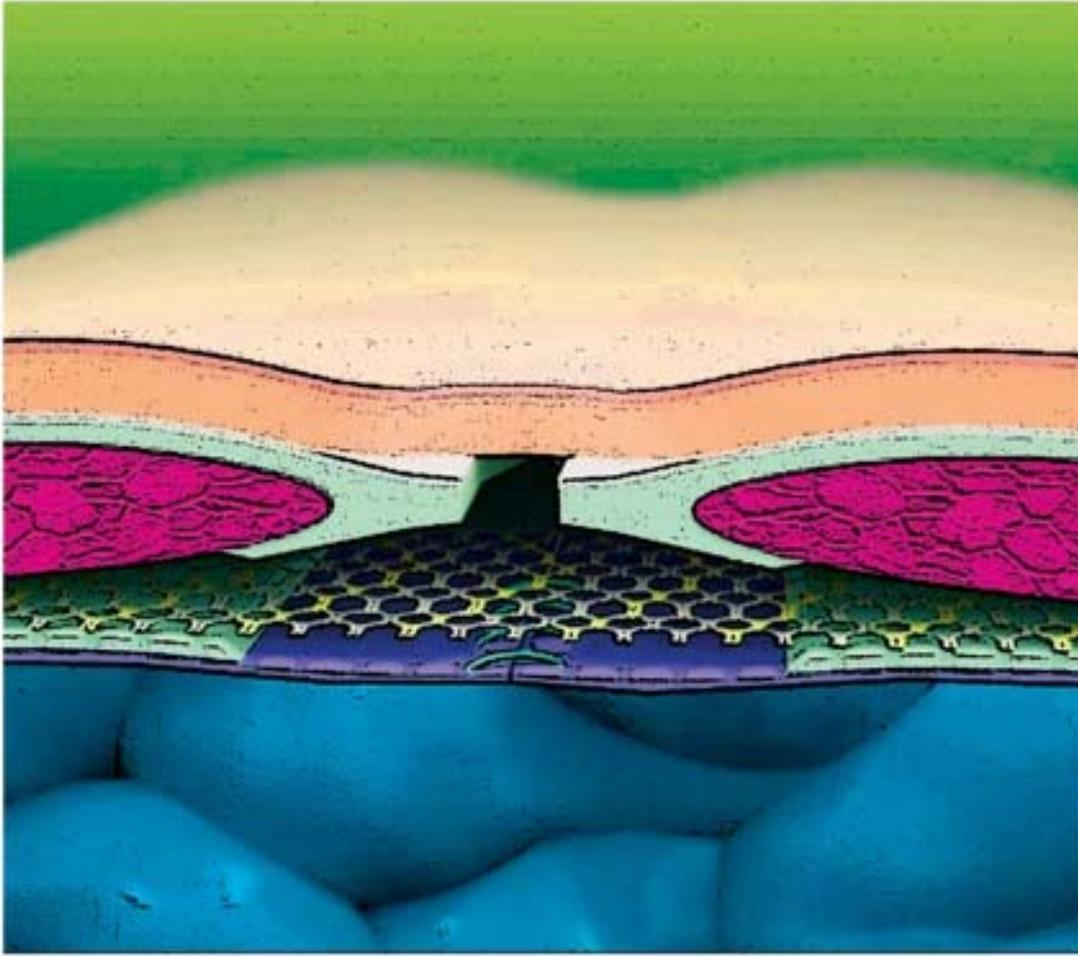


Mesh Anchored by Previously Placed Sutures

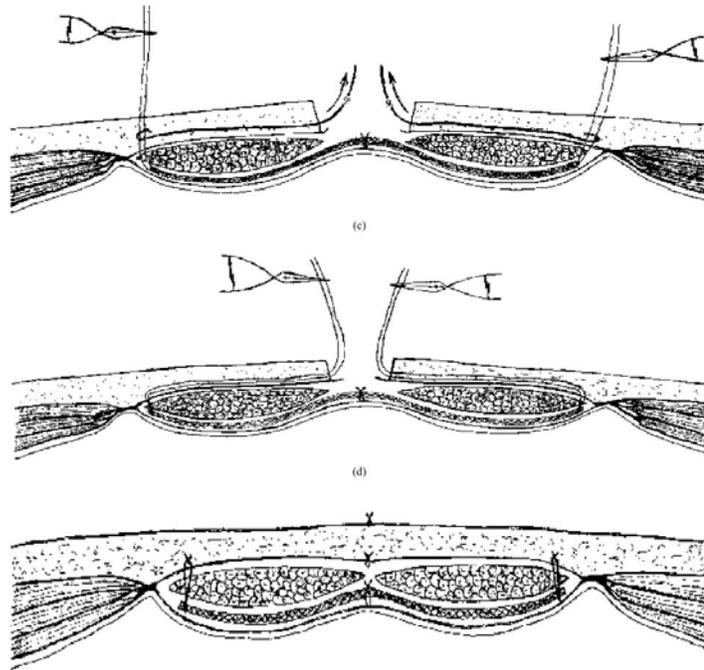


Completed Onlay Repair in Cross Section

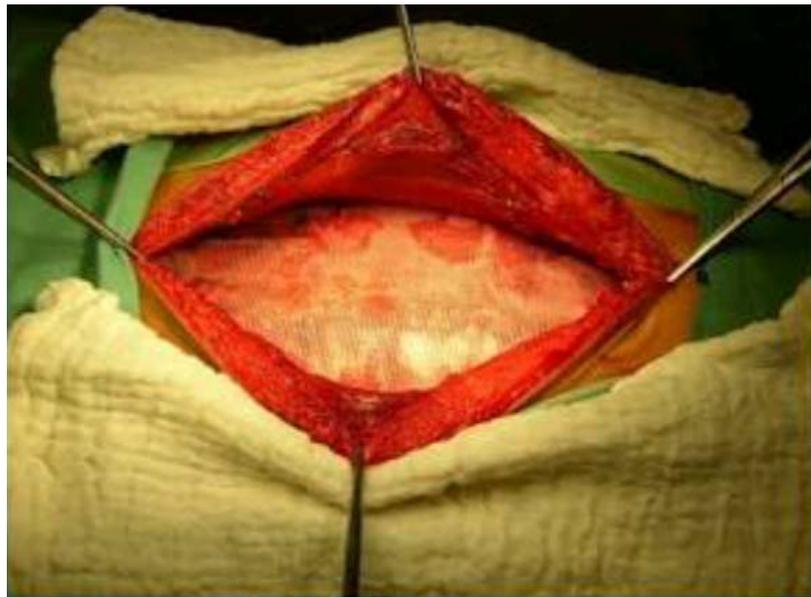
## SUBLAY MESH REPAIR



## SUBLAY MESH REPAIR



Cross Section to Demonstrate PolyPropylene Mesh In Preperitoneal Plane



Creation of Retrorectus Preperitoneal Plane

strength of the mesh-fascia interface by sandwich techniques and Inlay repair alone has gone out of favor with the surgeons.

### **TWO LAYER INLAY AND ONLAY MESH REPAIR (SANDWICH TECHNIQUE)**

In this repair one mesh is kept a subcutaneous plane superficial to musculoaponeurotic abdominal wall and deep in the extra peritoneal plane. In this method the hernia orifice is not sutured. This technique is not commonly used.

### **RETRO RECTUS SUBLAY TECHNIQUE:**

The Retro rectus placement of mesh, popularized by Rives and Stoppa. has been used with increasing frequency. The Mesh is placed extra peritoneally above the posterior sheath and beneath the rectus muscle. Below the arcuate line, the mesh is placed in the preperitoneal space.

The advantages of placing mesh in this plane are as follows: extensive overlap between the prosthesis and the fascial edges allows a tension free as well as a large surface area for tissue incorporation (Pascal's principle)

The mechanical strength of the prosthesis reinforces the abdominal wall, especially when there is increased intraabdominal pressure. Placement of the prosthesis adjacent to the vascular-rich rectus muscles facilitates tissue incorporation, promotes resistance to mesh infection, and allows interposition of autologous tissue between the prosthesis and the skin/subcutaneous tissues anteriorly and peritoneum posteriorly.

### **INTRA PERITONEAL UNDERLAY TECHNIQUE:**

The intraperitoneal underlay placement is a common technique used in open and laparoscopic approaches. Proponents of this technique cite that the ability to place the mesh with a large underlay allows for better tissue ingrowths and a more secure

meshfacial interface. The fear of enterocutaneous fistula is a dreaded complication of this technique though the incidence is very low.

### **COMPLICATIONS OF MESH REPAIR**

Although the application of mesh has resulted in significant improvements in recurrent rates, the use of mesh is associated with specific complications like:

1. Infection
2. Seroma
3. Mesh extrusion due to inadequate soft tissue coverage;
4. Pain and induration due to wide undermining and tissue ingrowths.
5. Enterocutaneous Fistula formation.

### **PRINCIPLES OF REPAIR**

#### **1. Notension:**

The body accommodates to tension by gradually retracting the wound margins, the wound only with thin scar that does not adequately resist the intra abdominal pressure created by normal daily activities. Over time the scar yields and recurrence will the maximum force that should be applied to close a wound is 3 Lb.

#### **2. Bowel should not be exposed to synthetic mesh:**

If the bowel is exposed to the prosthesis during this process, it becomes densely adherent and the mesh may become incorporated into the bowel wall resulting in bowel obstruction and fistula.

#### **3. Prosthesis should not be stapled/ sutured to the margins of Defect:**

Staples should not be used to fix the mesh, as they do not encompass enough strength to assure a solid anchor.

The prosthesis should not be attached directly to the margins of the hernia defect serves to concentrate the forces generated by normal physical activity directly on prosthesis tissue interface, increasing the risk of separation leading to failure.

**4. Attention to skin Hygiene:**

Many patients especially those with recurrent ventral hernia, are so obese that they suffer from intertriginous infection of skin in the groin, perineum, lower abdomen and submammary areas. Failure to control the infection will lead to wound infection and prosthesis contamination.

**Antibiotic prophylaxis:**

The presence of prosthesis within the wound disables normal host defense mechanisms that protect against the low level of bacterial contamination that occurs in surgical wound. This justifies the administration of perioperative antibiotics.

**6. Avoid counter relaxing incision:**

Relaxing incision on lateral of the wound to relieve the tension on repair should be avoided, as this will interfere with blood supply to that area and interfere with healing to recurrence.

**7. Adequate overlapping of mesh:**

The mesh should be adequately overlapped the hernia 4-6cm from the hernia orifice to prevent recurrence.

