CLINICAL STUDY AND MANAGEMENT OF INCISIONAL HERNIA BY PRE PERITONEAL MESH REPAIR

By

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Dissertation submitted to the

Sri Devaraj Urs Academy of Higher Education and Research

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In partial fulfilment of the requirements for the degree of

M.S in (General Surgery)

Under the guidance of

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ABSTRACT

Objective : To study Age, Sex distribution and Various risk factors leading to Incisional hernia and to evaluate Pre Peritoneal mesh repair and its complications .

Back ground Data: The incidence of incisional hernia in literature is 2- 11% following all laparotomies and it is a source of morbidity and requires high health care costs. Many factors are associated with incisional hernia like age, sex, obesity, chest infections, type of suture material, type of incision and most important wound infection. All of them present a challenging problem to the surgeon. This study has been undertaken to assess the magnitude of various factors leading to development of this condition ,plus to evaluate the technique of preperitoneal (sublay) mesh repair of incisional hernias with regards to post operative complications,hospital stay and recurrences, if any.

Materials & Methods: This is a prospective study of 50 cases of incisional hernia who attended to OPD and emergency department of R.L.Jalappa Hospital & Research Centre from May 2008 to May 2010. Data were collected from the patients ie, clinical history, examination and appropriate investigations. Documentations of patients which includes, identification , history, clinical finding, investigative tests, operation findings, operative procedures and complications during the stay in hospital and during subsequent follow up period, were all recorded in a proforma specially prepared.

Results: In our series of 50 patients, Incisional hernia was more common in females (88%) compared to males with 30 to 60 yrs age group forming the major bulk of cases.30% patients had early onset of incisional hernia within one year. Almost 78% patients had undergone obstetrics & gynaecological procedure with LSCS the most common operation followed by hysterectomy.Incisional hernia was most common

following lower midline incisions (74%).All patient underwent Preperitoneal mesh repair.86% cases had no post operative complication . Wound infection was seen in 2 % cases with seroma collection in another 10% cases.No recurrence was seen in cases followed between three months to two years.

Conclusion: In the present study, preperitoneal mesh repair had excellent long-term results with minimal morbidity. Comparing with other types of mesh repair techniques (in literature), the preperitoneal mesh repair is the gold standard treatment for incisional hernia repair .

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INTRODUCTION

Incisional hernia is defined as a "Any abdominal wall gap with or without bulge in the area of a postoperative scar perceptible or palpable by clinical examination or imaging''. It is the only hernia considered to be truly iatrogenic. Ian Aird defines incisional hernia as a diffuse extrusion of peritoneum and abdominal contents through a weak scar of an operation or accidental wound. It occurs due to the failure of the lines of closure of abdominal wall following laparotomy [1,2]. An incisional hernia occurs when all the layers except the skin fail to heal.

It is one of the most common conditions requiring major surgery despite advances in surgical techniques and suture material. The incidence of incisional hernia in literature is 2- 11% following all laparotomies [3] and it is a source of morbidity and requires high health care costs.The frequency of this complications seems to be increasing as major and lengthy operations are performed ,especially in elderly patients with concomitant organic disease.

As a result of high recurrence rate in the repair of incisional hernia, various types of repairs have been used both anatomical and prosthetic. Surgical repair is difficult in cases of large abdominal defects ,when the herniated viscera have **" lost their right to reside** " in abdominal cavity. The results have been disappointing with a high incidence of recurrence of about 30-50% after anatomical repair [4] and 1.5-10% following prosthetic mesh repairs [5].The introduction of prosthetics has revolutionized hernia surgery with the concept of tension free repair.

Although a wide variety of surgical procedures have been adopted for the repair of incisional hernia, but the implantation of prosthetic mesh remains the most efficient method of dealing with incisional hernia [6].The prosthetic mesh can be placed between the subcutaneous tissues of the abdominal wall and the anterior rectus sheath (onlay mesh repair) as well as in the preperitoneal plane created between the rectus muscle and posterior rectus sheath (sublay mesh repair). The later technique has several advantages one of being not transmitting the infection from subcutaneous tissues down to the mesh as it lies quite deep in the preperitoneal plane [7].

This study has been undertaken to assess the magnitude of various factors leading to development of this condition ,plus to evaluate the technique of preperitoneal (sublay) mesh repair of incisional hernias with regards to post operative complications,hospital stay and recurrences, if any.

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

Since the time abdominal operation became more common it was found that hernia through the scars were not infrequent sequelae. Various operative procedures were developed to tackle this disease, from Maydl (1886) to present date. The aim of this study is to study the following aspects of incisional hernia.

1) To study age, sex distribution and various risk factors leading to incisional hernia.

2) To evaluate pre peritoneal mesh repair and its complications.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Major abdominal surgery developed rapidly during the latter part of the last century and with it rose the incidence of postoperative hernias.In the pursuit of developing the best surgical technique for incisional hernia repair relatively little research has been conducted to elucidate the natural course of incisional hernias.

Surgical literature upon scar hernia reveals Gerdys report of the repair of large ventral herniae in 1836 as the first record of such a procedure[8]. He inverted the entire sac, including the skin and sutured the margins of the aperture together. Ammonia was then poured into the inverted sac, in order to form adhesions.

Maydl [9] (1886) first used a technique like present day standards. He dissected out the various musculo-fascial layers and repaired them separately. Witzel in 1890, Goepel in 1900, Barlet [10] in 1903, Mc Arthur [11] in 1901 described the repair of incisional hernia from continuous fascial sutures from the external oblique in autoplastic suture of hernia.

Koontz [12] and Throckmorton [13] (1948) introduced tantalum gauze. These foreign materials had the disadvantage of metal fatigue with subsequent fragmentation, sinus formation and perforation of bowel with fistula consequent to fragment penetration.

Judd [14] in 1912 and Gibson [15] in 1916 both described repair technique based on extensive anatomic dissection of the scar and adjacent tissues. Gibson again in 1920

reported having repaired successfully (quoted Ponka, 1980) 8 cases of large incisional hernia using lateral muscle relaxing incisions in the anterior rectus sheath, parallel to midline.

Techniques with extensive tissue dissection were described by Nuttal in 1932, Dixon (1929), Watson (1938), Wells (1956), Maingot (1958) and Madden (1964). These techniques frequently resulted in recurrence because the tissues were sutured.

Fascia lata grafts used in the form of strips or sheets were first reported by Mc Arthur6 in 1901, Kirschner in 1910, Gallie in 1921 and again in 1923, 1924, 1932 popularised use of fascia lata grafts. Hamilton in 1968 published a large series of hernia patients treated successfully with fascia lata grafts.

Mair [16] in 1945 advocated the use of skin in sheets or strips. Hamilton in 1968 also used the same material. However these tissues tends to get absorbed and were associated with high recurrence rates. Harvesting the graft was another problem as were complications such as sinus formation, dermoid cyst and even malignant changes.

Darn techniques involving aponeurosis of external oblique strips were described by Burton (1959). Gosset (1953) reported using skin ribbon sutures. Moloney (1948) used nylon and Maingot (1958) reported repair using floss silk.

The new era of darning started with the advent of newer materials when Abel (1960) used stainless steel wire for the lattice work after constructing the new linea alba in midline incisional hernia. Hunter in 1971 described an almost same technique using monofilament nylon. This trend has culminated in the description by Abrahamson (1987) of his shoelace darn technique in repair of incisional hernias.

The modern era of prosthetic hernia repair began in 1958 when Usher.F.C [17] reported his experience with polyethylene (marlex) mesh. Later polyamide (nylon) mesh and recently PTFE (Polytetra fluoro ethylene) were introduced. These three materials have revolutionized the surgery of incisional hernia, so that earlier methods have become of historical interest and have been now abandoned.

To prevent the development of chronic seroma in the abdominal wall after incisional hernioplasty with a prosthetic material, Usher in 1971, recommended the relative use of large romovac drains and the post operative application of an encircling elastoplasts girdle. Durden and Pemberton in 1974 also advocated the use of closed suction drains whenever a non-absorbable mesh is inserted into the wound and also reported their experience with the use of Dacron mesh for incisional hernia repair.

More recently use of expanded PTFE mesh has been reported by Sher (1980), Jenkins (1983) and Baner (1987). These materials cause little tissue reaction, are strong and are not easily infected.

Jayanth Sharma[18] et al in their study have stated that incisional hernia occurring through midline incision was the most common variety requiring prolene mesh repair(7.5%).

Lichtenstein [19] in 1991 reported that monofilament polypropylene stimulates a strong fibroblastic response and has a marked resistance to infection. Martijne van et al [20] found that Sepramesh significantly reduces mess surface covered by adhesions and prevents bowel adhesions to the mesh.

Comparative studies conducted by K. Cassar and A. Munro[21] (2002) for surgical treatment of incisional hernia concluded that open suture repair for incisional hernia carries an unacceptably high recurrence rate (31-49%).

Laparoscopic incisional hernia repair is becoming increasingly popular. An intraperitoneal mesh is sutured or tacked into place with the mesh extending a clear 5 cm beyond the edges of the defect[22].

Gregory .A.Dumanian and Woody Denham [23] compared laproscopic ventral hernia repair with sliding myofascial rectus flap ventral hernias.

The results for open mesh and laparoscopic mesh techniques are encouraging with recurrence rates of 0-10% and 0-9% respectively.

The laparoscopic methods result in less post operative pain and early return to work with comparable recurrence rates. However they are more expensive, more time consuming and technically demanding.

Despite the increasing progress of modern surgery, the optimum surgical treatment of incisional hernia is still an unanswered problem [24]. To sum up surgical technique for repair of incisional hernia has evolved over the years with each technique having its own merits and demerits.The process is still evolving and this is the precise reason to take up this particular study.

ANATOMY OF ANTERIOR ABDOMINAL WALL

The human abdomen (also called the belly) is the part of the body between the pelvis and the thoax. Anatomically, the abdomen stretches from the thorax at the thoracic diaphragm to the pelvis at the pelvic brim. The pelvic brim stretches from the lumbosacral angle (the intervertebral disk between L5 and S1) to the pubic symphysis and is the edge of the pelvic inlet. The space above this inlet and under the thoracic diaphragm is termed the abdominal cavity. The boundary of the abdominal cavity is the abdominal wall in the front and the peritoneal surface at the rear.

1. Surface Anatomy: Abdominal wall is made up of six layers:

• Skin

• Subcutaneous tissue

• Superficial fascia

• Muscles

• Fascia transversalis

• Extraperitoneal connective tissue

• Peritoneum.

In the midline- linea Alba, it extends from xiphisternum to pubic symphysis.

1. Skin:

Skin varies in texture, tending to be thin in front and thick behind. Natural lines of cleavage of the skin are important –since an incision along the cleavage line will heal as a hair line scar and across the lines will heal with a wide or heaped up scar. The cleavage lines run almost horizontally around the body wall.

2. Subcutaneous tissue :

It is same as elsewhere in the body. Fat is contained in loculi, whose fibrous walls connect the overlying dermis to the underlying deep fascia. The fibrous septa condense beneath the fat into a thin but strong membrane – Fascia of Scarpa. It allows the subcutaneous fat to slide freely over the underlying thoracic wall, rectus sheath and external oblique aponeurosis. Below, fibrous strands that connect the dermis to fascia lata extending from pubic tubercle to inguinal ligament attach it. Fascia of Scarpa is attached to the sides of the body of the pubic bone and is continued over the penis and scrotum, where it receives a different name- Colle's fascia.

• **BLOOD SUPPLY:** The intercostal and the lumbar arteries pass forward in the neurovascular plane to supply the flanks. The internal thoracic, inferior and superior epigastric arteries supply the ventral midline tissues. 3 superficial inguinal arteries – superficial epigastric artery, superficial external pudendal artery and superficial circumflex iliac artery.

The venous return from the subcutaneous tissue does not follow the arteries. The blood is collected into a network of veins that radiate out from the umbilicus. Above into the axillary vein via the lateral thoracic vein and below into the femoral vein via the superficial epigastric and great saphenous vein it drains. A few paraumbilical veins through the umbilicus and along the ligament teres to the portal vein (hence portal- systemic venous anamolies)

• **LYMPHATICS:** Water shed line at the level of umbilicus- above drains into axillary group of lymphnodes and below into the superficial inguinal lymphnodes.

• **NERVE SUPPLY:** Are derived from lower 5 intercostal nerves, subcostal and iliohypogastric nerves. They pierce the anterior wall of the rectus sheath close to the median plane, divide into medial and lateral branches and supply the skin of the front of the abdomen.

3. Muscles of the Anterior Abdominal Wall: There are 4 large flat muscles and two small muscles.

:: External oblique

:: Internal oblique

:: Transverse abdominis

:: Rectus abdominis

:: Pyramidalis

:: Cremaster.

External oblique

Origin: Arises by eight fleshy slips from the lower eight ribs. The fibres run downwards forward and medially.

Insertion: Upper fibres into xiphoid process, linea alba, pubic symphysis, pubic crest and pectineal line of pubis. Lower fibres are inserted into the anterior 2/3 rd of the outerlip of the iliac crest.

Inguinal Ligament: Extends from the anterior superior iliac spine to the pubic tubercle.Its edge is rolled inwards to form a gutter. The lateral part of the gutter gives origin to part of the internal oblique and transverse abdominis muscles. To the inguinal ligament is attached the fascia lata of thigh. Just above the pubic crest, the aponeurosis of the external oblique muscle presents, a triangular aperture - the superficial inguinal ring.

Internal oblique

Origin: Arises from the lateral 2/3rd of the inguinal ligament, anterior 2/3rd of intermediate area of the iliac crest and thoracolumbar fascia. The fibres run upwards,forwards and medially

Insertion: Upper fibres are inserted into the lower 3 or 4 ribs. Lower fibres end in an aponeurosis which is inserted into 7th, 8th and 9th costal cartilages, xiphoid process, linea alba, pubic crest and the pectineal line of the pubis. The lower border of the internal oblique arches over the inguinal canal and contraction and shortening of these fibres aids in preventing herniation by applying pressure against the canal. In the lower abdomen, internal oblique continues on spermatic cord as cremaster muscle.

Transverse abdominis

Origin: Lateral 1/3rd of the inguinal ligament, anterior 2/3rd of the inner lip of the iliac crest, thoraco-lumbar fascia, inner surface of the lower six costal cartilages.

Insertion: The fibres end in a broad aponeurosis which is inserted into the xiphoid process, the linea alba, pubic crest and pectineal line of pubis. The lowest fibres of the muscle fuse with the lowest fibres of the internal oblique to form the conjoint tendon.

Rectus abdominis

Origin: It arises from two heads, lateral head from the lateral part of the pubic crest and the medial head from the anterior pubic ligament. Fibres are directed vertically upwards.

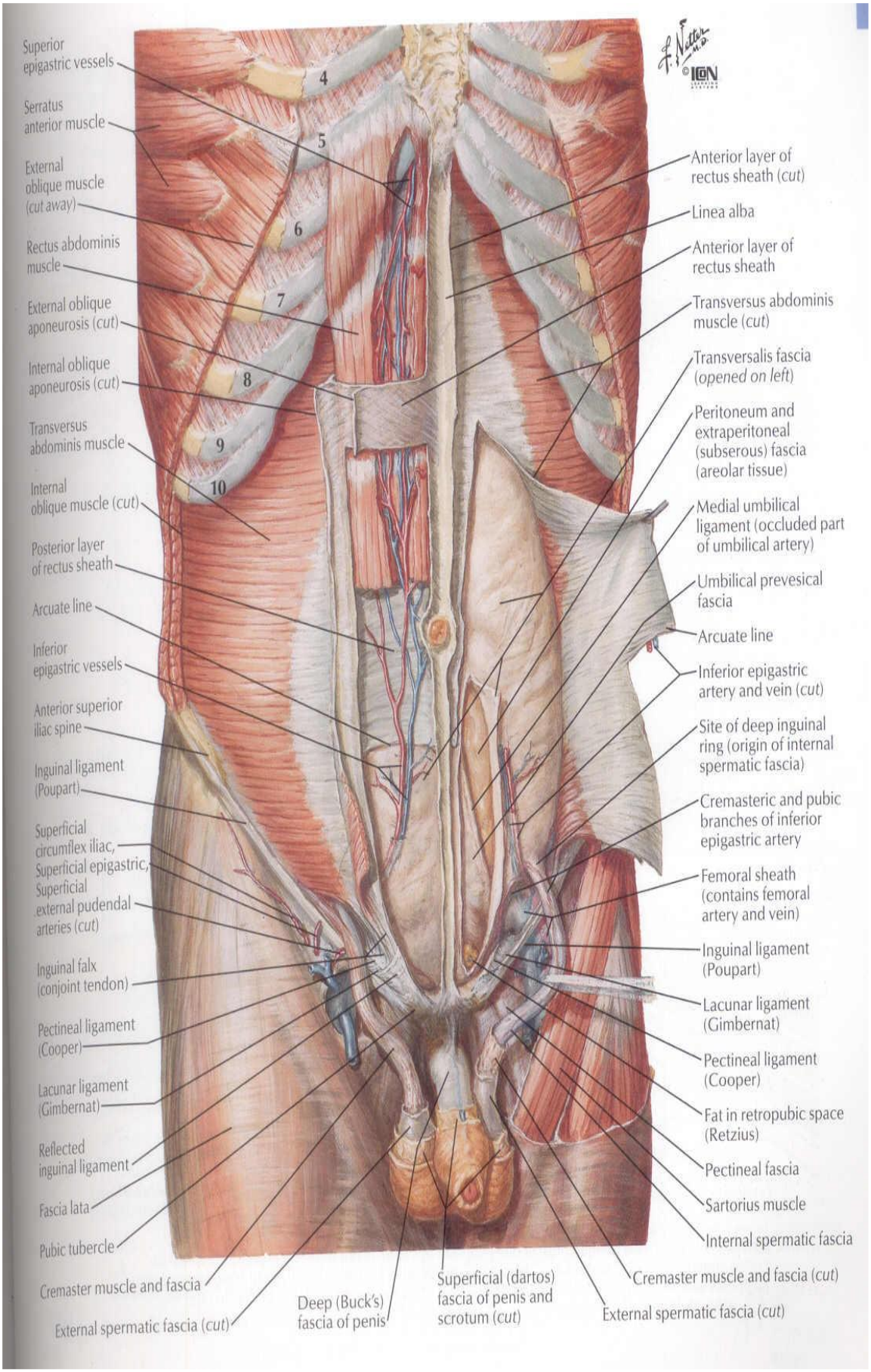
Insertion: Inserted into the anterior aspect of the 5th, 6th and 7th costal cartilages and the xiphoid process. The rectus muscle is divided by tendinous insertions into smaller parts, usually three in number, at the level of umbilicus, xiphoid process and midway between these two. These tendinous insertions are attached to the anterior portion of the rectus muscle and hence serve to prevent the retraction of muscle in transverse incision.

Pyramidalis

It is a small triangular muscle superficial to the rectus muscles, arising from the front of the pubis and inserting into the linea alba approximately halfway between the symphysis pubis and the umbilicus. Pyramidalis is a tensor of the linea alba.

Cremaster

It is derived from the lowest fleshy fibres of internal oblique arising from the inguinal ligament.


Superior epigastric vessels
Serratus anterior muscle
External oblique muscle (cut away)
Rectus abdominis muscle
External oblique aponeurosis (cut)
Internal oblique aponeurosis (cut)
Transversus abdominis muscle
Internal oblique muscle (cut)
Posterior layer of rectus sheath
Arcuate line
Inferior epigastric vessels
Anterior superior iliac spine
Inguinal ligament (Poupart)
Superficial circumflex iliac, Superficial epigastric, Superficial external pudendal arteries (cut)
Inguinal falx (conjoint tendon)
Pectineal ligament (Cooper)
Lacunar ligament (Gimbernat)
Reflected inguinal ligament
Fascia lata
Pubic tubercle
Cremaster muscle and fascia
External spermatic fascia (cut)
4
5
6
7
8
9
10
Anterior layer of rectus sheath (cut)
Linea alba
Anterior layer of rectus sheath
Transversus abdominis muscle (cut)
Transversalis fascia (opened on left)
Peritoneum and extraperitoneal (subserous) fascia (areolar tissue)
Medial umbilical ligament (occluded part of umbilical artery)
Umbilical prevesical fascia
Arcuate line
Inferior epigastric artery and vein (cut)
Site of deep inguinal ring (origin of internal spermatic fascia)
Cremasteric and pubic branches of inferior epigastric artery
Femoral sheath (contains femoral artery and vein)
Inguinal ligament (Poupart)
Lacunar ligament (Gimbernat)
Pectineal ligament (Cooper)
Fat in retropubic space (Retzius)
Pectineal fascia
Sartorius muscle
Internal spermatic fascia
Cremaster muscle and fascia (cut)
External spermatic fascia (cut)
Deep (Buck's) fascia of penis
Superficial (dartos) fascia of penis and scrotum (cut)

RECTUS SHEATH

It is derived from the aponeurosis of the three flat abdominal muscles. The relationship of the aponeurosis of the flat muscles is not constant throughout the course of the rectus muscle. The relationship is different above and different below the semicircular line of Douglas, which is about halfway between the umbilicus and pubic symphysis.

Above the semicircular line, the rectus sheath is strong posteriorly. Here the posterior sheath is composed of fascia from the internal oblique, transverse abdominis and transversalis fascia. Anteriorly above the semicircular line – the rectus sheath is composed of the external oblique aponeurosis and the anterior lamella of the internal oblique aponeurosis.

Below the semicircular line, which is the point at which the inferior epigastric artery enters the rectus sheath, the posterior rectus sheath is lacking because the fasciae of the flat muscles pass anterior to the rectus muscle. A thin layer of transversalis fascia covers the muscle below the semicircular line posteriorly.

FASCIA TRANSVERSALIS

The part of fascia that lines the inner surface of the transverse abdominis muscles is called fascia transversalis, which is separated from peritoneum by extra peritoneal connective tissue.

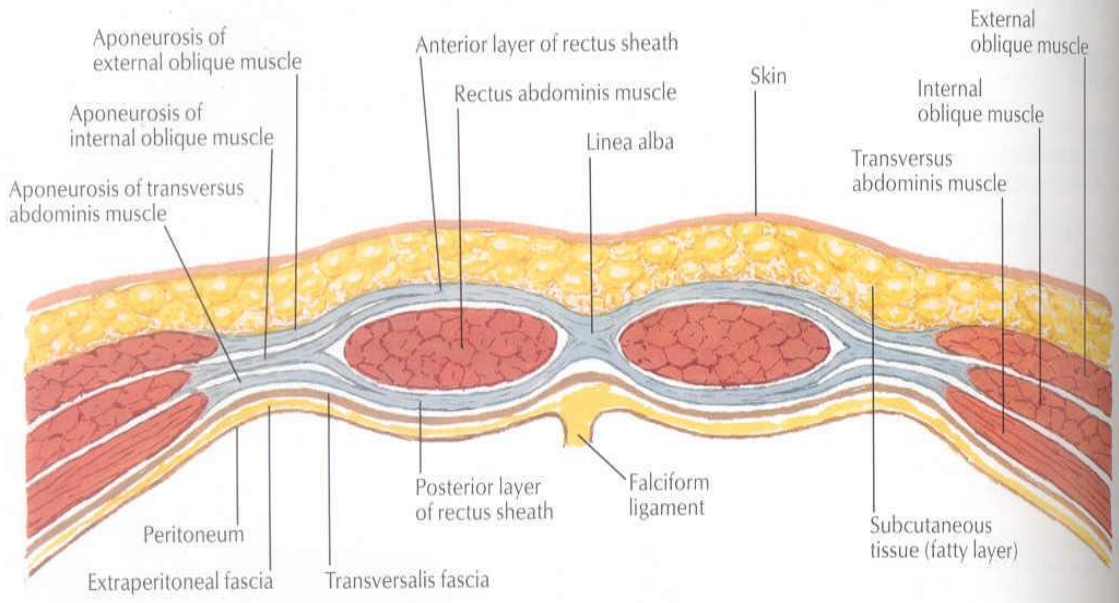
PRE PERITONEAL CONNECTIVE TISSUE

Found between the transversalis fascia and the peritoneum. This is surgically, relatively unimportant.