## **OTHER TECHNIQUES**

### **COMPONENT SEPARATION TECHNIQUE:**

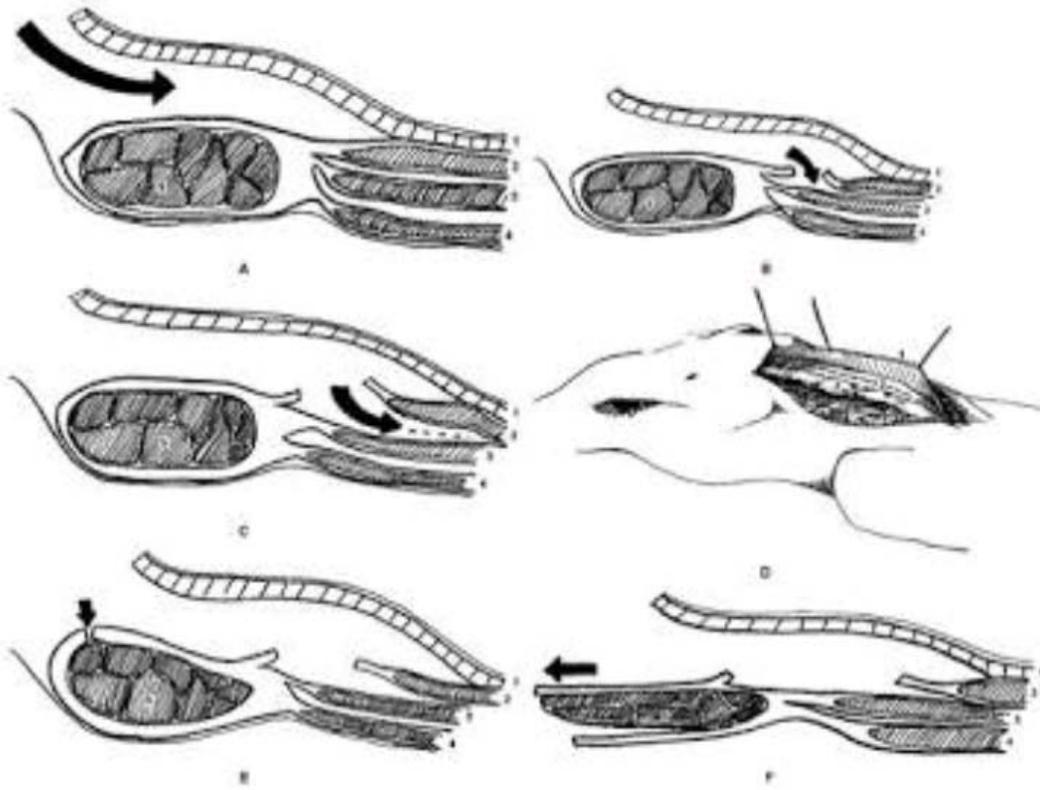
Ramirez and colleagues made significant contribution in Incisional Hernia repair by separating the overlapping muscle layer, preserving their innervations and blood supply, especially elevation of the external oblique muscle and releasing the rectus from the posterior sheath and advancing a compound flap of rectus muscle and internal oblique transverse abdominis complex can be used to cover large midline defects. Unilateral advancement of 5 cm in the epigastric region, 10cm at the umbilicus. 3 cm in the suprapubic region has been described. Wound related complications to wide undermining have been problematic with this technique.

### **FLAP RECONSTRUCTION:**

Local advancement flaps have been used to reconstruct hernia defects in which there is significant absolute loss of domain and in lateral defects that are not amenable to advancement techniques.

Faciocutaneous and Myocutaneous flaps like local rectus abdominis flap or distant muscle flaps like the tensor fascia lata, anterolateral thigh flaps, rectus femoris flap and latissimus dorsi flap are commonly used.

# COMPONENT SEPARATION REPAIRS



## **RECURRENCE FOLLOWING INCISIONAL HERNIA REPAIR**

Of all the complications of incisional hernia repair, recurrence is considered as primary outcome and guides in the selection of the technique which is most appropriate for incisional hernia repair <sup>41,42</sup>

### **FACTORS CAUSING RECURRENCE:**

1. Inappropriate selection of suture material:  
Healing proceeds more slowly in heavily scarred tissues, with its impaired blood supply and loss of elastic fibres. So using absorbable suture material may fail to maintain approximation long enough.
3. Infection.
4. Haematoma.
5. Obese patients.
6. Preoperative comorbid conditions affecting wound healing.
7. Post operative complications like abdominal distension, pulmonary complications.
8. Glucocorticoid therapy.
9. Failure to overlap the mesh for atleast 2-4 cms from the margin of the hernial defect or inadequate fixation of the mesh.
10. Inadequate relaxation during surgery.
11. Repair under tension, etc.

## **FACTORS IN PREVENTING RECURRENCE OF INCISIONAL HERNIAS:**

1. Sound surgical principles
  - Gentle handling of tissues.
  - Sharp dissection.
  - Perfect hemostasis,
  - Use of non absorbable suture material.
  - Avoidance of excessive tension.
2. Avoidance of infection
  - Preoperative antibiotics.
  - Strict aseptic precautions.
  - When it occurs, treat it properly and vigorously.
3. Use of suction drains to aspirate blood and serum.
4. Avoidance of post operative complications like abdominal distension by Ryles tube aspiration.
5. Treatment of pulmonary complications pre and post operatively.
6. Weight reduction in obese patients.
7. Using of Mesh and appropriate surgical techniques.

## **LAPAROSCOPIC INCISIONAL HERNIA REPAIR**

Laparoscopic approach for incisional hernia repair gained popularity in the last decade with advances in minimal access surgery and the advantages of the laparoscopic repair

### **Principles:**

- Tensionless closure of defect
- prosthetic reinforcement of the defect and
- eliminating the risk of infection
- Patient selection

### **Contraindications**

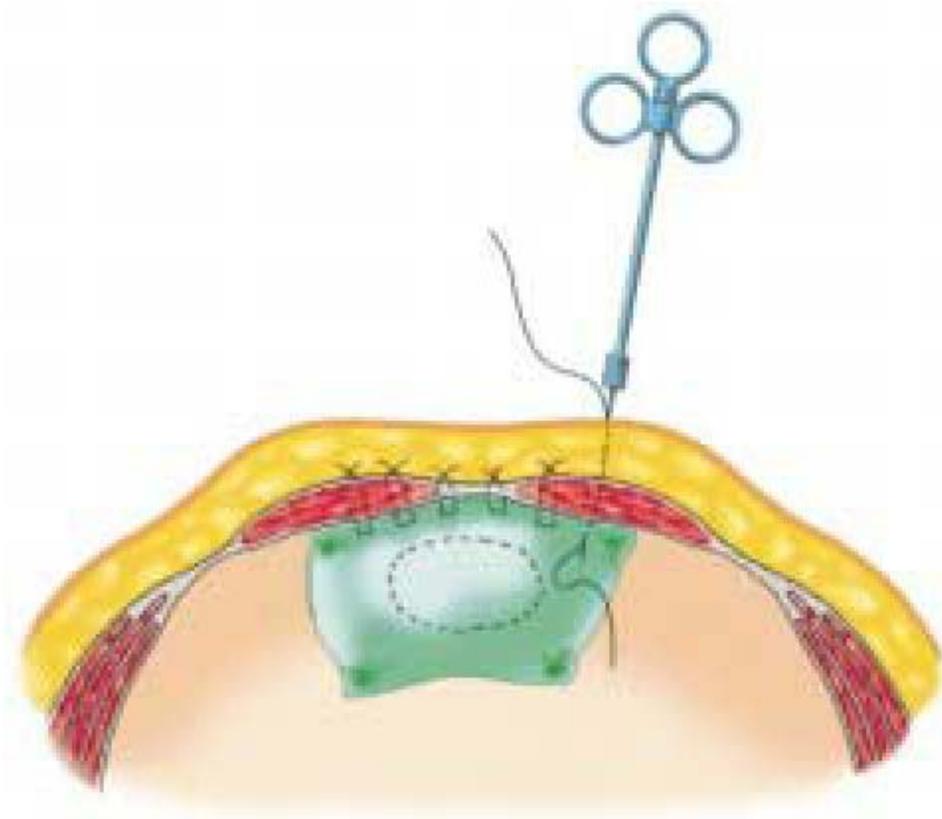
- grossly obese patients,
- wide defects with divarication of recti,
- densely scarred abdomen
- acute abdomen having a septic focus or strangulated bowel.

Port placement is a key consideration in the Laparoscopic approach, which are placed as far away from the defect as possible to allow access to the anterior abdominal wall with adequate room for prosthetic overlap and also to prevent any inadvertent bowel injury

After substantial adhesiolysis. the fascial edges are cleared for at least 5 cm around hernial defect and the defect is fully elucidated, a prosthetic material is chosen to cover the hernial defect. The Underlay intraperitoneal technique is more commonly used and the prosthetic material is secured posteriorly to the abdominal wall musculature.

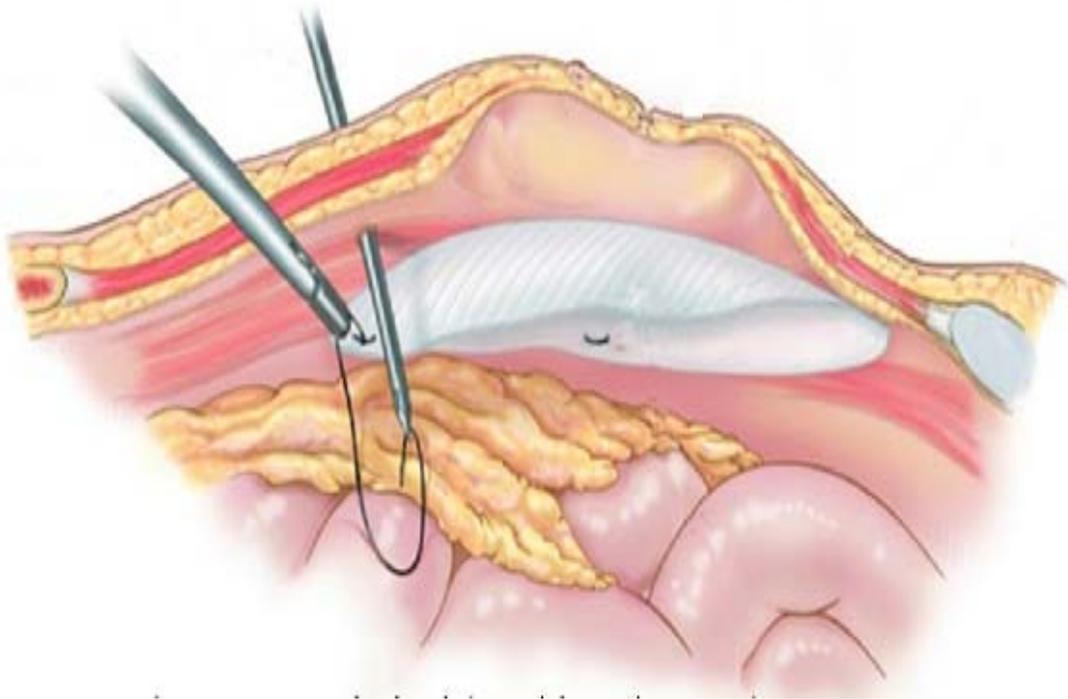
Substantial overlap of the defect with a large prosthesis with fixation by sutures to the posterior abdominal wall is necessary to facilitate ingrowth of tissues into the mesh and prevent recurrences and mesh migration.