PARIETAL PERITONEUM

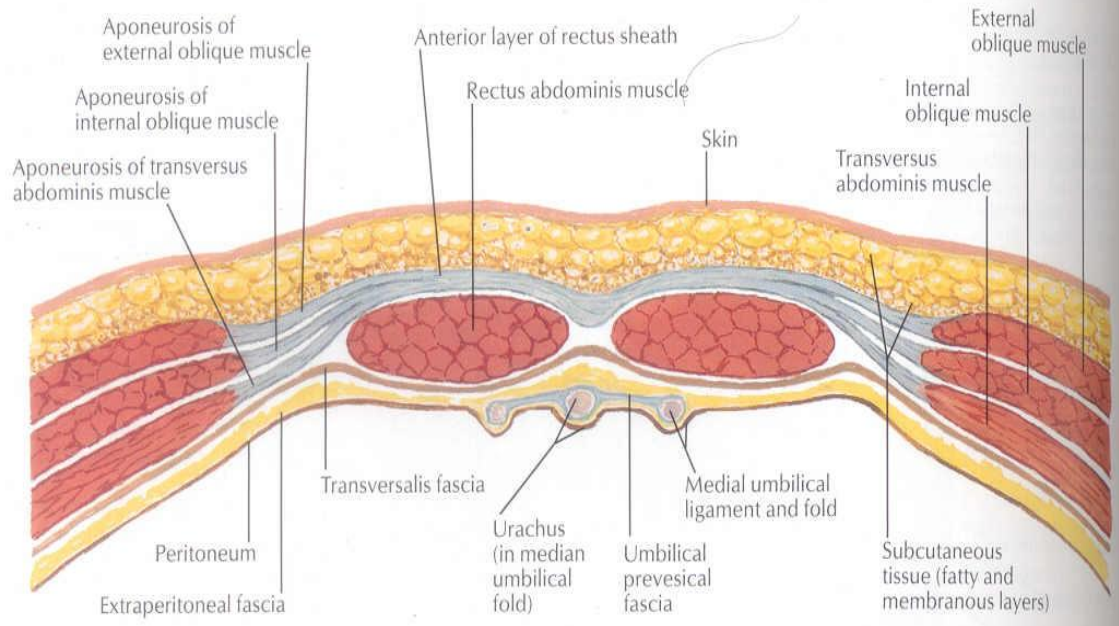
It is the innermost layer of the abdominal wall. It is a thin layer of dense, irregular connective tissue and is covered on the inside by a layer of simple squamous mesothelium.

Section above arcuate line



Aponeurosis of internal oblique muscle splits to form anterior and posterior layers of rectus sheath. Aponeurosis of external oblique muscle joins anterior layer of sheath; aponeurosis of transversus abdominis muscle joins posterior layer. Anterior and posterior layers of rectus sheath unite medially to form linea alba

Section below arcuate line



Aponeurosis of internal oblique muscle does not split at this level but passes completely anterior to rectus abdominis muscle and is fused there with both aponeurosis of external oblique muscle and that of transversus abdominis muscle. Thus, posterior wall of rectus sheath is absent below arcuate line and rectus abdominis muscle lies on transversalis fascia

ANATOMY OF ABDOMINAL INCISIONS AND CLOSURES

The choice of incision and correct methods of making and closing such wounds are factors of great importance. The incisions 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. Any mistake may result in serious complications. Therefore to prevent such complications, certain essentials should be achieved. The principles governing abdominal incisions are:

• Incision must give ready and direct access to the part to be dealt with.

• The incision should be extensible in a direction that will allow for any probable enlargement of the scope of the operation.

• Security: The closure of the wound must be reliable and ideally, should leave the abdominal wall as strong after the operation as before.

• As for as possible, muscles must be retracted or split in the direction of their fibres rather than cut across.

• The incision must traverse the muscle rather than fascia, as the scar left in the peritoneum is best protected.

• Incisions placed across the blood and nerve supply are prone for post operative complication of dehiscence.

• Oblique and transverse incisions are stronger and less liable for disruption and herniation.

• The opening made through the different layers of the abdominal wall must as for as possible, not be superimposed.

• Reentry into the abdomen should be performed through the previous incision, since hernia can be repaired at the same time.

•In children, skin incision should confine to Langer's lines, otherwise the scar becomes hypertrophic and unsightly with age.

The principles governing abdominal closure are:

• The sutures should not be tightened too tightly to avoid interruption of the circulation resulting, in areas of focal necrosis.

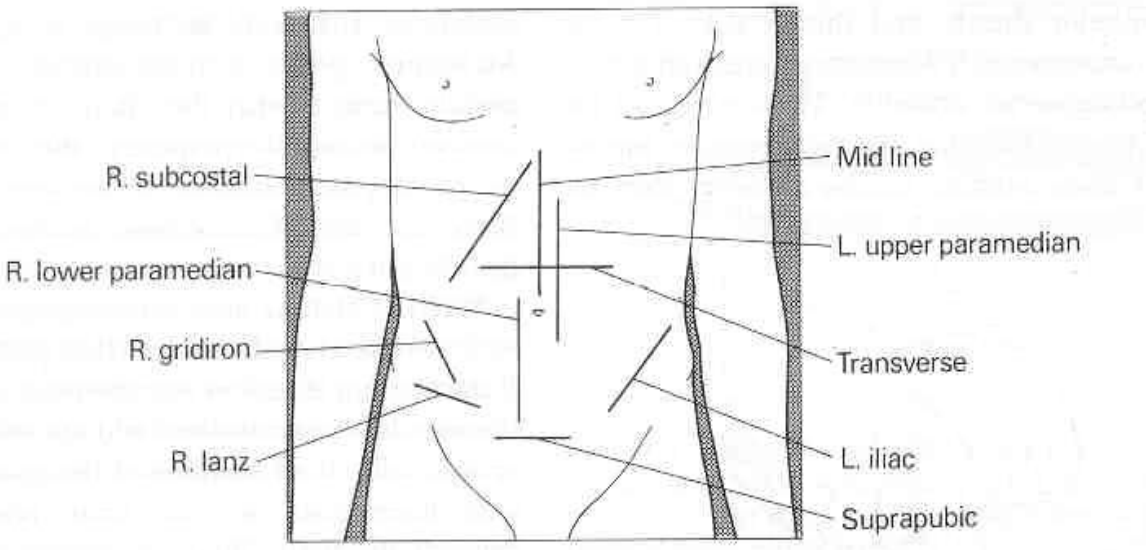
• The drainage tube should be inserted through a separate small incision otherwise it infects the main wound and weakens the scar.

•When wound tension is anticipated, deep tension sutures can be used and if they have been employed, they are left in situ for 14 days.

• Non-absorbable suture materials – should be used to suture the fascial layers.

DIFFERENT INCISIONS

- Dividing no muscles- Median, Paramedian, Pararectal, Pfannensteil's.
- Splitting muscles- Paramedian muscle splitting, McBurney, Lanz, hernia incision.
- Dividing muscles- Subcostal (Kocher), Rutherford Morrison, Transverse incision,Oblique lumbar (Morrison).



COMMONLY USED INCISIONS:

1. Midline incisions:

It is vertical, either above or below umbilicus. Commonly used for exposure in a wide variety of intra abdominal operations. No muscle fibres are divided. No nerves are injured. It is very quick to open and close, when speed is essential. It can also be extended and has the advantage of being able to be reused again and again.

Particularly useful in presence of peritoneal contamination since, tissue exposure is minimized.

2. Mc Burney's grid iron incision:

Routinely done for appendectomy. It is an example of utilizing the muscle tension to achieve a secure wound closure. If further access is required in an upward or downward direction, muscles can be divided. Ilioinguinal nerve may be injured and cause incisional hernia.

3. Kocher's subcostal incision:

Right side incision is used for gall bladder, biliary tract and on left side, for splenectomy. The incision commences exactly at the middle about 2.5 – 5 cm below the xiphisternum, runs outwards and downwards one inch below and parallel to costal margin. All muscles are divided in the same line. The disadvantage is, it takes longer time to open and close the abdomen.

4. Paramedian incision:

This incision can be made on either side of midline and both supra and infra umbilical region of the abdomen- parallel to midline and one inch from it. Vertical incision over the midrectus sheath and rectus muscle is retracted laterally. Then the posterior sheath is incised vertically. Advantage is it gives a strong scar. Disadvantage is that more time is required for its performance and the difficulty in performing this incision, when a previous laparotomy scar has to be reopened.

THE MOST DESTRUCTIVE INCISIONS ARE:

1) Pararectus incision:

It divides the intercostal nerves and blood vessels- as they pass medially. Incision is just lateral to the rectus abdominis muscle.

2) Long oblique incision:

This incision is used for kidney exposure, begins in the renal angle and passes just below and parallel to the 12th rib anteriorly upto the lateral border of rectus abdominis.

This incision cuts posteriorly lattismus dorsi, serratus posterior inferior and anteriorly flat muscles of anterior abdominal wall. Peritoneum is stripped forward and the lumbodorsal fascia incised posteriorly to expose the kidney with its fascial sheath. This incision may divide lateral cutaneous branch of 12^{th} thoracic nerve and also ilioinguinal and iliohypogastric nerves. While closing muscles are repaired by two tiers of suture.

3) Multiple incisions:

Multiple incisions in a same patient produce areas of weakness in between them. A number of hernias have developed at the angle formed by a vertical midline incision followed by a subcostal incision.

AETIOLOGICAL FACTORS

Many factors, singly or in various combinations may cause failure of wound to heal satisfactorily and lead to the development of incisional hernia. The important etiological factors are: -

1. Poor surgical technique

2. Sepsis.

Jack Abrahamson described two types of postoperative hernias

a) Early

b) Late.

EARLY INCISIONAL HERNIA

This appears soon after the original laparotomy closure; often the whole length of the wound grows rapidly and becomes large. This early failure is usually due to failure on the part of surgeon and several other factors.

1. POOR SURGICAL TECHNIQUE:

NONANATOMIC INCISIONS:

These are typified by vertical pararectus incision, along the outside of the lateral border of rectus sheath, which destroys the nerves and vascular supply of the tissue medial to the incision causing them to atrophy. It is commonly believed that these hernias are more common in vertical incisions and less common in transverse or oblique incisions.

LAYERED CLOSURE:

Layered closures are followed by a greater incidence of incisional hernia as compared to those wounds that were closed with single layer mass closure technique.

INAPPROPRIATE SUTURE MATERIAL:

With absorbable suture materials that lose 80% of their strength within 14 days, incisional hernia has been shown to be more common. The sutures are entirely responsible for the integrity of the wound for the first 6 months. Hence ideal suture material for abdominal closure is monofilament stainless steel wire used in the form of integrated mass closure. Polypropylene and polyamide sutures can be used but are not convenient to knot.

SUTURING TECHNIQUE:

If a single stitch in an interrupted closure is very tight, ischaemia will develop in the tissue enclosed. In this technique more knots, more foreign materials will be deposited resulting in wound infection and sinus formation. The rate of incisional hernia is more if the SL: WL is less than 4. If the stitch length is more than 5cm, rate of wound infection is high. Incorporating peritoneum, muscle or subcutaneous tissue may have deleterious effects. Excessive tension placed on the suture reduces local blood flow and is associated with increased wound infection.

TENSION:

Closing wounds under tension is bad surgery. The lateral pull of the abdominal wall muscle against the suture creates an area of pressure necrosis where the suture meets

the tissue. This was amply demonstrated as a cause of wound dehiscence by Bartett(1985).

2. SEPSIS:

It is the second major cause of the early wound failure in 50% of postoperative hernias, which develops within first year of operation. It may range from frank acute cellulitis with fascitis and necrosis of tissues on each side of incision to low-gradechronic sepsis around suture materials. The infection causes inflammation and edema of tissues, which become soft and weakened so that the sutures tear the tissue and pull out under the strain of intraabdominal pressure.

3. DRAINAGE TUBES:

Drainage tubes brought out through the operative wound are a potent cause of postoperative hernias. Since tissue planes along the tract are not sutured, an open and weak passage is present throughout the layers of the wound, through which a hernia may develop.

4. OBESITY:

Excessive fat in the omentum and subcutaneous tissue results in increased strain on the wound with all body movements in the early postoperative period. Associated poor muscle tone and lack of muscle mass also are causative factors in the development of incisional hernia. Surgery in obese patients is associated with an increased potential for postoperative pulmonary complications, wound infection, deep vein thrombosis and pulmonary embolus.

5. GENERAL CONDITION:

a. AGE: Wound healing in older patients is retarded.

b. GENERALIZED WASTING AND MALNUTRITION – patients who have lost a significant amount of weight and whose levels of serum albumin and other proteins reflect a state of malnutrition are at higher risk for poor wound healing.

c. STEROIDS: Wounds heal poorly in patients receiving long term steroid therapy. Due to decreased inflammatory responses with consequent impaired deposition and polymerization of collagen in the wound. Other factors include avitaminosis (especially vit-C), malignant disease, anaemia,jaundice, ascitis and alcoholism.

6. POST OPERATIVE CONDITION:

Post operative abdominal distension by way of prolonged post operative paralytic ileus, urinary retention and chest complications such as pulmonary collapse, bronchopneumonia, asthma. Postoperative retching and vomiting also increases strain on the wound and may cause increase in incidence of incisional hernias.