LAPROSCOPIC UNDERLAY MESH REPAIR



Intra Peritoneal Underlay Techniques of Mesh Repair

## LAPAROSCOPIC INCISIONAL HERNIA REPAIR



**Advantages of laparoscopic repair over open repair are as follows:**

1. Fewer postoperative wound complications due to less dissection of the subcutaneous tissues.
2. Shortened hospital stay and less pain and better outcomes like lower recurrence.
3. Allows the repair of large or multiple hernias without extending the incision.
4. Evaluates the abdominal wall completely permitting identification of remote or "Swiss-cheese" defects.

**Disadvantages of laparoscopic repair include the following:**

1. Seromas are common in laparoscopic repair since drains are not routinely placed. This can be reduced significantly by placing the patient in abdominal binder postoperatively.
2. Potential risk of bowel injury while accessing the abdomen or during adhesiolysis.
3. Mesh migration and failure of the repair with recurrence.
4. Bleeding from the abdominal wall vessels.
5. Persistent pain at the site of transfixation sutures.
6. Inability to deal with the unsightly scar and poor cosmetic appearance needing other procedures like abdominoplasty.
7. Rarely enterocutaneous fistula can occur, prevented by using composite mesh or covering the prosthesis with omentum.

Surgical expertise in laparoscopic incisional hernia repair is considered to be of marked importance to achieve better results and prevent complications.

Even though laparoscopy is an appropriate approach for the repair of incisional hernia, it needs a steep learning curve and ushers a new era of incisional hernia repair.

## MATERIALS AND METHODS

### I. MATERIALS:

The study was a prospective study of 106 consecutive patients admitted with the diagnosis of incisional hernia in the Thanjavur medical college and hospital between September 2016 and October 2017.

Patients were considered eligible if they had an incisional hernia, defined as a palpable fascia or muscle defect at the site of a previous abdominal incision. Hernias were detected clinically and assessed by ultrasonography. Patients presenting in emergency with obstructed or strangulated incisional hernia are included.

Patients who were not fit for general anesthesia, with other general contraindications for laparotomy or laparoscopy and were not operated for repair of incisional hernia, Patient with collagen vascular disorder, young female patients who have not completed their family were excluded Thus 4 patients are excluded.

Patients with a hernial defect of less than 6cm in both the axis were included in Simple hernia group (no=57) who were subjected to Suture repair or Mesh repair or Preperitoneal MeshSublay.

Patients with a hernial defect of more than 6 cms in either horizontal or vertical axis or with multiple defects or recurrent incisional Hernia or with pathologically weak abdominal musculature assessed intraoperatively were included in "Complex" hernia group (no=45) who were subjected to Mesh Onlayrepair orSublay repair or Autologous tissue repair as per the discretion of the surgeon.

Results of the various techniques were compared and the short term and long term outcome were measured. All the patients gave informed consent. The college ethics committee approved the study protocol.

## **METHODS**

The Methods include obtaining information from the patient, thorough clinical examination and doing investigations necessary for management. All the information was entered in a proforma specially designed for this study. All the preoperative, peroperative, postoperative details and events were recorded. Outcome measures and data collection were done. He. All the outcome measures were analyzed statistically for significant difference between the treatment groups.

## **METHODOLOGY: -**

The patient related preoperative factors including age, sex, presence of obesity.age of presentation, cough, constipation, prostatism, diabetes mellitus, steroid therapy, smoking status and previous abdominal surgical details were recorded.

Factors related to the previous surgical techniques and presence of seroma, hematoma. infection and dehiscence in the postoperative period of the previous surgery recorded.

Thorough clinical examination of the patient was carried out .All the details of the incisional hernia were recorded. Rectal examination for prostate hypertrophy, external genitalia stricture urethra and meatal stenosis were noted. Respiratory system examined bronchial asthma, lower respiratory tract infection or chronic bronchitis.

Basic investigation like Hemoglobin %, urine examination, blood sugar, renal function parameters were done in all patients. X ray chest and ECG were taken to assess the cardiac status as examine by specialist and ECHOCARDIOGRAM was taken if necessary. ULTRASOUND abdomen and pelvis was done to assess the hernia defect and rule out other associated factors. Urologist opinion was obtained in Case of BPH and managed accordingly. Based on the above investigations patients were assessed for regional or general anesthesia and managed surgically.

## **MANAGEMENT**

Informed written consent was obtained in all the patients after explaining the disease and surgical techniques and postoperative complications.

All the patients were operated under general or regional anesthesia.

All the patients were prepared preoperatively as suggested and all of them received operative intravenous antibiotics at the time of anesthetic induction.

All the operating surgeons had wide experience of the procedure done and all the operative findings and surgical details regarding the duration of surgery, intra operative findings and type of surgical repair were recorded meticulously in all the cases. All the patient is received suction drainage at the operated site as suggested.

Post operative care of all patients consist of hernia truss, analgesics, antibiotics , Ryle's tube aspiration and bladder drainage if indicated. Drains were removed 48hours to 5 days at the latest. Patients were informed about the type of surgery performed and instructed to avoid heavy lifting during convalescence.

## **FOLLOW UP AND OUTCOME MEASURES**

The primary outcome measure was hernia recurrence. Short-term outcome results were duration of surgery and length of hospital stay.

Follow up examinations of the patients were done at 1, 2, 3, 6, 12, 18 and 24 months. Complications served as a secondary outcome measure. Wound healing disorders defined as any event that required reopening of the wound or treated by aspiration or puncture.

Other outcome measures included return to usual daily activities, pain and stiffness of abdominal wall and quality of life. Pain was graded post operatively and at 6 weeks and months follow up by VISUAL ANALOGUE SCALE and consumption of analgesics was documented.

## OBSERVATION AND RESULTS

### PATIENT CHARACTERISTICS AND SURGICAL MANAGEMENT:

Among the 106 consecutive patients admitted with Incisional Hernia in Thanjavur medical college and hospital between September 2016 to October 2017, 2 patients were not fit for surgery and 2 patients expired due to pulmonary embolism, Myocardial Infarction. all these 8 patients were excluded from this study.

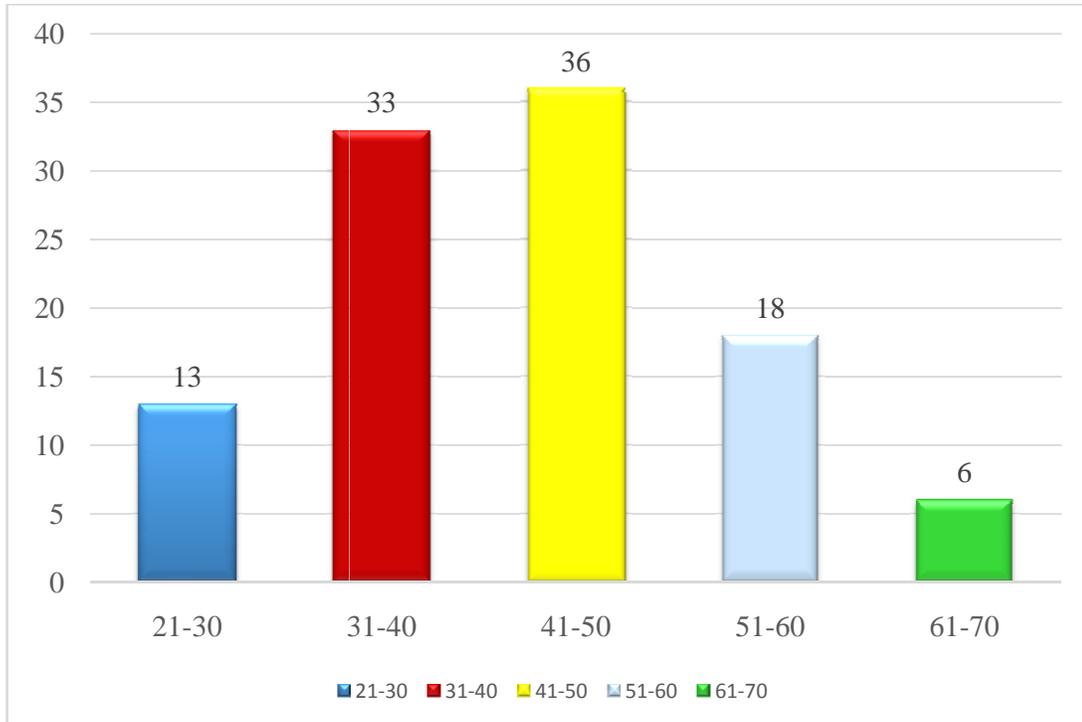
Among the 102 patients enrolled in this study and underwent treatment: 57 patients had a simple hernia and 45 patients had a complex incisional hernia. The clinical characteristics of the patients in each group were as follows.

### AGE INCIDENCE:

All the patients were in the age group from 21 to 80 years among them

< 20 years	0
21-30 years	13
31-40 years	33
41 -50 years	36
51-60 years	18
61-70 years	6

## AGE DISTRIBUTION

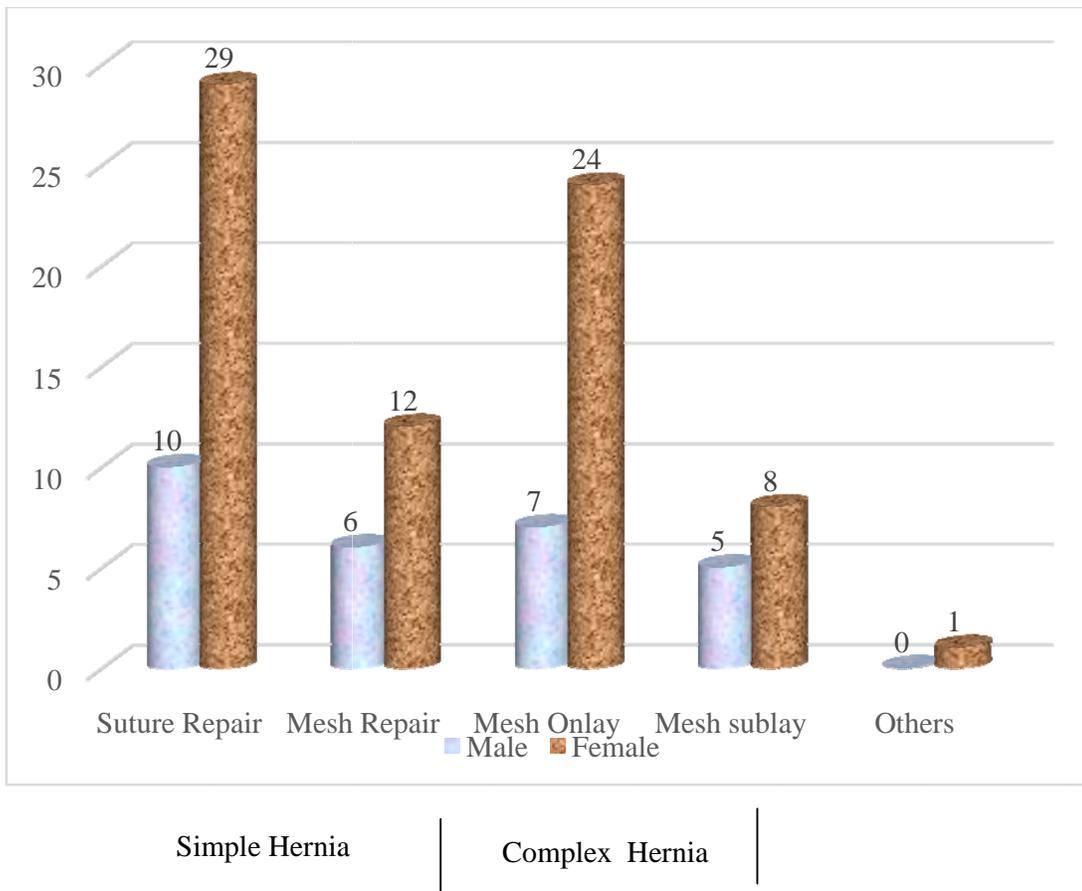


**SEXINDENCE**

Female		Male	
NO	%	No	%
74	72.54	28	27.45

The various clinical characteristics and co morbid conditions associated are enumerated in next table.

**SEX DISTRIBUTION**

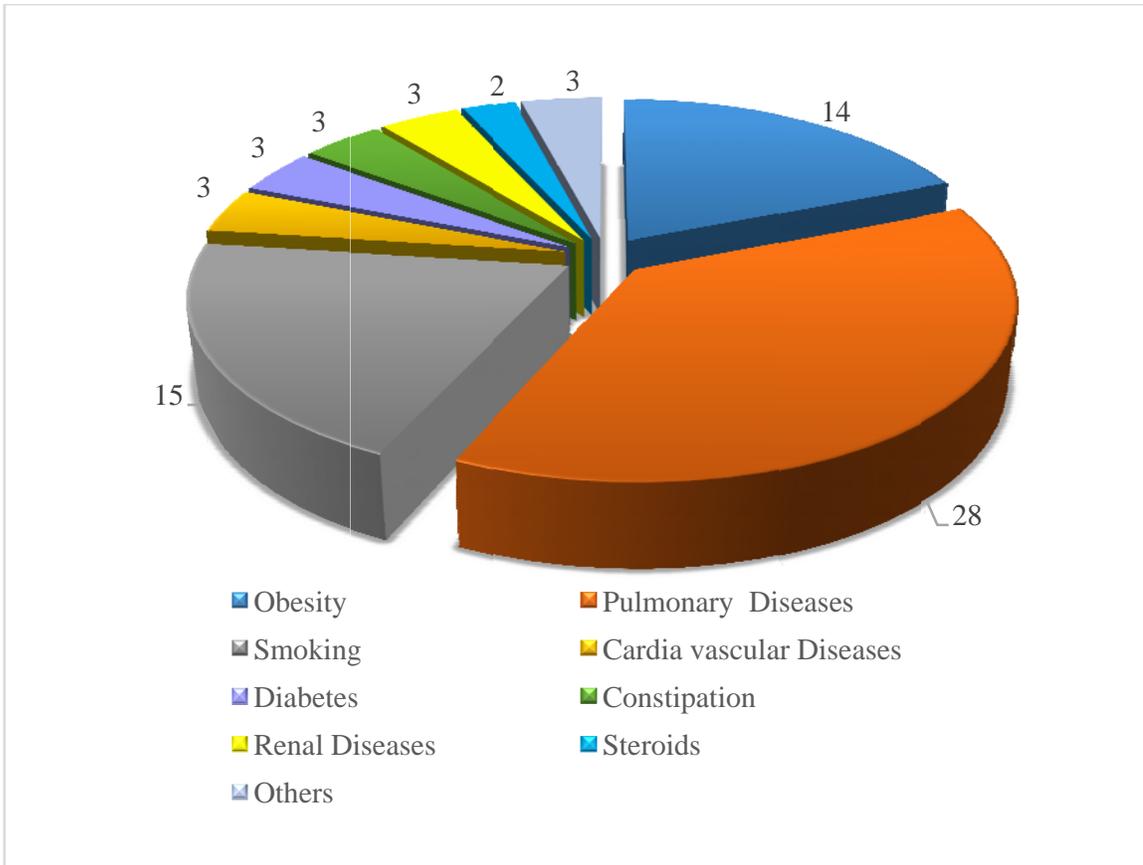


## CLINICAL CHARACTERISTICS OF PATIENTS

	SIMPLE HERNIA N=57		COMPLEX HERNIA N=45		
	SUTURE REPAIR N=39	MESH REPAIR N=18	MESH ONLAY N=31	MESH SUBLAY N=13	COMPONENT SEPARATION TECHNIQUE N=1
Age (years) Median range	40 22-70	42 30-60	43 25-65	38 25-76	50
Gender					
Male	10	6	7	5	
female	29	12	24	8	1

Specific risk factors					
Obesity BMI>30	5	2	6	1	
Pulmonary Disease	7	5	10	6	
Smoking	1	3	1	3	
Cardiovascular Disease	3	2	6		1
Diabetes			3		
Renal disease	1	1	1		
Constipation	2		1		
Steroid Treatment	1		1		
Other	2 (jaundice, anemia)		1 (hypo Thyroid)		

### COMORBID CONDITIONS



INCISIONAL HERNIA THROUGH MCBURNEY'S INCISION



INCISIONAL HERNIA THROUGH COLOSTOMY CLOSURE SITE



INCISIONAL HERNIA THROUGH LOWER MIDLINE INCISION



INCISIONAL HERNIA AT PFANNENSTEIL INCISION



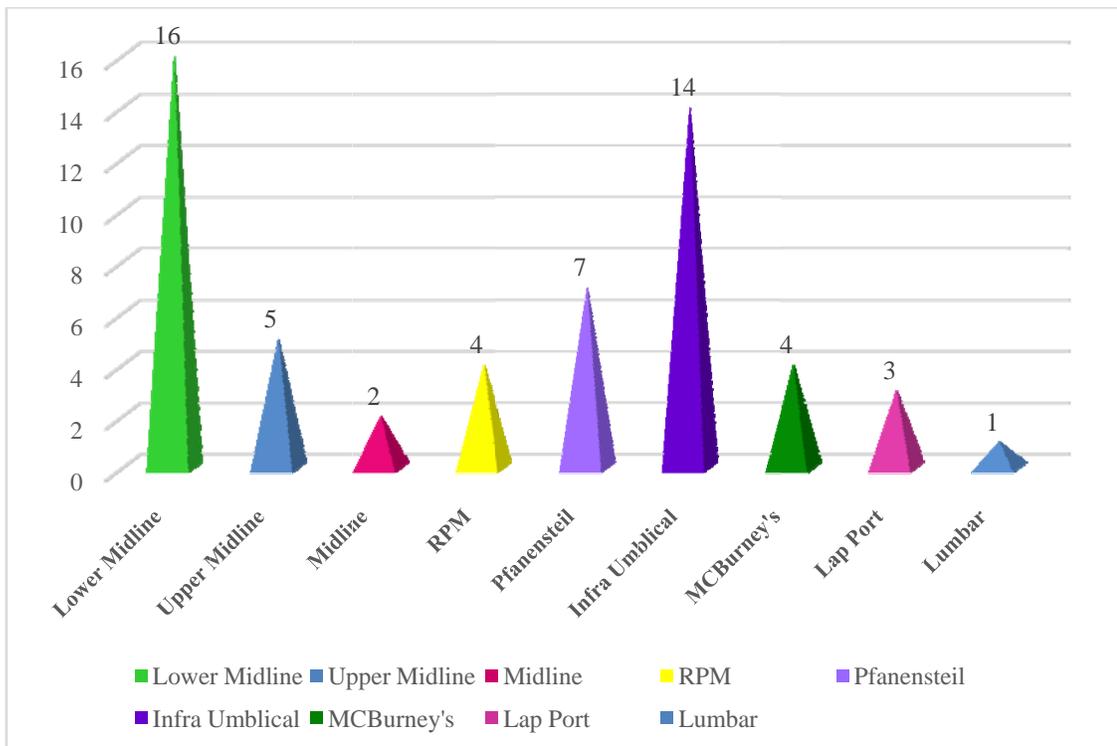
## HERNIA CHARACTERISTIC

The various clinical details of hernia size, modes of presentation and site of hernia and previous incision are summarized in the following table.

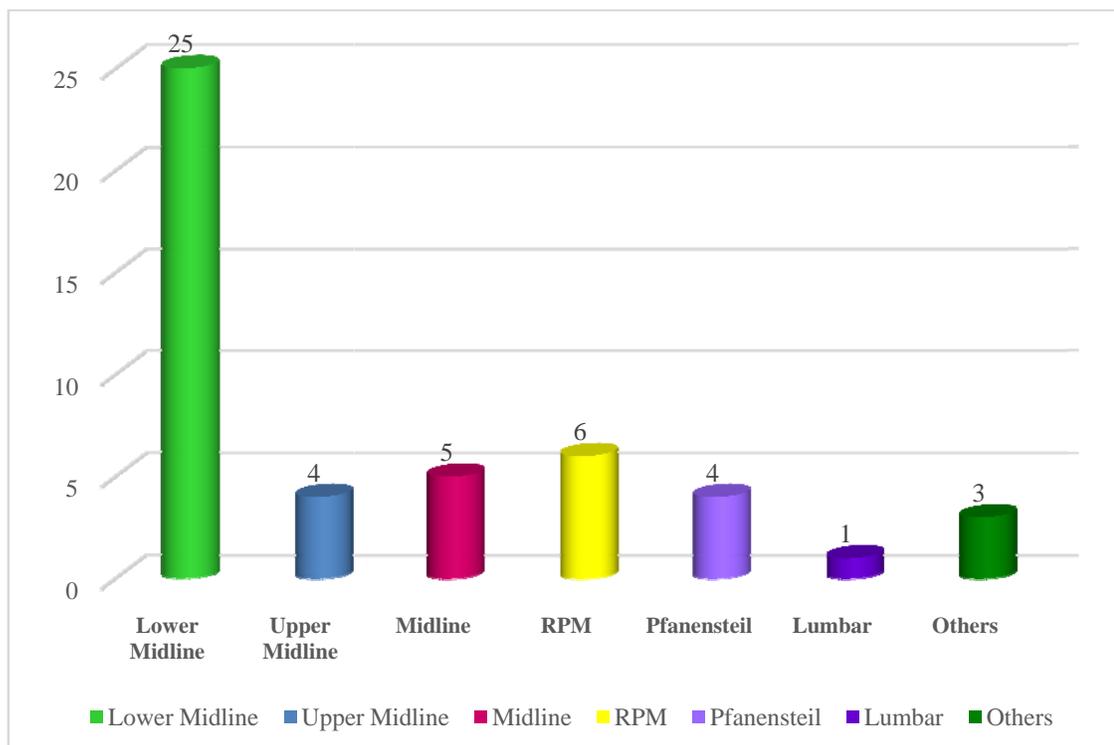
	SIMPLE HERNIA			COMPLEX HERNIA		
	SUTURE REPAIR	MESH ONLAY	MESH SUBLAY	MESH ONLAY	MESH SUBLAY	OTHERS
MEAN HERNIA SIZE CM						
VERTICAL	3.65	4.23	2.80	7.41	7.09	8
HORIZONTAL	3.59	3.92	3.40	6.18	5.37	6
MODES OF PRESENTATION						
SWELLING ONLY	26	9	3	19	8	
SWELLING AND PAIN	3	2	2	9	5	1
COMPLICATED (LOCAL, PRODUCIBLE, OBSTRUCTED, PRODUCIBLE, OTHERS)	10	2		3	1	