7. TYPE OF OPERATION:

Certain types of operations have a tendency to be followed by hernia. These include laparotomy for generalized or localized peritonitis, in patients with perforated peptic ulcer, appendicitis, diverticulitis, acute pancreatitis, intraabdominal malignant diseases, chronic inflammatory bowel disease and reoperation through original incision within the first 6 months after initial procedure. The cause of the wound failure is not in the operation itself, but in the presence of many of the factors previously mentioned.

8. POST OPERATIVE WOUND DEHISCENCE (BURST ABDOMEN):

Rupture of all layers of the abdominal wall with extrusion of the viscera is termed evisceration (burst abdomen). It occurs in approximately 1% of laparotomy wounds and associated mortality- 20%. Wound dehiscence occurs because knots slip or because an insufficient number of sutures are inserted.

Hernia formation- common complication of abdominal and flank wounds. Its incidence after primary healing is approximately 1% rising to 10% for infected wounds and 30% after dehiscence and reclosure.

LATE HERNIA

These late hernias develop in a perfectly healed wound that has functioned satisfactorily for 5, 10, 15, or more years after operation.

1. TISSUE FAILURE:

The etiology is not clear. It could be because of decrease in oxytalan fibres and increase in amorphous substance of the elastic fibres as a function of age – described by Rodrigues. The aging and weakening of the tissues and the raised intra abdominal pressure associated with chronic cough, constipation and prostatism are cited as factors.

2. COLLAGEN ABNORMALITIES:

Abnormal collagen production and maintenance have been associated with recurrent hernias in certain patients. There is a deficiency of collagen and abnormalities in its physiochemical structure. This manifests in reduced hydroxyproline production and changes in the diameter of collagen fibres.

CLINICAL MANIFESTATIONS

• Sixty percent of patients with incisional hernia do not experience any symptoms.

•The patient complains of an unsightly bulge in the operation scar as well as of pain and discomfort.

•They often suffer from a heavy sickening, dragging sensation aggravated by coughing and straining.

• In large dependent hernias, areas of skin may undergo pressure ischaemic necrosis and may ulcerate and rarely the hernia may rupture.

• If the hernia strangulates, the symptoms of intestinal obstruction and ischaemic bowel will supervene.

• Intertrigo may develop in the deep crease between the hernia and abdominal wall.

• There is often a history of repeated mild attacks of incomplete obstruction manifesting as colicky pain and vomiting.

• Rupture of large incisional hernia is encountered occasionally.

INCIDENCE

The incidence of incisional hernia varies. In 1887 John Himans of Bostan reported an incidence of 10% of incisional hernia in 184 cases of laparotomies. Incidence figures vary considerably but most studies have assessed incidence at 1yr assuming that incisional hernia will be obvious by that time.

In 1993 Cave quoted by Zimmerman [25] in 1967 found an incidence of 6% of incisional hernia in laparotomy wounds.Rodney Maingot states that incisional hernia occur in 1-14% of patients undergoing transperitoneal abdominal operations. Akman (1962) reported that 67.8% of hernias were apparent by one year and 97.7% within 5years. A further 1.4% occurred between 5th and 13th year.

Goligher [26] and colleagues in 1975 at Leeds general infirmary did not encounter even a single incisional hernia in 108 laparotomies closed by all coats interrupted wire suture. Donaldson [27] and colleagues (1982) at St.Janne's hospital Leeds, using the lateral paramedian incision found only a single incisional hernia in 231 laparotomies.

Bucknall [28] and colleagues (1982) studied 1129 major laparotomy wounds in adults and meticulously followed them for 12 months after the operation. They detected 84 cases of incisional hernia (7.4%). Pollock in 1981 reviewed 961 patients, 6 months after laparotomy and detected 96 cases of incisional hernia (10%).

Most studies giving incidence of incisional hernia give results at 6-12 months after the operation. Ellis et al [29] studied 383 patients known not to have had incisional hernia at one year after operation of which 5.8% were found to have developed incisional hernia between 2 ½ - 5 ½ years of followup. In his study of 84 incisional hernia reviewed he found 18 were found at 1 month, 30 at 3 months and a total of 20 new hernias were noted at 6 months, 15 at 12 months and one after 1year.

This led to the understanding that perhaps scar tissue is more dynamic than previously been thought. So that metabolic stresses on the patient might result in some disturbances on the dynamic equilibrium of new collagen tissue.

INVESTIGATIONS

Incisional hernia is usually a clinical diagnosis. Ultrasonography is the most useful diagnostic test and will often reveal an impalpable defect, particularly in obese patient. Other associated intra abdominal pathology can also be detected which can be dealt with during operation.

Other investigations are done as routine to assess the fitness for operation like :

- Hb%
- Bleeding time & Clotting time
- Urine examination
- FBS & RBS for diabetes
- Blood urea and serum creatinine for renal function.
- ECG for heart diseases
- CxR for lung diseases.

When required, blood grouping and cross matching is also done.

PREVENTION

Armed with the knowledge of aetiological factors, various authors proposed various preventive methods, which may help in preventing incisional hernia. Many of the factors identified as being important for the rate of wound complications are not possible to correct preoperatively.

A. INCISION:

Use of lateral paramedian incision is best and should be used wherever it is possible to use it. Donaldson and colleagues in 1982 found 0.37% incisional hernia. Guillow et al (1980) had 0% incidence. Cox et al in 1986 had two incisional hernias in 431patients.

B. USE OF CORRECT SUTURE MATERIAL:

For closure of fascia, sheath and aponeurosis use non absorbable suture material (Nylon, Prolene and Vicryl). Twin strands of suture are better than a thick single strand.

C. CLOSURE OF LAPAROTOMY WOUND:

Mass closure of abdominal incision is better and faster than layered closure [30]. Peritoneal layer can be left behind unsutured [31]. Use of nylon and prolene to close skin as stitch abscess is less common.

D. METICULOUS OPERATING TECHNIQUE:

Thorough skin preparation prior to incision and draping towels should be carefully clipped to the wound edges. Gentle handling of the tissues and to take minimum tissue in haemostat is necessary. Cauterize small bleeders rather than tying. Perfect

haemostasis, as haematoma commonly leads to wound sepsis. No dead space should be left in the wound.

E. PROPHYLACTIC ANTIBIOTICS:

Used to prevent wound sepsis which may lead to wound failure. Polk et al [32] recommended prophylactic antibiotic therapy, both in clean and contaminated wounds. These antibiotics attain therapeutic concentration along the incision and prevent wound sepsis. Rios [33] et al concluded that antibiotic chemoprophylaxis is useful in abdominal incisional herniorraphy surgery with implantation of prosthetic material for reducing local septic complications.

F. USE OF MESH/ DARN:

When it is not possible to approximate the rectus sheath without tension, use of PTFE, Marlex mesh or Darn repair [34] should be done using monofilament nonabsorbable sutures.

G. WOUND SEPSIS:

Irrigate wound margins with saline, betadine, tetracycline where wound sepsis is probable. Skin and subcutaneous tissue can be left open if sepsis is considerably feared. Mesh soaked in antibiotic solution helps to decrease wound infection rate.

H. DRAINAGE TUBE:

If wound sepsis is a likely outcome, then use of fine suction tube to drain the skin wound, brought out through para incisional stab wound is useful.

I. OBESITY:

It should be corrected as much as possible in all elective situations.

J. GENERAL BUILD OF PATIENT:

Build up of patient's general state prior to surgery. In debilitated patients wound failure is common. Correct anemia, correct asthma and give good chest physiotherapy in COPD prior to surgery.

K. ANAESTHESIA:

Though wound disruption occurs with equal frequency after local, spinal, inhalation anaesthesia, an efficiently administered general anaesthesia with adequate muscle relaxation and smooth extubation, avoiding straining and struggling is advantageous in herniorraphy. Postoperative vomiting and retching should be avoided.

PREOPERATIVE MANAGEMENT

Repair of large postoperative ventral hernia is a major undertaking and requires careful preoperative assessment and preparation of the patient.

1. The repair should be delayed for atleast 1 year after the operation that caused hernia, as this is the time it takes for collagen to mature and for the tissues to reach their dry state.

2. After all the infection and sinuses have healed.

3. Optimal skin hygiene: important when the patient is obese or has intertrigo or diabetes mellitus. Twice daily antiseptic showers to decrease skin flora. Treatment of ulcer if present and any mycotic infection in obese or diabetic patient should be treated.

4. Weight reduction: Obese patients must be advised to reduce weight before the operation, as it is associated with a higher recurrence rate.

5. Advice to stop smoking: Stop atleast 2wks before the operation. Respiratory exercises are begun few weeks prior to surgery.

6. Management of inter current diseases: COPD, HTN, DM, CVS, Renal and other general illnesses should be diagnosed, assessed and treated. The operation is usually elective and must be delayed until the patient is in optimal state.

7. Treatment of nutritional and vitamin deficiency: Hypoalbuminemia should be treated with enteric hyperalimentation. Vit A, B & C can be provided as oral or parenteral supplements and should be given for 3 to 4 wks before the operation.

8. Low dose heparin prophylaxis: Due to high risk of DVT, a dose of 5,000 units subcutaneously 8^{th} hrly beginning the night before operation and continuing until the patient can walk and is ready for discharge from the hospital.

9. Therapeutic pneumoperitoneum: Used in some centres to stretch the abdominal cavity so that it will more easily accommodate the hernial contents and improve diaphragmatic function.

PROCEDURE: 22G needle, 50 ml syringe and 3-way stopcock. The needle is introduced into the peritoneal cavity wall away from the hernia about 600 cc of air is injected initially. This is increased by 200 ml on alternate days until the total volume of 2000- 2500 cc /day is reached by end of 2nd week. Complications of the procedure include urinary retention, subcutaneous emphysema and respiratory distress.

10. Perioperative antibiotics should be used.

TREATMENT

General Considerations:

The ideal treatment for incisional hernia is surgery alone. The choice of treatment of hernia depends on the size of hernia, the symptoms produced, presence or absence of complications and general condition of the patient. The major considerations in the incisional hernia repair include the following

1. **CHOICE OF INCISION:** Whenever possible a transverse closure should be used. An ellipse of skin is usually removed. These operations require a good deal of undermining of the subcutaneous tissues and if some portion of skin is not sacrificed, the circulation is deficient and necrosis of the skin edges after sutures may occur.

2. **ISOLATION OF HEALTHY FASCIA:** The operation essentially consists of a good and clean dissection of the abdominal wall and identification of its layers. The sac is exposed and all the fat and areolar tissue should be removed.

3. **CLOSURE OF THE SAC:** After opening the sac, contents of the sac freed from the adhesions, reducing the viscera, excess omentum should be removed and some portion of it may be overlapped or invaginated to give solid extra peritoneal and peritoneal support. Good relaxation is necessary with minimal respiratory depression. Haemostasis should be perfect, since haematoma formation followed by infection almost certainly leads to recurrence.

4. **FASCIAL Vs MESH CLOSURE:** In some cases with poor abdominal walls and in cases of recurrent hernia, the anatomy may be so distorted and the tissue defect may be so great that it is impossible to find fascia with muscle under it. In such cases the defect has to be repaired by a graft or mesh.

5.Relaxing incision in the aponeurosis of the external oblique on each side as well as in the rectus sheath is valuable. In recurrent hernias – flaps are fashioned out of the sac and are overlapped.

6. **DRAINS:** Drains are required in all, except small incisional hernias and are always necessary when mesh is inserted in the wound. Suction tube drain with multiple perforations, kept in place for 5-6 days.

7. **ANTIBIOTICS:** As prophylactic measure upto the 5^{th} post op day . According to Robert. J. Baker, antibiotics are not required when an effective closed suction drainage is used unless the patient is diabetic or if pus is encountered during the repair. Successful repair of incisional hernia require proper pre-operative preparation of the patient, correct method of repair and proper post op care.

Indications for Surgery:

a) Cosmetic purpose

b) Pain and discomfort

c) Large hernias with small opening having risk of strangulation.

d) History of recurrent attacks of subacute obstruction, incarceration and irreducibility.

e) For conservative- asymptomatic, non-growing.

Contraindications for Surgery

a) Extreme obesity.

b) Continuing deep sepsis

c) Skin infection and Intertrigo.

OPERATIVE PROCEDURES

The two basic methods are

1) Primary closure

2) Mesh repair.

1. **REPAIR OF ABDOMINAL WALL:**

   i. Anatomical layer-by-layer reconstruction.

   ii. Catell's operation in five layers.

2. **OVER LAP METHODS**

   i. Modified Mayo's imbrication

   ii. Layer reconstruction of the defect.

   iii. Vertical overlap of the anterior sheaths of rectus muscles (Rutherford Morrison's repair).

   iv. Judd's double breasting method.

   v. Use of muscle flap.

3) **DARN REPAIR**:

   i. Maingot's keel operation

   ii. Shoelace darn repair.

   iii. Burton's fingered fascia lata graft repair.

4) **NUTTAL'S OPERATION**

5) **BIOMATERIALS**

- Autologus graft
- Heterologus graft
- Synthetic mesh.

6) **LAPAROSCOPIC**

VARIOUS MESH REPAIR TECHNIQUES

-Underlay

-Inlay

-Overlay

-Combined underlay and overlay graft.

-Marlex peritoneal sandwich technique.

-Rives- stoppa technique.

OPERATIVE DETAILS

1) ANATOMICAL RECONSTRUCTION:

This is recommended for small and moderate size incisional hernias and for those, in which the gap between the opposing muscles may be moderately long in the verticalplane.

The ideal method is to excise all scar tissue, sac is separated, opened, to free adherent omentum and intestines. The peritoneum is closed with a continuous suture of "0" chromic catgut. The muscle layers are approximated with interrupted sutures of catgut and the aponeurosis with interrupted sutures of non-absorbable material.Subcutaneous tissues are drawn together with fine plain catgut. Skin edges are approximated with silk or ethilon.

2) CATTELL'S OPERATION :

This is recommended for large incisional hernias, which can be repaired without grafts or prosthesis. Catell described in 1926- Sac opened, adhesions released, peritoneum and abdominal wall are approximated at the neck of the sac from inside with interlocking sutures of chromic catgut and excess sac is excised. The cut edges of the base of the sac are approximated with non-absorbable sutures. An elliptical incision is made 2cm lateral to previous suture line over the fascial layer. The medial borders of the incision are approximated in the midline by interrupted sutures. The

lateral edges of the fascia, which are far from the overlying muscles, are approximated with interrupted sutures at the upper and lower ends of the wound.

Alternating stitches approximates the muscles and the remaining fascial layer. If there is tension in the final fascial layer, relaxation incisions are made well laterally.Subcutaneous tissue is approximated with plain catgut and the skin is closed with subcuticular continuous non-absorbable suture.

OVERLAP METHODS

1 MAYO'S TECHNIQUE:

Here after opening the sac near its neck and dissecting off any attached bowel, the sac is excised off. Lateral incisions are made from the defect ring in the healthy aponeurosis and a series of mattress sutures placed. This method is suitable only for incisional hernias with vertical small defect.

2 VERTICAL OVERLAP TECHNIQUE:

Employed for vertical paramedian incisional hernias. It involves mobilization of the sac and its opening with freeing of omentum and bowel and excision of the sac. The medial margin of the defect is opened to separate the anterior and posterior rectus sheath throughout the whole length of the defect. The posterior rectus sheath and peritoneum are then closed with catgut as a single layer. The anterior rectus sheath is

then separated from the muscle and vertically overlapped in double breast fashion one over another and sutured in two rows with interrupted non absorbable sutures- the first as mattress and the second as simple suture.

3 JUDD'S DOUBLE BREASTING METHOD:

Judd described this method in 1912. In this method flaps consisting of peritoneum, muscles, fascia and scar tissue are overlapped over a similar flap on the opposite side.

4 USE OF MUSCLE FLAP:

Described by Tansini in 1896, which is composed of lattismus dorsi muscle, lumbo dorsal fascia, pregluteal fascia below the iliac crest which is nourished by thoraco dorsal artery and nerve.

Here the flap is raised and passed through a subcutaneous tunnel to the anterior abdominal wall where the pregluteal and lumbo dorsal fascia are sutured to the margins of the defect. Loose abdominal skin can then cover the flap and skin of the back incision is closed. Drains are kept, one at donor site and another at repair site.Its main disadvantages are a large area of dissection and lumbar hernia.

DARN REPAIR

1.KEEL OPERATION (MAINGOT'S):

The scar tissue over the sac is excised which is dissected free well beyond the hernia ring. Peritoneum is not opened and any inadvertent opening is closed with catgut. The sac is then inverted and fibroaponeurotic ring is defined which is closed with a series of mattress sutures of nonabsorbable materials. These sutures when tied have their knot hidden from the view. A continuous Cushing's stitch is then passed through healthy aponeurotic layer uniting opposing muscles and inverting previous stitches. Complete haemostasis achieved. Polythene drains are positioned longitudinally and brought out through a separate stab incisions. Since it does not involve opening of peritoneal sac, post operative ileus is not a problem.

2.MODIFIED KEEL REPAIR:

In this, the sac is opened; omentum and loops of bowel are freed from abdominal wall. The sac is then closed and keel repair carried out.

3. SHOELACE DARN REPAIR:

Described by Abrahmson. Here after dissection of the sac, the sac is inverted and over it a new linea alba is constructed after incising whole length of rectus sheath longitudinally, 1.5 cm away from medial margin and suturing the medially reflected margins together continuously in the midline with monofilament nylon.

The resultant thinly separated recti and anterior rectus sheath are then closed with doubled ‘0’ monofilament nylon 3mtrs long. The suture begins at one end from inside out and through the same leaf outside in, takes a bite on new midline to the other side. At this stage the advancing end of suture is slipped through the loop at the end of the suture and the shoelace darn continued till it reaches the lower limit where the nylon is tied with a loop in the loop (Aberdeen) knot under the rectus sheath. With this the cut edges of the rectus have been brought parallel and rectus muscle is no longer splayed.

A vacuum drain is positioned and subcutaneous fat and skin closed.This method is applied to paramedian and post appendicectomy hernias. The advantages are it is extraperitoneal and involves only two suture lines placed in normal healthy tissues.

4. BURTON’S FINGERED FASCIA LATA GRAFT REPAIR.

This method is useful for repair of large incisional hernias. Technique is, the margins of the ring are held with a number of artery forceps on either side. Fascia lata graft larger than the size of the gap is taken and is held over the ring. Several parallel lateral incisions are made on either side of the excess of part of the graft, so as to create a number of lateral strips of about 2cms wide. The fascia lata graft thus prepared is laid subperitoneally. Few slits are through the slits of the fascial margins and tightened.

The strips are folded back, twisted in pairs with the opposite side strips and fashioned with additional thick silk sutures to prevent slipping of twisted loops. Subcutaneous layer is approximated and the skin is closed.

4) NUTTAL'S OPERATION

This operation is recommended for midline subumbilical incisional hernias with a large defect, present immediately above the symphysis pubis.

TECHNIQUE: Two crescentric incisions meeting just below the umbilicus and above the symphysis are used and the skin and fat are reflected on either side for a distance sufficient to expose the lower halves of the rectus muscles and their sheaths.

The sac is opened and any redundancy is cut away , adherent omentum or bowel is detached as may be necessary and edges of the mobilized peritoneum are sutured with a continuous stitch of '0' chromic catgut. The rectus sheath is incised longitudinally on each side, after which the sheaths are mobilized and retracted laterally in order to expose the outer border of the muscle and to afford a good view of the short tendinous origin of the rectus muscles from the symphysis pubis.

Each rectus muscle is then detached, from its origin as close to the bone as possible and without interfering with its nerve supply. The tendon of the left rectus muscle is then drawn downward to the opposite side of the pubis and sutured to ligament and fibrous tissues here. The opposite muscle is then sutured to ligaments and fibrous

tissues of contralateral side, a series of loosely applied interrupted sutures are next inserted along the edges to maintain the good opposition of the overlapping muscles.

The margin of the aponeurotic sheath on either side is then brought together in the midline by a continuous suture or by a series of interrupted nylon sutures, thereby obliterating the triangular gaps on either side at the outer border of the rectus muscle. Haemostasis must be complete and all dead spaces must be obliterated before the skin is closed or sutured.

BIOMATERIALS

The evolution of prosthetic implant has slowly replaced most of the older types of repair.A biomaterial is defined as any synthetic or non pedicled natural substance that can be used for tissue replacement. Varying substances have been used for this purpose from the turn of this century with varying degrees of success.These materials can be classified as:

AUTOGRAFTS:

a) Autologus cutis graft

b) Whole skin graft

c) Fascia lata graft

d) Tendon (plantaris) grafts.

Autologus dermal grafts assume the histological character and gross functions of aponeurosis or tendon that they replace. Loeve first used cutis graft in 1913. rehn in 1914 and canadey [35] in 1942 used cutis grafts in repair of large incisional hernias.

Complications due to retained epidermal elements like Sinus tracts, sepsis, cyst and squamous cell carcinoma have lead to turning this method obsolete.

Fascia Lata Graft:

1901 Mc Arthur used pedicled strips of external oblique aponeurosis for herniorraphy. Gallie and Leo Measurier [36] used free fascia lata strips using a loose weave of fascial strips. These free fascial strips were infiltrated by fibroblast and a new structure is created. Recurrence rates is however 10-15%.

HOMOGRAFTS:

• **Aortic and dural homograft:** Lyophilized aortic homograft obtained from artery bank has been used but experience is limited. Preserved dural graft obtained from unembalmed bodies is used. It is stronger than fascia lata graft due to its multidirectional fibres. But its use is complicated by infection, seroma and a possibility of fatal viral encephalitis.

HETEROGRAFT:

• **Porcine dermal heterograft**: Porcine corneum used with proteolytic enzyme and glutaraldehyde was used. Postoperative infection and seroma are major complications of their use.

• **Bovine fascia heterograft**: Bovine fascia lata grafts have been used to close large defects in abdominal wall or chest. It is strong and durable but has high infection

rate,fascia sloughs off and recurrence occurs. Koontz utilized strips of ox fascia lata graft for repair of hernial defects.

METALLIC MATERIALS

a) **Stainless Steel:** A popular prosthesis in the form of filigree, mesh or cloth. It has been used as inlay or onlay graft. It is more inert than tantalum.

b) **Tantalum:** Throckmorton and Koontz popularized this metal for herniorraphy. Tantalum exhibits excellent tensile strength and is quite malleable.

c) **Silver:** Mc Govin [37] in 1932 first used it. Cole in 1936 also used it in herniorraphy with excellent results.

Pain, fragmentation, extrusion, early loss of tensile strength, low tolerance to infection and seroma formation are the major disadvantages associated with the use of these synthetic grafts.

SYNTHETIC PLASTIC MATERIALS

a. **Absorbable Synthetic Material**: Polydiaxonone , polyglycolic acid polymer (Dexon, vicryl), polygalactin are the examples of absorbable synthetic material used for herniorraphy. Since these sutures extend support to wound till only six weeks, their use in herniorraphy is hazardous. Incidence of 4.2 % incisional hernias is reported if linea alba is closed with these sutures [38].

b. **Non Absorbable Synthetic Material**: Polyethylene (marlex), polyamide (nylon), polyester sheeting, synthetic acrylic (orlon), polyvinyl sponge (ivolon) PTFE (Teflon mesh), Dacron mesh (mersilene), Dacron reinforced silicon (sialastic), expanded

PTFE (Goretex) are the various types of nonabsorbable synthetic material available to surgeons for repair.

No ideal synthetic material with certain properties is available so that it could provide non-antigenic framework that is gradually replaced by post fibroplasia so that a stable aponeurotic structure is available. However, polypropylene (prolone), polyethylene (marlex), mersilene (Dacron) have been widely used since long time and have proved extremely useful in repair of large hernial defects . Only problem with this synthetic material is the risk of seroma formation, sinus formation and susceptibility to infection.

c. **Carbon implants and composites**: Flexible filamentous carbon attracts fibroblastic ingrowth and leads to functioning dense connective tissue structure with collagen bundles oriented along the lines of stress. Carbon implants gradually fractionates and is slowly removed by phagocytic action [39].

A composite biomaterial with polylactic acid and filamental carbon or carbon cloth is being tried in clinical trials and is found acceptable. The possibilities of carbon acting as carcinogenic agent have been mentioned but are generally due to impurities in carbon than carbon itself.

OPERATIVE TECHNIQUE:

Once the fascia is cleared and hemostasis secured the hernia sac is then imbricated with a continuous polypropylene suture, uniting the edges when possible. The mesh is

then sutured over the fascia as an onlay graft. The mesh, cut slightly larger than the defect may also be sutured in the inner aspect of abdominal wall as an underlay graft or it is sutured to the edges of the defect as an inlay graft.

A combined inlay and onlay graft can also be applied. The same mattress sutures engage both the meshes. The sutures on one side are placed and tied. Those on the opposing sides are placed and tagged with hemostats until all sutures have been placed, and then they are pulled up and tied. A suction drain is always left behind. The subcutaneous fat is tackled down to the underlying aponeurosis to reduce the dead space and skin closed over it.