SITE OF HERNIA	NO.OF PATIENTS
VERTICAL MIDLINE	
LOWER ABDOMINAL	45
UPPER ABDOMINAL	9
BOTH UPPER AND LOWER ABDOMINAL	7
PARAMEDIAN	
RIGHT UPPER	6
RIGHT LOWER	4
TRANSVERSE AND MUSCLE SPLITTING	
PFANENSTEIL	11
UMBILICAL AND INFRA UMBILICAL	14
MCBURNEY'S	4
LAPAROSCOPY PORT	3
LUMBAR	2
OTHER (MULTIPLE SCARS COLOSTOMY CLOSURE SITE)	3

## SIMPLE HERNIA – SITE OF HERNIA



### COMPLEX HERNIA – SITE OF HERNIA



## INDEX OPERATION

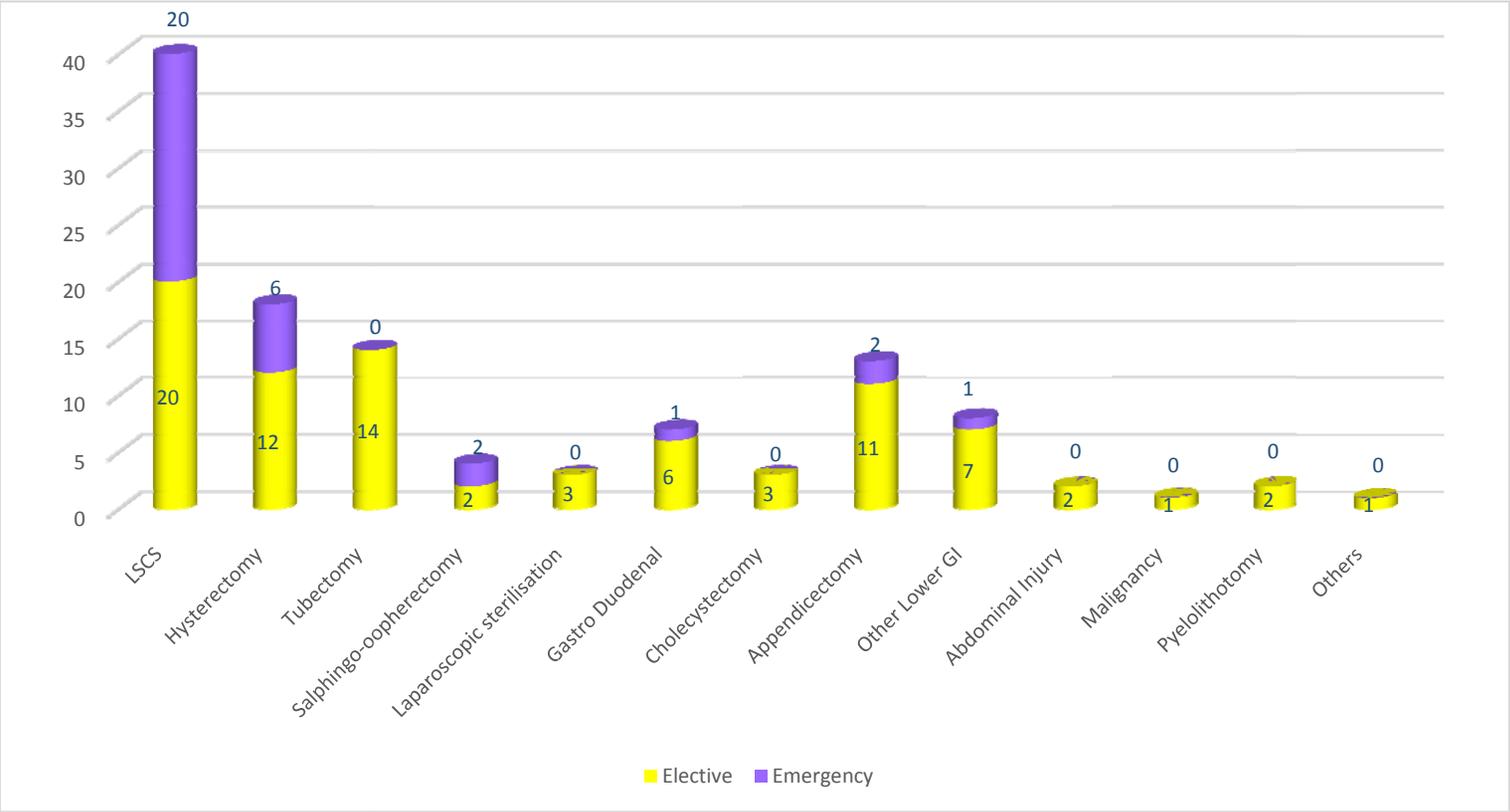
An index operation is the previous surgery, which resulted in the incisional hernia. Gynecological operations accounted for 68.1% of our incisional hernias. Emergency procedures accounted for 43% and Elective gynecological procedures for 57% showing almost equal incidence. However in Gastrointestinal procedures accounting for 29.3% of incisional hernias Emergency procedures carry a higher incidence of postoperative wound complications and incisional hernia formation (76.5%) compared to Elective procedures, which account for only 23.5%

## INITIAL OPERATIVE PROCEDURES AND ORGANS OPERATED UPON

INDEX OPERATION	EMERGENCY	ELECTIVE
<b>GYNAECOLOGICAL</b>		
LSCS	20	20
HYSTERECTOMY	12	6
TYBECTOMY		14
OOPHERECTOMY+/- SALPHINGECTOMY	2	2
LAPAROSCOPIC STERILIZATION		3
<b>GASTROINTESTINAL</b>		
UPPER GI/ BILLIARY	6	1
GASTRO DUODENAL		3
CHOLECYSTECTOMY		
<b>LOWER GASTRO INTESTINAL</b>		
APPENDICECTOMY	11	2
OTHERS	7	1
PENETRATING	2	

ABDOMINAL INJURY		
MALIGNANCY		1
PYELOLITHOTOMY		2
OTHERS (UMBILICAL HERNIA REPAIR)		1

**INDEX OPERATION**



WOUND INFECTION IN MESH REPAIR



WOUND INFECTION IN SUTURE REPAIR



## COMPLICATIONS FOLLOWING INDEX OPERATION

COMPLICATION **	NUMBER
WOUND INFECTION	37
WOUND SEROMA	21
WOUND HEMATOMA	10
WOUND DISRUPTION	10
BURST ABDOMEN	4
SECONDARY SUTURING	14
SINUS/FISTULA/ULCER	3
OTHERS*	3

\*Include general complication like Ileus, Peritonitis and Cardiovascular problems

\*\*Most of the complications were common in Emergency procedure.

## TIME OF ONSET FOLLOWING INDEX OPERATION

Early time of onset following the index operation occurred mostly in patient with

- Wound dehiscence post operatively,
- Emergency procedures
- Gastrointestinal procedures.
- Gynecological procedure

- lower segment caesarian section (LSCS) and Tubectomy,incisional hernia presented late;
- hysterectomy patients, it presented earlier.

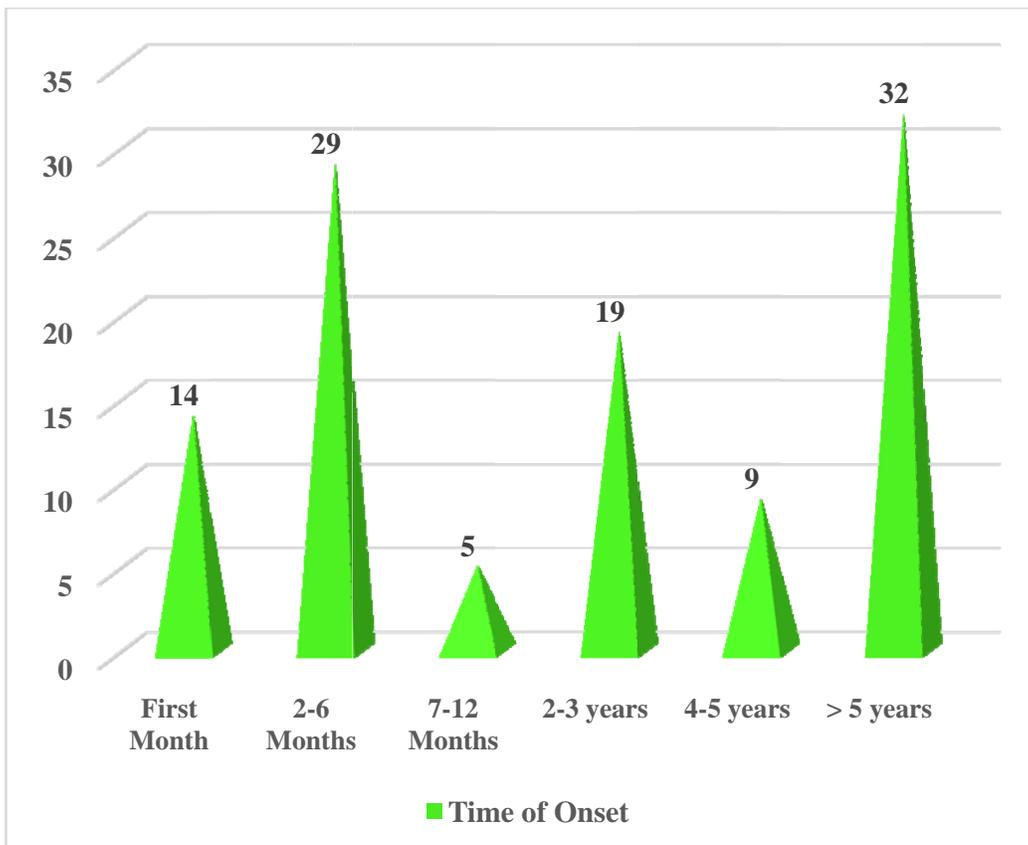
The distribution of the time of onset following index operation as follows:

Cases in our study includes both elective and emergency admissions like irreducible,obstructed,strangulated hernia are included.

**TIME ONSET**

<b>TIME</b>	<b>NUMBER</b>
FIRST MONTH	14
2- 6 MONTHS	29
7-12 MONTHS	5
2-3 YEARS	19
4-5 YEARS	9
LONGER	32

## TIME OF ONSET



**COMPARISON BETWEEN THE OUTCOMES OF VARIOUS  
TECHNIQUES FOR INCISIONAL HERNIA REPAIR**

A) COMPARISON BETWEEN SUTURE REPAIR AND MESH REPAIR:

SHORT AND LONG TERM OUTCOMES

	SIMPLE HERNIA		
	SUTURE REPAIRn=39	MESH REPAIR n=18	p value
Length of operation (min)*	41.8(12.4)	42.94(7.93)	0.687 <sup>^</sup>
Hospital stay (days)+	8(5.5-9.5)	9.5(7.25-1.75)	0.04 <sup>^^^</sup>
<b>Results at 6 weeks</b>			
Return to full activity (weeks)+	4(3-8)n=37	4(3-4)75)n=18	0.317 <sup>^^</sup>
Pain intensity (VAS)+	0(0-0)	0.5(0-1.75)	0.03 <sup>^</sup>
Presence of pain (VAS>0)	9 of 37	9 of 18	0.04 <sup>^^^</sup>
<b>Results at 6 months</b>			
Pain intensity (VAS)+	0(0-0) n=23	0(0-0.75) n=6	0.08 <sup>^</sup>
Presence of pain (VAS>0)	0 of 23	2 of 6	0.13 <sup>^^^</sup>
<b>Follow up</b>			
Duration (months)+	6(3-10)	4(3-6.75)	0.154 <sup>^^</sup>

\*Values are mean (s.d)or +median (25<sup>th</sup> and 75<sup>th</sup> percentiles):

\*\*Mean values (s.d), a value of 100% indicate perfect quality of life;

<sup>^</sup>t-test; <sup>^^</sup>Mann-Whitney U test; <sup>^^^</sup>chi –squares test; VAS-visual analogue scale.

## B) COMPARISION BETWEEN MESH SUBLAY AND MESH ONLAY

### TECHNIQUES FOR INCISIONAL HERNIA REPAIR:-

#### SHORT AND LONG TERM OUTCOMES

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	P value	MESH SUBLAY n=13	MESH ONLAY n=31	P value
<b>Short term results</b>						
Length of operation (min)*	36.2 (6.57)	45.54 (6.96)	0.02 <sup>^</sup>	57.85 (48-72)	53.58 (47-58)	0.39 <sup>^</sup>
Hospital stay (days)+	6(4-7)	10(9-15)	0.01 <sup>^^</sup>	8(8-10)	14 (9.5-17)	0.001 <sup>^^</sup>
<b>Results at 6 weeks</b>						
Return to full activity (weeks)+	2(2-3) n=5	4(4-6) N=13	0.001 <sup>^^</sup>	3(2-3) N=13	9.5(5.25-12) n=1	0.001 <sup>^^</sup>
Pain intensity (VAS)+	0(0-0)	1(0-3)	0.001 <sup>^^</sup>	0(0-0)	1(1-2)	0.001 <sup>^^</sup>
Presence of pain (VAS>0)	0 of 5	9 of 13	0.01 <sup>^^</sup>	2 of 13	26 of 29	0.02 <sup>^^</sup>
<b>Results at 6 months</b>						
Pain intensity (VAS)+	0(0-0) n=3	1(0.5-2) n=3	0.08 <sup>^^</sup>	0(0-0) n=10	0(0-1) n=19	0.04 <sup>^^</sup>
Presence of pain (VAS>0)	0 of 3	2 of 3	0.32 <sup>^^</sup>	0 of 10	7 of 19	0.132 <sup>^^</sup> <sup>^</sup>
Quality of Life (%)**	78(3.46)	28(10.7)	0.02 <sup>^</sup>	71.4(4.22)	55.68 (5.87)	0.001 <sup>^</sup>
<b>Follow up</b>						
Duration (months)+	6(3-15)	4(3-6)	0.17 <sup>^^</sup>	8(6-15)	6(3-10)	0.1 <sup>^^</sup>

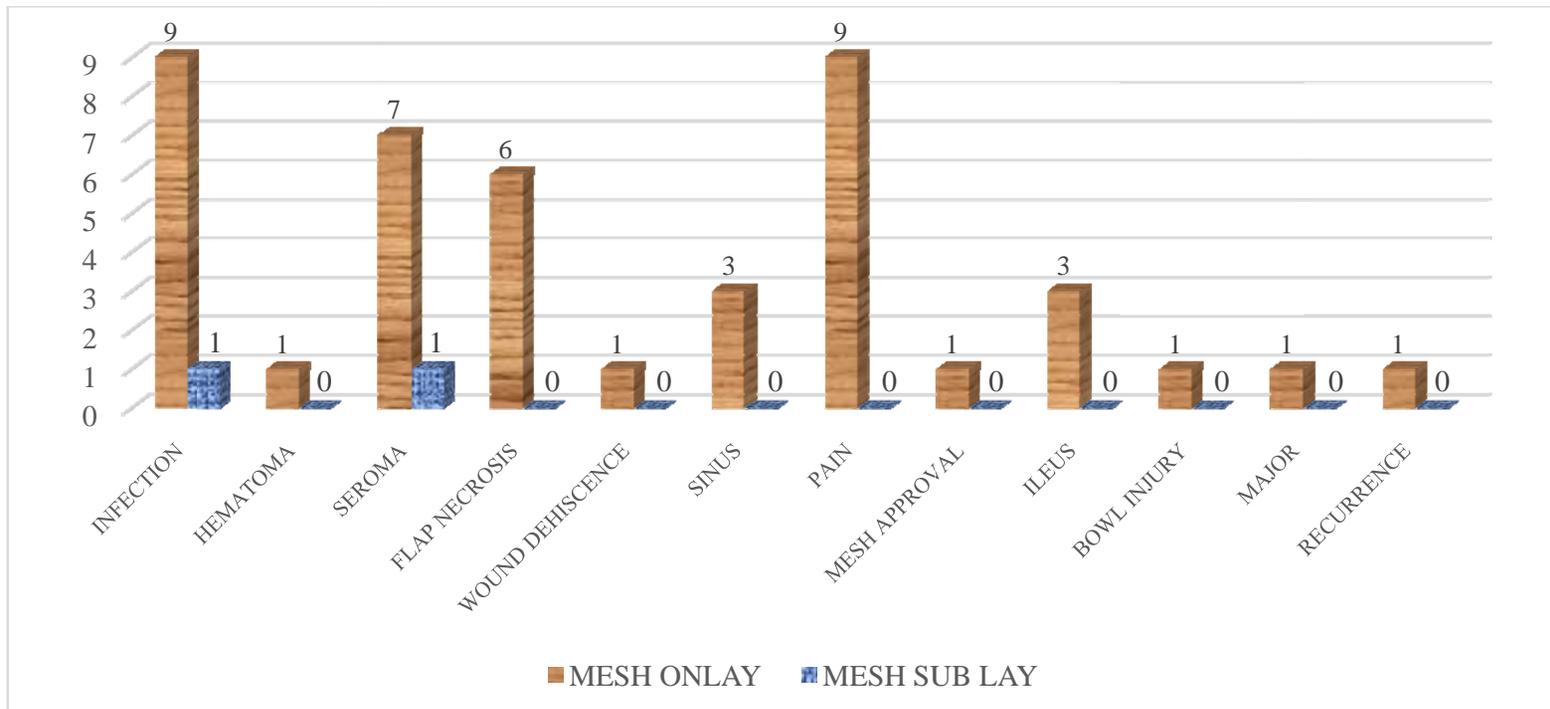
\*Values are mean (s.d)or + median (25<sup>th</sup> and 75<sup>th</sup> percentiles):\*\*mean values (s.d), a value of 100% indicate perfect quality of life;

<sup>^</sup>t-test; <sup>^^</sup>Mann-Whitney U test; <sup>^^^</sup>Chi-squares test; VAS – visual analogue scale

## COMPLICATIONS OF SURGERY AND HERNIA RECURRENCES

	Simple Hernia		Complex Hernia		
	Suture repair	Mesh onlay	Mesh sublay	Mesh onlay	Mesh sublay
Local complications					
Infection major	3	2	-	5	-
Infection minor	2	2	-	3	1
Hematoma	1	-	-	1	-
Seroma	3	2	-	5	1
Flap necrosis	2	2	-	4	-
Wound dehiscence	-	-	-	1	-
Sinus	1	1	-	2	-
Induration and pain	9	9	-	7	-
Mesh infection and removal	-	-	-	1	-
Total (intention to analysis)	6 of 39 (15.38%)	3 of 13 (23.07%)	0 of 5	15 of 31 (48.38%)	1 of 13 (0.07%)
Total (analysis as treated)	4 of 39 (10.25%)	3 of 13 (23.07%)	-	13 of 31 (41.93%)	0 of 13
General complications					
Ileus	2	1	-	2	-
Inadvertent enterotomy	1	-	-	1	-
Major(cardio pulmonary, thromboembolic, neurologic)	1	-	-	1	-
Mortality*	-	-	-	-	-
Recurrence**	1(3)	-	-	(1)	-

## COMPLICATIONS



## **DISCUSSION**

All the patients who were included in the study were admitted at our hospital and detailed history and physical examination was done as discussed above and all were recorded in the appropriate proforma prepared and stored.

Analysis of observed data were done to trace the etiological factors and identify the risk factors for incisional hernia formation and compare the various Surgical techniques for incisional hernia repair and evaluate the short term and long term outcomes of the surgical techniques.

### **AGE AND SEX INCIDENCE**

In this study of 106 patients with incisional hernia, the gynecological causes .laparotomy were most commonly associated with incisional hernia formation (68.1%) and naturally the incidence was found to high among females (72.5%). If we consider only those operations performed on both the sexes, then incisional hernia occurred more frequently in males than females by a ratio of approximately 4.5:1. This in comparison with a similar study done at Henry Ford Hospital of 794 patients. the x distribution was in the ratio of 3:2

The incisional hernia occurrence was most commonly noted between the age group .(30-50 years in this study, compared to the Henry Ford Hospital group, which had more patients above 40 years. This could be explained by the large number of gynecological procedures done a younger age group.

## CLINICAL CHARACTERISTICS

Most of the patients with incisional hernia presented with swelling alone and even in large hernia only discomfort was present. Pain was noticed in patients with very narrow neck and with features of obstruction. Among the 106 patients, 5 patients presented with intestinal obstruction and features of strangulation and immediate emergency intervention was done and one patient expired among them due to various causes. This the only mortality in this study group. All these 5 patients were excluded from further v for outcome measurement.