Indications for use of prosthetic materials in incisional hernia repair:

a) Repair of recurrent incisional hernias.

b) In primary repair of massive hernia in which tissues are deficient and repair without tension cannot be accomplished.

c) In the repair of an incisional hernia in which future disruption are predictable.

d) Losses of essential fascial segments by severe trauma.

DESIRABLE QUALITIES OF A PROSTHETIC MATERIAL:

Cumberland in 1952 has listed several criteria for a desirable foreign material to be used in the repair of hernias.

a) Tissue reaction – Lack of irritation, it should be relatively inert biologically and clinically.

b) Durability – Indestructible in human tissues.

c) Strength

d) Flexibility and pliability

e) It should be smooth so as not to injure the viscera or vessels.

f) Easy handling

g) Tolerance – Must be able to withstand the effects of infection.

h) Nonfragmentation

i) Non wandering

j) Availability

k) Porosity – because it permits ingrowth of fibrous tissues and capillaries.

l) It must be easily sterilized

m) It must be radio translucent.

GENERAL PRINCIPLES IN PROSTHETIC REPAIR:

1) Timing – when infection is present,repair should be deferred.

2) Avoidance of undue tension

3) Suture materials like synthetic non-absorbable monofilament must be used.

4) Adequate haemostasis must be achieved.

5) Drainage – a closed suction drain is essential

6) Antibiotic prophylaxis – pre and post operatively.

LAPAROSCOPIC HERNIA REPAIR:

It is the latest addition in the management of the incisional hernia. Laparoscopic repair of abdominal incisional hernia with dual mesh plug biomaterial adheres to the principles of hernia repair without extensive dissection.

Procedure: After inserting the ports, the first step is to visualize the hernia, free all adhesions and reduce its contents. Later the mesh is prepared according to the size of the hernial defect. The four corners of the mesh are marked with easily identifiable signs such as circle, square, star and triangle. The corresponding corners of hernia are marked.

At each of the four corners of the mesh, a non absorbable suture is placed, tied and cut leaving six inch tails, the knots are placed on the surface of the mesh, which will be in contact with the abdominal wall.

The mesh is then inserted to the abdominal cavity through 10 mm port and the four stitches anchor the mesh to the abdominal wall. The strings are tied with knot in the subcutaneous tissue. The abdomen is deflated and the fascial defects are closed and then skin closure is performed.

Advantages:

i. Tension free repair

ii. Long incision and extensive dissection is avoided

iii. Less pain, shorter hospital stay, quicker return to normal activities.

Complications:

Seroma formation, recurrence, haematoma, infection, prolonged ileus and bowel obstruction.

MESH REPAIR

Mesh can be used in several ways to reinforce the repair of incisional hernias. Many variations and combinations of mesh repair are as follows-

OPERATIVE TECHNIQUE:

The initial step is to reopen the old incision, mobilize the hernial sac, reduce its contents, excise any redundant peritoneum and close the sac. Thinned out and redundant scar and fascia should be excised back to healthy strong fascial margins.Wide flaps of skin and subcutaneous tissue should be dissected back from the wound margins in the suprafascial plane for a distance of 8-10 cms from the margin of the hernial aperture. The fascial margins are now tested for tension during approximation.

If the margins of the hernia can be approximated without undue tension then the technique of onlay reinforced primary repair is selected. If the margins of the hernia defect either cannot be approximated or can be brought together only with undue tension, then the technique of replacement of deficient tissue using a double layer graft repair are selected.

ONLAY REINFORCED PRIMARY REPAIR :

The peritoneum is closed after reduction of the viscera and excision of the redundant peritoneum and fascial scar. Wide dissection in the suprafascial plane is done and full thickness flaps of skin and subcutaneous tissue is mobilized. With the fascial hernia aperture still open, a series of synthetic non-absorbable mattress suture are placed 1.5 cms apart, about 5-6 cms away from the fascial margin around the circumference of the hernia. The mattress sutures include the full thickness of the musculofascial

abdominal wall but exclude the peritoneum. The suture ends are left long and collected in groups and held by the haemostats.

The hernial defect is then closed with interrupted prolene (no.1 or ‘0’) sutures. The knots are placed alternately on either side of the line of closure. The ends of these sutures are also left long. Polypropylene mesh is now cut to fit as an onlay, so that it is 1cm wider than previously placed mattress sutures all around the wound. The ends of the mattress sutures as well as the ends of the sutures used to close the hernia primarily are threaded on needles are then brought through the prosthesis tied and cut.

One or more polyethylene suction drain tubes are placed over the surface of the mesh and brought out through stab wounds remote from the main incision. The wound is irrigated with antibiotic solution and complete haemostasis is achieved. The subcutaneous tissue is closed and skin is closed.

According to Larson and Vandertoll, onlay graft is not an ideal method for two reasons. First- the wound is repaired primarily with sutures often placed under excessive tension and subsequent application of this onlay mesh graft does little to relieve this tension. Second- since the hernia defect is already closed, it is both difficult and risky to place full thickness sutures through the mesh and fascial layer because of possible bowel injury. Therefore there is tendency to place sutures too superficially.

INLAY GRAFT:

With subfascial or intraperitoneal placement, it is anchored to a solid fascial rim by a series of mattress sutures placed along the length of the incision on one side, with no.1 polypropylene mattress sutures are placed about 3/4th of an inch back from the edge of the hernia. After all sutures are tied on one side the mesh should be tailor-cut to bridge the defect, then another row of mattress sutures placed on opposite side. The sutures are then pulled through by the assistant while each mattress suture is tied by the surgeon.

The remaining anterior fascial layers may be closed if they meet or they may be tackled down separately to the mesh. Redundant skin and excess subcutaneous tissue is excised to allow for snug closure. The suction drains are placed to prevent collection of fluid in the wound. Skin is closed and pressure dressing is applied.

Usher has employed two modifications to guarantee better fixation of the mesh. In one method, he used two layers of mesh, internal and external to the fascial margin and in the other he used a cuff of mesh on either side of the defect with subsequent imbrication of these cuffed layers. Usher has demonstrated that when this mesh is in contact with the musculofascial layers, there is satisfactory ingrowth of fibrous tissue that provides additional strength to the wound.

The inlay technique seems to be the better technique in the repair of large midline incisional hernias with the use of a polypropylene mesh. Though it carries a high risk of complications and has a high reherniation rate.

DOUBLE LAYER MESH GRAFT:

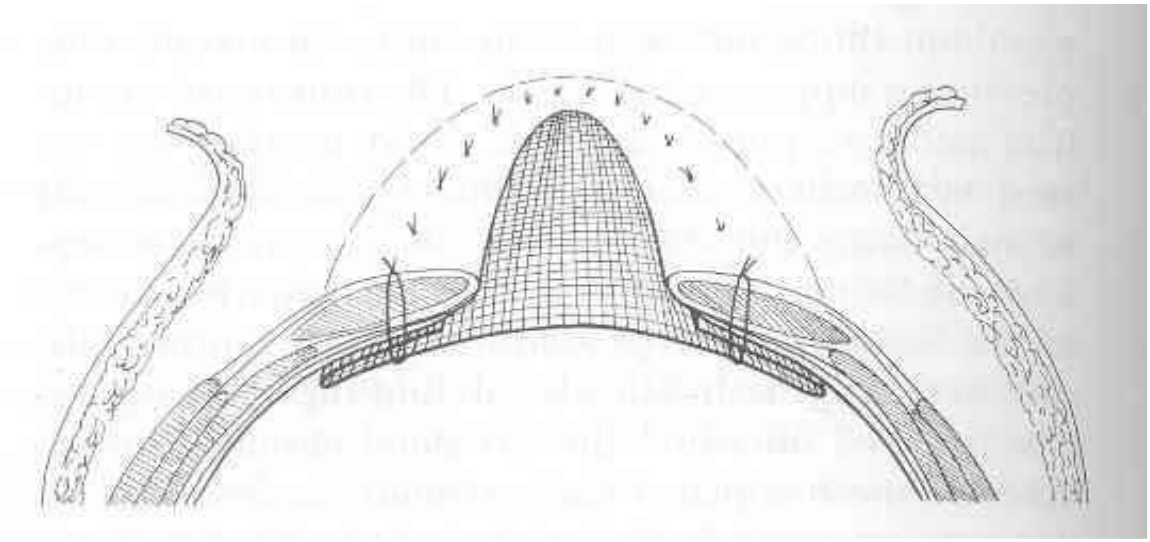
The deep layer of the repair is located immediately extraperitoneally, but deep to the muscles and fascia of the abdominal wall. Prolene mesh is usually used for deep layer but it has the disadvantage, that its inflammatory response results in adhesions of intestines to the peritoneum adjacent to the prosthesis.

If polypropylene mesh is used in this layer, the omentum should be interposed if possible between the intestine and peritoneum in the area of the hernia repair. If peritoneal closure cannot be accomplished prolene mesh should not be placed permanently in direct contact with intestines. In this situation polyglactic acid (vicryl) mesh can be used as deep layer. Expanded PTFE mesh is less reactive and nonabsorbable, can also be used in the construction of the deep layer of the repair.

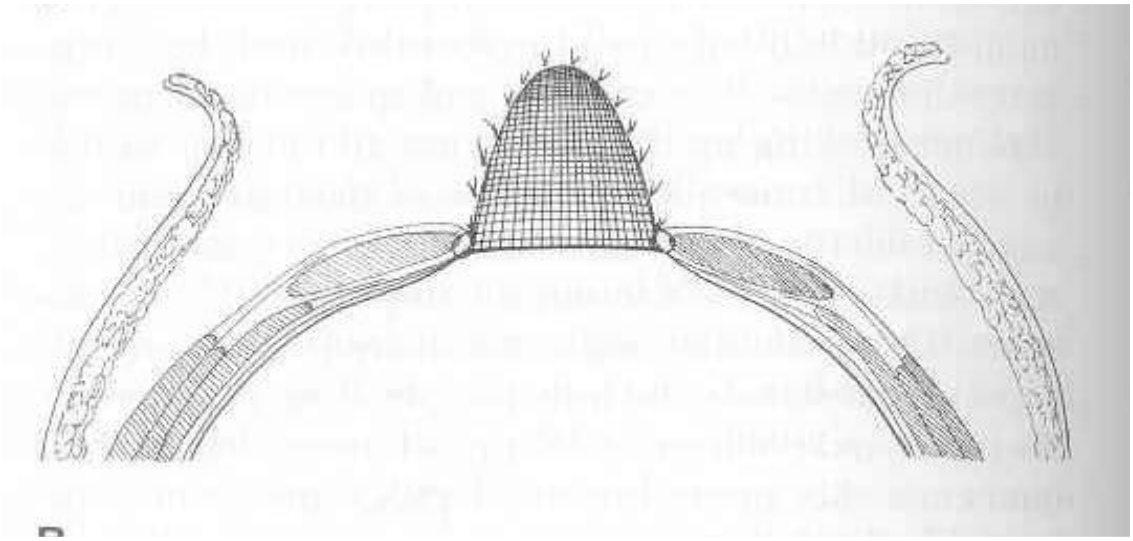
The wide dissection in the suprafascial plane mobilizes the full thickness of skin and subcutaneous tissue for 8-10 cms from the margins of hernial aperture. The deep layer of prosthesis is cut so that it will bridge the hernial aperture plus about 5-6 cmx on all margins. Mattress sutures are then placed about one cm from the free edge of the prosthesis. Both ends of the sutures are brought through the full thickness of the abdominal wall about 5cms from the hernial orifice.

These sutures are placed one at a time, the prosthesis being repetitively inserted and partially removed to permit accurate placement of each suture. The second layer of prosthesis is cut to fit, the ends of the mattress sutures are drawn through it, tied and cut.