Many comorbid conditions were identified with the patients predisposing to incisional hernia formation. Obesity accounted for 13.7% of patients as already discussed it is an important predisposing factor. Pulmonary diseases and smoking were in 32.5 % patients which cause chronic cough and lead on to wound dehiscence and cardiovascular diseases were found in 14.7 % patients. Other factors predisposing to raised intra abdominal pressure like constipation and prostatism were present in 6 patients and actors affecting wound healing like diabetes, steroid intake, anemia and jaundice were noted in 8 patients. In general, in 44.4% patients certain comorbid conditions were found.

Physical examination of the patient was done to identify the hernia size, site and other characters. In 57 patients the hernia was simple with defect less than 6 cms in size and 47 patients had complex hernia with large defects or multiple defects or weak abdominal wall. All the findings were noted and summarized.

## **SITE OF HERNIA**

The most common site of hernia was found in the lower midline below the umbilicus. It was found in about 40.1% of patients. It is well known and as already lower vertical midline incisions were more prone for incisional hernia formation. statistics on the exact frequency of incisional hernias following various operations, precise records of the procedures were not available.

Next in frequency were umbilical, paraumbilical used for tubectomy and lower incisions (Pfannenstiel) used mostly in elective gynecological operations accounting in 14 and 11 patients each .

Upper midline vertical incisions used for upper gastrointestinal procedures and multiple incisions scar used for multiple laparotomies.

## **INDEX OPERATION AND ITS POST OPERATIVE COMPLICATIONS:**

An index operation is the previous surgery, which resulted in the incisional Hernia . Gynecological operations accounted for 68.1% of our incisional hernias Emergency procedures accounted for 43% and Elective gynecological procedures 57% showing almost equal incidence. Lower segment caesarian section was the most common operation either by midline or pfannenstiel incision. Other procedures included tubectomy, hysterectomy and ovarian cyst excision. In Gastrointestinal procedures which accounted for 29.3% of incisional hernias. Emergency procedures carry a higher incidence of post operative wound complications and incisional hernia formation (76.5%) compared to Elective procedures, which account for only 23.5%.

Upper gastrointestinal procedures mainly included complications of duodenal ulcer and biliary tract procedures. Lower gastrointestinal tract mainly involved emergency appendectomy. All these procedures were complicated by wound infection and predisposed to incisional hernia formation. Operations following trauma like penetrating injuries also had a higher incidence of hernia. Elective lower gastrointestinal tract had fewer incidence of hernia.

Complications following the index operations mainly predominated by wound related infections and seroma and ultimately leading to wound failure and resulting in incisional hernia formation. Although precise incidence of wound infection as a factor in genesis of incisional hernia has not been determined, it was found to be a major factor for the occurrence of incisional hernia in about 50% of the reported patients in this study. Other general complications like ileus and peritonitis were rare. It was found out that in 42.15% outpatients incisional hernia occurred within 6 months of the operation. This suggests that the technique of wound closure was inadequate and use of non-absorbable suture material is important in prevention of incisional hernias.

## **ETIOLOGICAL FACTORS IN INCISIONAL HERNIA**

It was impossible to describe the appearance of an incisional hernia to a single cause, since so often more than one factor was operative in causation. But it was important to identify the factors predisposing to incisional hernia so that it can be eliminated and incisional hernia occurrence can be prevented.

From the above observations in this study, the various factors predisposing to incisional hernia were identified as follows:

1. Wound infection and disruption as a factor was identified in more than 50% of the patients, which can be prevented, by strict aseptic precautions and appropriate antibiotic treatment.
2. Faulty technique — as identified in 42.15% of patient with early onset of incisional hernia was probably due to faulty techniques. which can be eliminated by using proper technique and evaluating its outcome.
3. Comorbid conditions - were found in 44.4% of patients. Although all the factors cannot be eliminated, most can be treated in anticipation of incisional hernia and thus it can be prevented.
4. Undetermined cause- the etiologic factors could not be identified in a large number of patients.

## CLINICAL OUTCOMES OF VARIOUS SURGICAL TECHNIQUES

### PRIMARY OUTCOME MEASURES

#### SIMPLE HERNIA:

#### COMPARISON BETWEEN SUTURE REPAIR AND MESH REPAIR SHORT TERM

#### RESULTS:

The short-term results were evaluated based on the duration of surgery and the length of hospital stay.

It was found out that the duration of surgery was almost similar between both the groups (p= value=.687; not significant)

Study	Suture repair	Mesh repair
Our study	41.8mins.	45.94mins
Luijendijk et al <sup>(10)</sup>	45mins	58 mins

#### Length of hospital stay

Study	Suture repair	Mesh repair
Our study	8(5.5-9.5)days	9.5(7.25-1.75)days
Luijendijk et al <sup>(10)</sup>	6.2(1-27)days	6.3(1-28)days

In our study it was found out that patients with suture repair had significant shorter hospital stay (p Value-<0.04) compared to mesh repair. This may be due to less complication rate in suture repair

## RESULTS AT 6 WEEK FOLLOW UP

Return to full activity

Study	Suture repair	Mesh repair
Our study	4(3.8)days n=37	4(3-4.75) days n=18
Luijendijk et al <sup>(10)</sup>	4-20days	2-14 days

There was no statistically significant difference between the two groups (p Value=0.317). pain intensity and presence of Pain:

Pain as measured by Visual Analogue Scale was statistically significant .

Pain intensity (VAS)+	0(0-0)	0.5(0-1.75)	0.03^^
Presence of pain (VAS>0)	9 of 37	9 of 18	0.04^^^

This was mainly due to the dull aching pain and induration, which were due to the foreign body reaction to the mesh.

## RESULTS AT 6 MONTHS FOLLOW UP

Pain intensity and presence of pain

Pain intensity (VAS)+	0(0-0) n=23	0(0-0.75) n=6	0.08^^
Presence of pain (VAS>0)	0 of 23	2 of 6	0.13^^^

This shows that at 6 months the presence of pain was not statistically significant

Length of hospital stay.

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
Hospital stay (days)+	6(4-7)	10(9-15)	0.01^^	8(8-10)	14 (9.5-17)	0.001^^

There was a very much significant difference between the sublay and onlay repair in both the hernia groups, this is mainly because of the absence of complications in sublay technique.

## RESULTS AT 6 WEEK FOLLOW UP

Return to full activity:

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
Return to full activity (weeks)+	2(2-3) n=5	4(4-6) n=13	0.001^^	3(2-3) n=13	9.5(5.25- 12) n=31	0.001^^

This also shows that sublay technique had better outcome in the form of early return to activity in both the groups.

**COMPARISON BETWEEN MESH ONLAY AND MESH SUBLAY REPAIR IN BOTH SIMPLE AND COMPLEX HERNIA**

**SHORT TERM RESULTS:**

Duration of surgery

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
	Length of operation (min)*	36.2 (6.57)	45.54 (6.96)	0.02 <sup>^</sup>	57.85 (48-72)	53.58 (47-58)

This shows that the time taken for mesh sublay in a simple hernia is shorter, but in a complex hernia there is no significant difference.

**LENGTH OF HOSPITAL STAY**

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
	Hospital stay (days)+	6(4-7)	10(9-15)	0.01 <sup>^^</sup>	8(8-10)	14(9.5-17)

There was a very much significant difference between the sublay and onlay repair in both the hernia groups, this is mainly because of the absence of complications in sublay technique.

## RESULTS AT 6 WEEK FOLLOW UP

Return to full activity:

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
Return to full activity (weeks)+	2(2-3) n=5	4(4-6) n=13	0.001^^	3(2-3) n=13	9.5(5.25- 12) n=31	0.001^^

This also shows that sublay technique had better outcome in the form of early return to activity in both the groups. Pain intensity and presence of pain at 6 weeks and 6 months

	SIMPLE HERNIA			COMPLEX HERNIA		
	MESH SUBLAY n=5	MESH ONLAY n=13	p value	MESH SUBLAY n=13	MESH ONLAY n=31	p value
Results at 6 weeks						
Pain intensity (VAS)+	0(0-0)	1(0-3)	0.001^^	0(0-0)	1(1-2)	0.001^^
Presence of pain (VAS>0)	0 of 5	9 of 13	0.01^^^	2 of 13	26 of 29	0.02^^^
Results at 6 months						
Pain intensity (VAS)+	0(0-0) n=3	1(0.5-2) n=3	0.08^^	0(0-0) n=10	0(0-1) n=19	0.04^^
Presence of pain (VAS>0)	0 of 3	2 of 3	0.32^^	0 of 10	7 of 19	0.132^^^

There was significantly better painless outcome by sublay techniques in both the groups at 6 weeks time. By 6 months the pain is similar in both groups.

## **SECONDARY OUTCOME MEASURES:**

### **POST OPERATIVE COMPLICATIONS**

A) In the simple hernia group, both the suture repair group and in mesh repair mesh Onlaygroup had similar pattern and rate of complications, which were not significant statistically.

In suture repair 4 patients out of 39 patients were treated for complications and mesh onlay group 3 out of 13 patients were treated. None of the patients in sublay group had any complications.

Pain was the major complaint in both the groups followed by wound infections, seroma, flap necrosis and sinus formation. All were treated accordingly. Among general complications one patient had inadvertent bowel injury in the suture group and prolonged ileus in 2 patients and a cardiovascular incident unrelated to the surgical procedure.

B) In a complex hernia, there was more wound related complications like wound infections, seroma, flap necrosis and wound dehiscence needing secondary suturing among patient treated with onlay repair. Severe infection resulting in mesh extrusion and removal occurred in one patient.

There was no significant complication in mesh sublay group. All the above findings were comparable with the randomized clinical trial for incisional hernia by M.Korenkov, S.Sauerland et al. [2]

## **RECURRENCES**

Only one case of recurrence was noted in the follow up of patients operated during the study period 3 months following the suture repair using the Mayo's technique.

Similarly one case of recurrence following mesh repair operated before the study period also presented as first recurrence that as also treated by mesh repair. In order to compare the suture repair and mesh repair, the two cases of recurrences were considered as primary recurrence following suture repair along with the one recurrence that occurred during the study period and similarly one case of recurrence following mesh repair was considered as primary recurrence after mesh repair and analysed.

The results are similar to M.Korenkov, et al ,Unlike Luijendijk who reported higher recurrence rate for suture repair (43%), our study didn't report high incidence rate at the end of 6 months follow up.

## SUMMARY

The summary of the observations made in this study is as follows:

1. Of the 106 cases admitted in our hospital. 102 cases were included in the study of incisional hernia and the outcomes of various surgical techniques; out of which 57 cases were included in simple hernia group and 45 cases were included in the complex hernia group.
2. Incisional hernia was common in the age group of 30-50 years. The minimum age of occurrence being 22 years and the maximum age being 70 years.
3. Female patients constituted the majority % since gynecological causes were the most common Index operation performed (68.1%).
4. The commonest site of incisional hernia formation was following lower midline incision.
5. The commonest presentation was swelling alone in most of the patients, but pain over the swelling occurred in 21% of the patients and complications was found in 15.7% of the patients at the time of presentation.
6. The presentation of the incisional hernia occurred, within 6 months duration in 42.16% and in 31.3% of the patients it occurred late after 5 years.
7. The etiological factors identified among the patients with incisional hernia were probably wound related complications in about 50% of the patients, faulty techniques in 42.15%, comorbid conditions in 44.4% and undetermined in most of the patients.
8. Of the simple hernia, 39 patients underwent suture repair by various techniques and 18 patients underwent mesh repair by onlay technique in 13 patients and sublay technique in 5 patients and were followed up and compared or analysis.