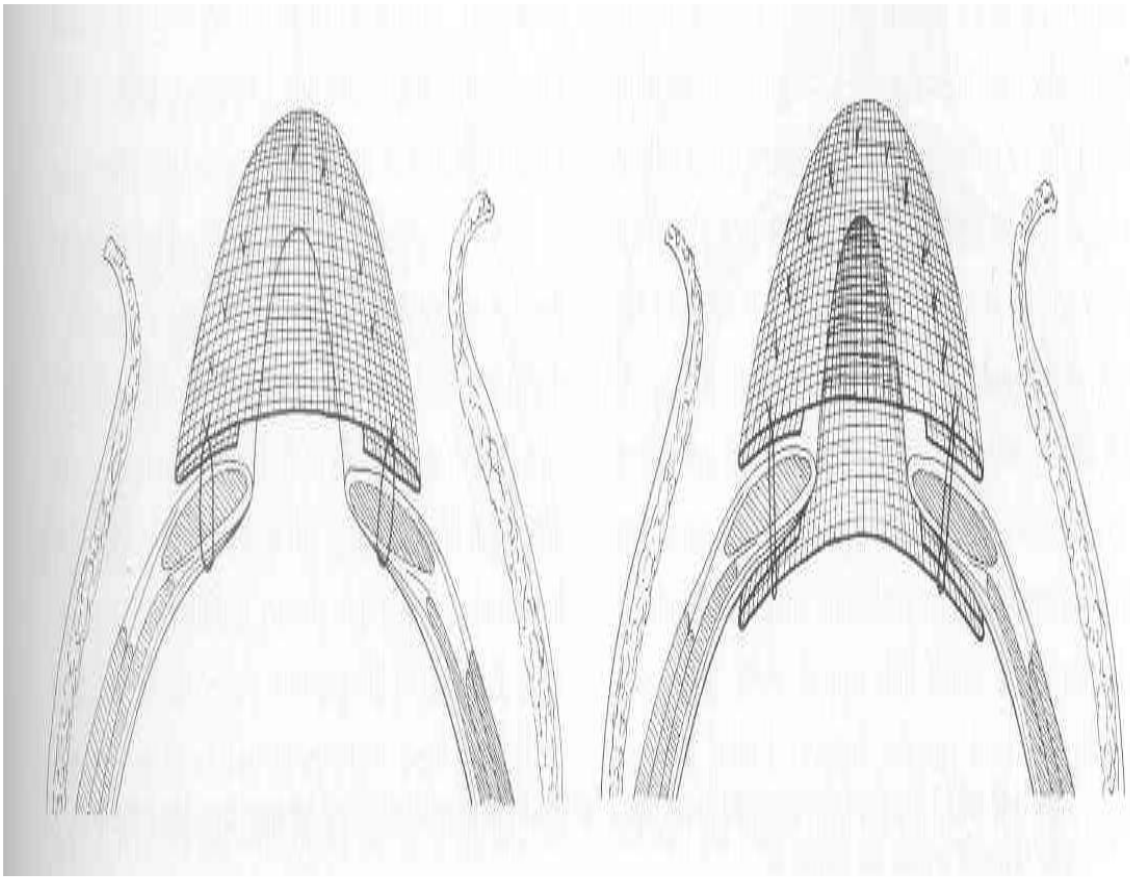
One or more closed suction drainage tubes are placed on the surface of the prosthesis and brought out through stab wounds remote from the main incision. Any redundant skin and subcutaneous fat are excised. Haemostasis is achieved. The subcutaneous tissue and skin are closed. Pressure dressing is applied.



Underlay



Inlay



Overlay Combined Overlay and Underlay graft

POST OPERATIVE CARE

• Nasogastric aspiration was done 2nd hrly to keep stomach decompressed. Ryle's tube was removed once patient passed flatus.

• Deep breathing exercises were commenced as soon as patient was able to do them. Patients were encouraged to move limbs while in bed.

•Operative wound was dressed and supported with elastoplast. All patients were instructed to support their operated wound in case of cough or vomiting.

• Chest physiotherapy and tincture benzoin inhalations were started from the post operative evening.

• I/V fluids – till patient passed flatus.

• Early limited ambulation was done as soon as patient was able to bear the pain.

• Suction drain was kept till the drainage became less than 25 cc in 24 hrs.

• Broad spectrum antibiotics continued till the removal of suction drain.

• Laxatives – to avoid straining while passing stools.

• Skin sutures removed on 8th -10th post operative day.

• Following discharge, patient was advised to restrict heavy work for 6months and in child bearing age, females were advised to avoid pregnancy for 1yr.

• Sexual intercourse should be abstained, for a month or more after surgery.

POST OPERATIVE COMPLICATIONS

•**GASTROINTESTINAL:** Paralytic ileus may result due to mobilization and excessive handling of intestines. Ileus contributes to poor healing through increased intra abdominal pressure with resultant impaired circulation to the repair site, thus increasing stress on wound which may result in recurrence of hernia.

• **PULMONARY:** Respiratory tract diseases add increased stress on the suture line by increasing the intra abdominal pressure. Allergic conditions causes coughing or sneezing, which should be properly treated.

• **URINARY:** After operations on lower abdominal incisional hernia, often patients will have retention of urine. Catheterization of the bladder with an indwelling Foley's catheter obviates these complications.

• **THROMBOPHLEBITIS:** When the contents of the massive hernial sac are reduced into the abdominal cavity, the increase in intra abdominal pressure causes venous hypertension in the lower extremities with an increase in the incidence of DVT. This can be prevented by low dose heparin prophylaxis. Active limb movements in early postoperative period are also helpful.

LOCAL COMPLICATIONS:

• SEROMA:

The development `of seroma is a common complication. A recurring accumulation of serum in abdominal wall usually calls for repeated needle aspirations and external application of mild pressure, but rarely a tube is inserted for continuous wound drainage.

•HAEMATOMA:

Small haematoma need not be disturbed, but the blood outside the vascular system is a type of necrotic or dead tissue. Small subcutaneous drains are desirable if necessary.

•WOUND INFECTIONS:

Minor – These are superficial infections associated with minor skin loss at the marginof the wound.

Major – These are suppurations, which occur in the depth of the wounds. Drainage is essential, C&S obtained and antibiotic irrigations must be used.

•ABDOMINAL WALL SINUSES:

As a result of infection in wounds containing foreign bodies, persistent draining sinuses are frequent. These sinuses may be due to the infection in sutures or infection in sheets of implanted materials.

• **RECURRENCE AND MORTALITY:**

Recurrence rate for the repair of incisional hernia

Author	Type of repair	No Of Cases	Recurrence	Percentage	Mortality
Rodney Maingot	Keel	115	**5**	4.3	Zero
Abrahamson	Shoelace	300	**6**	2.0	--
Adloff and Arnaud[40]	Mersilene mesh	130	**6**	4.5	1.5%
Usher	marlex mesh	96	**10**	10.4	

MATERIALS AND METHODS

MATERIALS AND METHODS

The study " CLINICAL STUDY AND MANAGEMENT OF INCISIONAL HERNIA BY PRE PERITONEAL MESH REPAIR " has been carried under the guidance of Dr.A.BHASKARAN, Head of department of Surgery,Sri Devaraj urs medical college,Tamaka,Kolar.

This is a prospective study of 50 patients of Incisional hernia who attended opd and emergency department of R.L Jalappa hospital between May 2008 to May 2010.Exclusion criteria included all incisional hernia complicated cases.Cases were studied as per the proforma attached.

All patients were admitted through outpatient department (OPD). The epidemiological data i.e. the name, age, sex, medical record number,postal address and phone number was noted at the time of admission. The clinical features and their duration, time of initial operation and the interval between thefirst surgery and appearance of incisional hernia were asked from patients and recorded in the data.

All patients were evaluated for systemic disease or precipitating cause. Patients who had hypertension, diabetes mellitus or cough were controlled preoperatively. Routine investigations were done for all patients including chest x-ray and ultrasonography of the abdomen.

A day prior to surgery, shaving of the abdomen and genitalia was done. Overnight nil orally was advised and proctoclysis enema was advised once in night and once in morning the day of surgery. Foley's catheter was passed and broad-spectrum antibiotics was given to all patients before the procedure.

Patients were explained about the effects and complications of the procedure.The procedure was done under general anaesthesia, spinal or epidural anaesthesia in supine position. In all cases, old operative scar was excised,generous skin incision were used to permit adequate exposure of hernial sac and defect.

The sac was opened and contents were reduced after lysis of the adhesions. The excess sac was excised, peritoneum was closed with absorbable synthetic suture. Adequate preperitoneal plane was prepared between the posterior rectus sheath and peritoneum ;mesh was placed and fixed with prolene number 2-0 or 3-0 sutures. Suction drainswere laid on the mesh and brought out through separate stab wounds. Muscular aponeurotic structures repaired with prolene number 1. Skin was closed after insertion of suction drain in subcutaneous plain.

Foley's catheter was removed on postoperative day one. Suction drain was removed once the drainage falls to 25 to 30 cc. Antibiotics were continued for three days. Postoperatively, deep breathing exercises,movement of limbs in bed was advised as soon as patient recovered from anaesthesia.

Early limited ambulation was done once the patient was able to bear the pain. Skin sutures removed on 7th day and in few cases after 10th day. At discharge, patients

were advised to avoid carrying heavy weights and advised to wear abdominal belt. Patients were reviewed after one month and three months in all cases and few cases upto two years. At review, symptoms were asked for and operative site examined for any recurrence.

These cases were then analyzed and results were compared with existing literature. An extensive review of literature is carried out.

Statistical Methods - Chi-square and Fisher exact test have been used to test the significance of proportion of postoperative complications between PPMR and Other Mesh Repairs (Other Studies).

Statistical software -Microsoft word and Excel have been used to generate graphs, tables etc**.**

OBSERVATION AND RESULTS

OBSERVATION AND RESULTS :

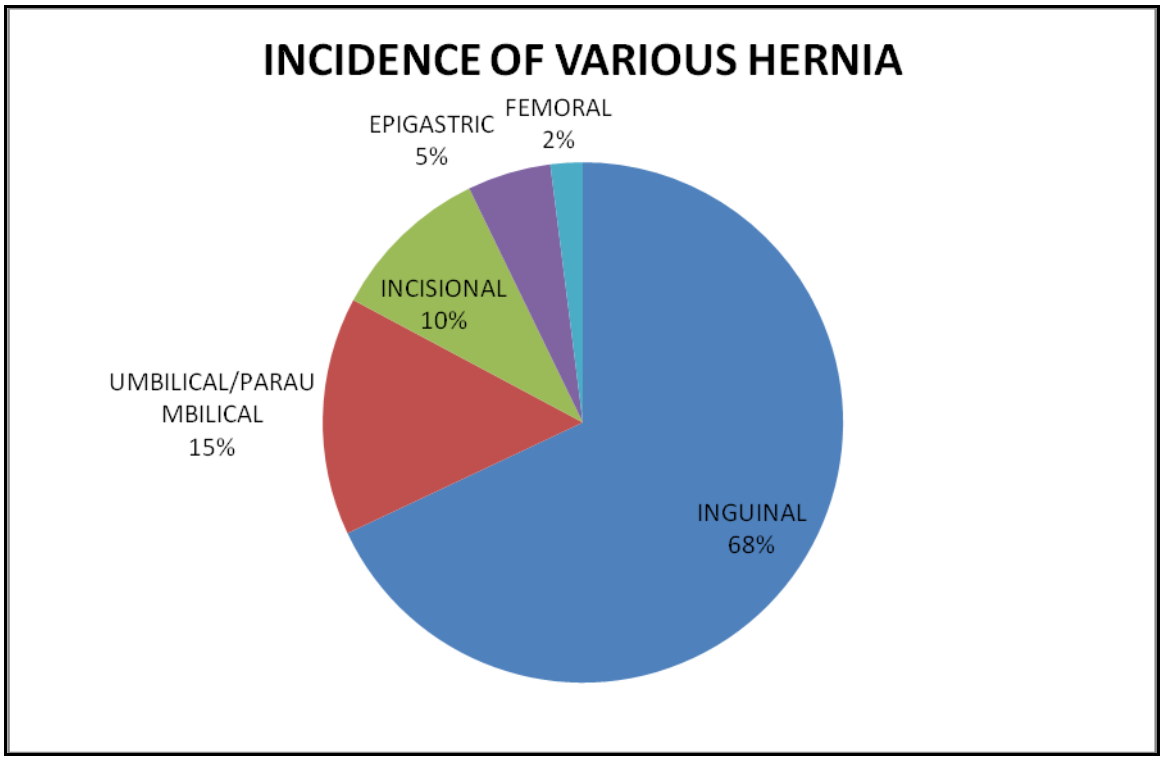
Study Design: A prospective clinical study consisting of 50 patients with Incisional hernia who undergone preperitoneal mesh repair is undertaken to investigate he role of preperitoneal mesh repair and its postoperative complications. The following is the analytical results of all the cases and conclusion drawn from it

1. INCIDENCE OF VARIOUS HERNIAS

Out of 470 cases of hernias operated at R L Jalappa hospital between May 2008 to May 2010 68% constitutes Inguinal hernia, 14.8% constitute Umbilical and Para umbilical hernias, 10% constitute Incisional hernia, 5.2% constitute Epigastric hernia, 2% constitute Femoral hernia.