9. Of the complex hernia. 31 patients underwent onlay mesh repair, 13 patients underwent sublay repair and by component separation technique in one patient and were followed up and compared for analysis. In general onlay repair was done in 44 patients and sublay repair was done in 8 patients and were compared for analysis.
10. Short-term clinical outcomes compared were length of operation and hospital stay. In simple hernia, the duration of the operation was the same for both the suture repair and mesh repair; but the hospital stay was significantly lower in suture repair group compared to mesh repair. On comparison between sublay and onlay group in both simple and complex hernia, both the duration of operation and the hospital stay were significantly lower in sublay repair.
11. Long term follow up at 6 weeks and 6 months were done and the clinical outcome measured were presence of pain and pain intensity, return full activity and quality of life outcome which also included cosmetic appearance.
12. The pain was present in significant number of patients with mesh repair compared to suture repair in a simple hernia group, but the long term follow up of return to full activity and quality of life were similar.
13. On comparison onsublay type and onlay type of mesh repair, the pain levels, return to daily activity and quality of life were significantly better sublay repair in both the simple and complex hernia.
14. The incidence of complications in suture repair was about 15.38% and in mesh repair it was about 23.07% which needed treatment in all the cases.

15. There was only one case of recurrence noted in the suture repair group during the study period, there was no statistical difference in recurrence rates between the suture repair and mesh repair in general.
16. In conclusion, onlay mesh repair of incisional hernia carried a high risk of infections and local wound related complications and pain in the current study. Therefore conventional suture techniques may still have a place in the repair of a small, simple incisional hernia.
17. In both the simple and complex incisional hernia. sublay technique in which mesh is placed in the retrorectus space is the most ideal repair technique.

The limitations of this study were as follows:

- There were no randomisation of the patients done in this study
  - It was limited in its validity due to small sample size and short follow up period.
  - As it was an unblinded study, there was chance of observational bias.
- 1) The suggestion from this study was the need for a large randomized controlled trial comparing the sublay technique and onlay technique of mesh placement in incisional hernia repair.

## CONCLUSIONS

1. The main etiological factors identified for the occurrence of incisional hernia were Woundrelated - complications. Faulty techniques. Comorbid conditions and undetermined causes. Hence the incidence of the incisional hernia can be decreased by preventing these factors and by early identification and providing appropriate treatment.
2. In a small, simple incisional hernia, onlay mesh repair of incisional hernia carried a high risk of infections and local wound related complications and pain in the current studs' which was similar to various studies.
3. In a small, simple incision hernia, suture repair had similar outcomes in terms of recurrence rates. The incidence of other complications was less compared to onlay mesh repair in a small, simple hernia. Hence in a small, simple incisional hernia, repair by conventional suture repair still has a role if proper technique is used and other factors for recurrences are taken care. These findings correlated with that of the randomized trial conducted by M.Korenkov, S.Saucrland et al (25). In both the simple and complex hernia, Sublay technique of Mesh repair, where the mesh is placed preperitoneally in a retro-rectus plane had virtually no complications and both the short term and long term results were excellent
5. Comparing with other techniques it has an excellent post operative quality of life and better its-to and better patient acceptability, which is similar to other studies
6. Preperitoneal Retro-rectus Sublay technique of incisional hernia repair is the ideal technique of choice, which needs further long term randomized trials for validation and confirmation.



HYPERTENSION, DIABETES MELLITUS, PULMONARY  
TUBERCULOSIS, DRUG INTAKE - STEROIDS, JAUNDICE.

ANY SIGNIFICANT MEDICAL ILLNESS.

**PREVIOUS SURGERY DETAILS:**

NATURE - EMERGENCY / ELETIVE

PROCEDURE -

INCISION -

ABDOMEN CLOSURE TECHNIQUE -

TYPE OF SUTURE MATERIAL USED -

POST OPERATIVE PERIOD: -

WOUND INFECTION -

WOIJND DISCHARGE / SEROMA -

WOUND HEMATOMA -

POST OPERATIVE COUGH -

FEVER/ ABD DISTENSION. -

WOUND DEHISCENCE -

BURST ABDOMEN -

SECONDARY SUTURING -

DURATION OF HOSPITALISATION

**PERSONAL HISTORY:**

SMOKING, ALCOHOLISM. OTHERS.

**GENERAL EXAMINATION:**

- BUILT AND NOURISHMENT
- PALLOR / ICTERUS / PEDAL EDEMA /

**LYMPHADENOPATHY.**

- VITAL SIGNS

**CARDIOVASCULAR SYSTEMS:**

**RESPIRATORY SYSTEM:**

**CENTRAL NERVOUS SYSTEM:**

**ABDOMEN EXAMINATION:**

- CONTOUR
- DISTENSION
- TENDERNESS
- PREVIOUS SURGERY SCAR:
  - o SITE, SIZE, CONDITION, SKIN.
- HERNIA DETAILS:
  - o SITE
  - o SIZE OF DEFECT
  - o CONTENTS
  - o COUGH IMPULSE
  - o REDUCIBILITY
  - o COMPLICATION

**SIGNS OF OBSTRUCTION / INCARCERATION /**

STRANGULATION.

BOWEL SOUNDS

FREE FLUID

ORGANOMEGALY.

EXTERNAL GENITALIA:

PER RECTAL EXAMINATION:

PROSTATE ENLARGEMENT. –

PER VAGINAL EXAMINATION:

**INVESTIGATION**

<b>Urine</b>	<b>Alb</b>	<b>Sugar</b>
Blood	Sugar	Hemoglobin
	Urea	Grouping & Typing
	Creatinine	
Others	X-ray chest	ECG
	UGI Scopy	Ultra sound Abdomen and Pelvis

TREATMENT:

PRE OPERATIVE PREPARATION:

SURGERY DETAILS:

DATE OF SURGERY –

TYPE OF ANAESTHESIA –

TYPE OF SURGERY:

INTRA OPERATIVE

SUTURE REPAIR

MESH REPAIR

DURATION OF SURGERY POST OPERATIVE PERIOD:

RETURN TO FULL ACTIVITY

ANALGESIA REQUIREMENT

VISUAL ANALOGUE SCALE

POST OPERATIVE COMPLICATIONS:

GENERAL –

LOCAL –

WOUND INFECTION –

WOUND HEMATOMA –

WOUND SEROMA –

WOUND DEHISCENSE —

MESH DISRUPTION I EXTRUSION –

FISTULA/SINUS —

RECURRENCE –

LENGTH OF HOSPITAL STAY –

FOLLOW UP:

REGULAR FOLLOW UP:

ASSESSMENT AT 6 WEEKS:

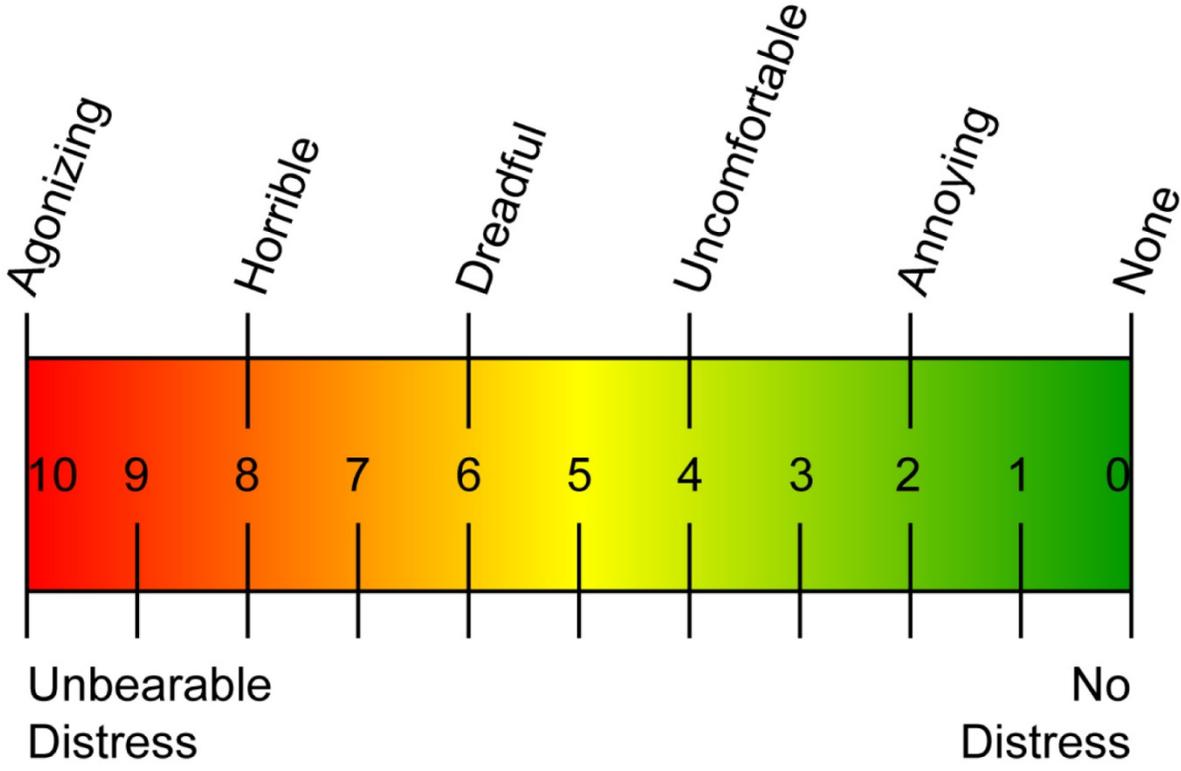
PAIN ASSESSMENT BY VISUAL ANALOGUE SCALE:

RETURN TO FULL DAILY ACTIVITY AT:

I ASSESSMENT AT 6 MONTHS:

PAIN ASSESMENT BY VISUAL ANALOGUE SCALE:

VISUAL ANALOGUE SCALE



Task \_\_\_\_\_

Date \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_

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## **KEYS TO MASTER CHART AND ABBREVIATIONS**

BMI	:	Body Mass Index.
LSCS	:	Lower Segment Caesarian Section.
TAH	:	Trans Abdominal Hysterectomy.
BSO	:	Bilateral Salphingo Oophorectomy.
MTP	:	Medical Termination of Pregnancy.
PS	:	Puerperal Sterilisation.
DU	:	Duodenal Ulcer.
PGJ	:	Posterior Gastro Jejunostomy
LML	:	Lower Midline
LAT	:	Lower Abdominal Transverse Incision
RPM	:	Right Para Median