TOTAL NUMBER OF CASES = 470

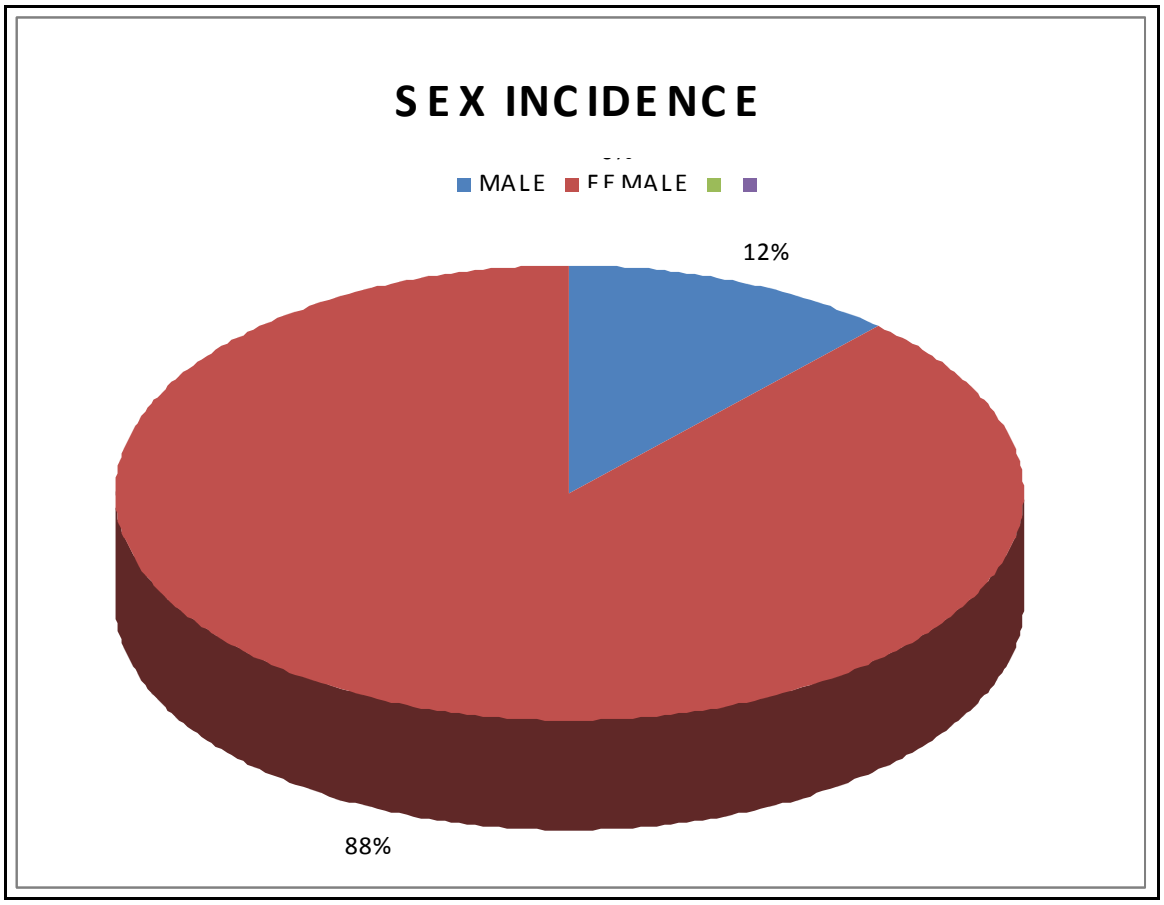
INGUINAL HERNIA	320
UMBILICAL/PARAUMBILICAL HERNIA	70
INCISIONAL HERNIA	50
EPIGASTRIC HERNIA	25
FEMORAL	5



2. SEX INCIDENCE

In the study of 50 cases , incidence of incisional hernia is more common in females as compared to males.

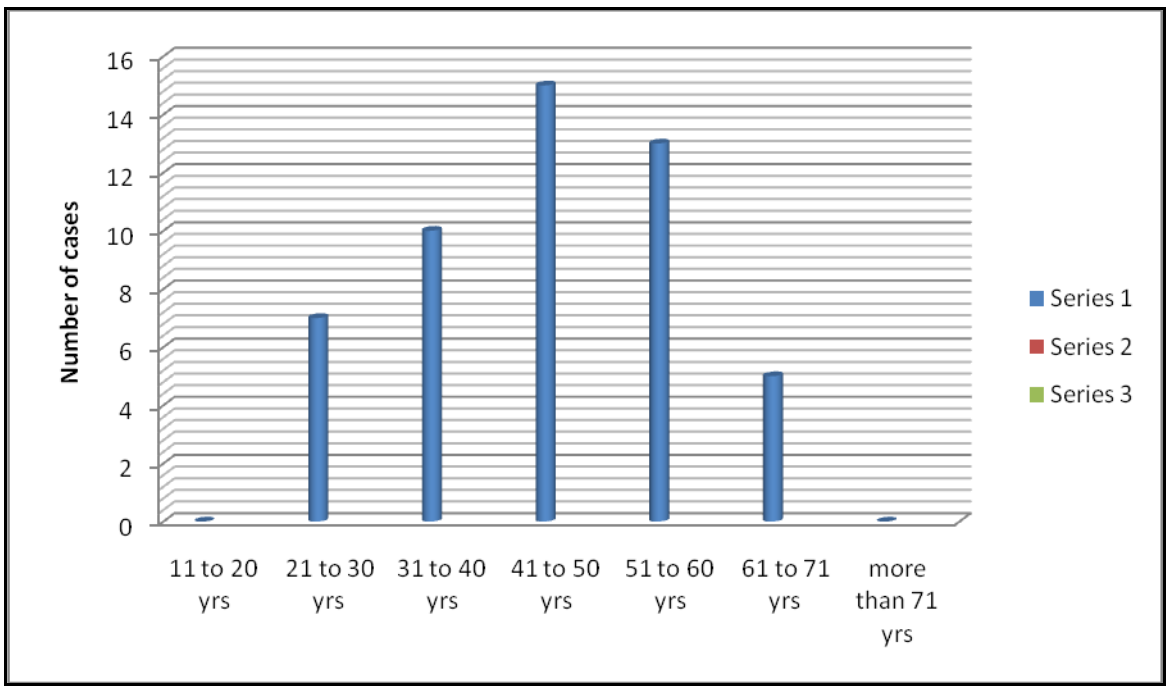
SEX	No. of Cases	Percentage
MALES	6	12
FEMALES	44	88
TOTAL	50	100



3. AGE DISTRIBUTION

Age Incidence

Age group	Goel & Dubey		Anantha Krishnan et al		Present study	
	No. of cases	%	No. of cases	%	No. of cases	%
11-20	6	12	3	1.4	0	0
21-30	35	17.0	51	23.1	7	14
31-40	51	34.1	69	31.3	10	20
41-50	40	40.2	67	30.5	15	30
51-60	14	6.1	23	10.5	13	26
61-70,			2	0.9	5	10
>71			5	2.3	0	0

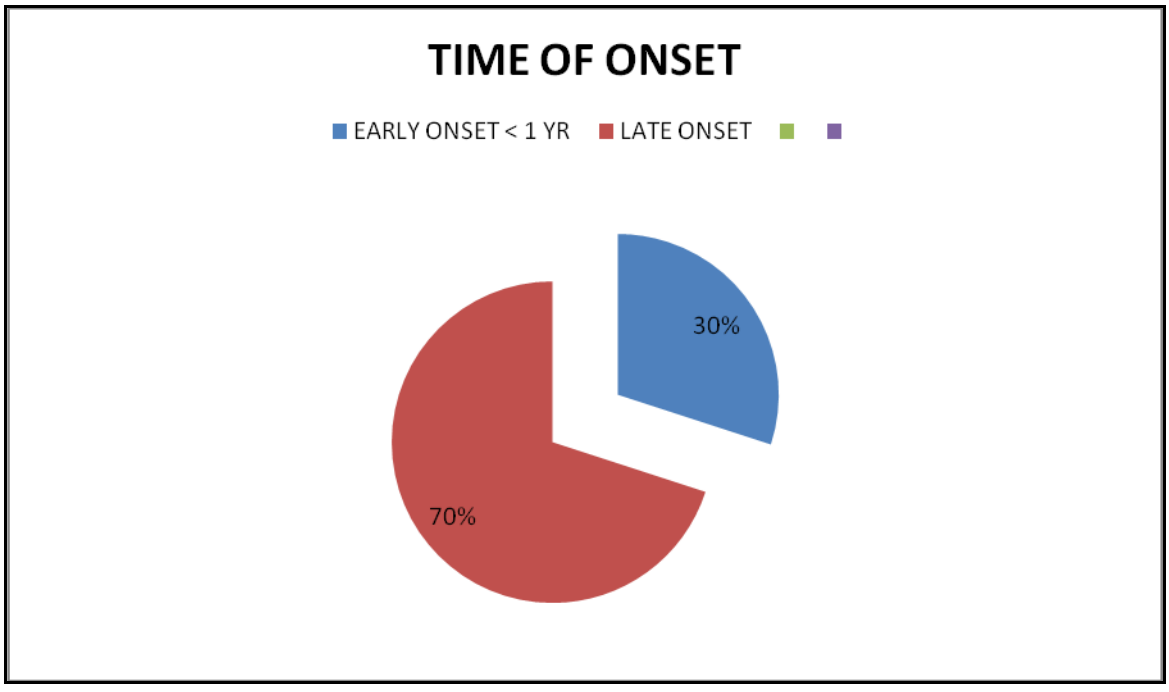


Incidence of incisional hernia is more common in 30-60 age group. This is comparable with that of N. Anantha Krishnan et al studies and Goel and Dubey studies.

4. Mode of Presentation

All patients presented with history of swelling of which 18 cases also presented with history of pain. On examination,swelling was reducible in 45 cases (90%) and irreducible in 5 cases (10%). We had approximately, 30% of cases with early onset of incisional hernia (within one year), 70% of cases had late onset of incisional hernia > 1 year.

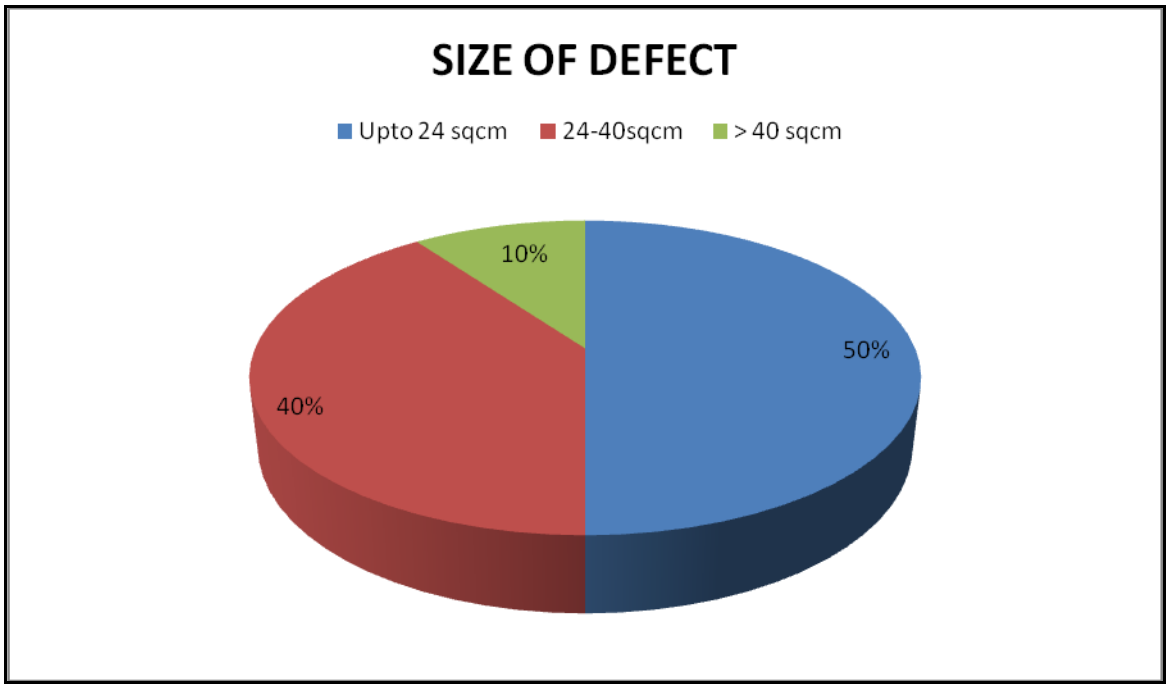
Mode of Presentation	Number of Patients	Percentage
Swelling	50	100
Swelling & Pain	18	36
Reducible swelling	45	90
Irreducible swelling	5	10
Early onset< 1 yr	15	30
Late onset	35	70



5. Size of the Defect

25 patients had hernia defect which measured upto 24 sqcms.20 patients had defects between 24-40 sqcms. Only 5 patients had defects more than 40 sqcms.

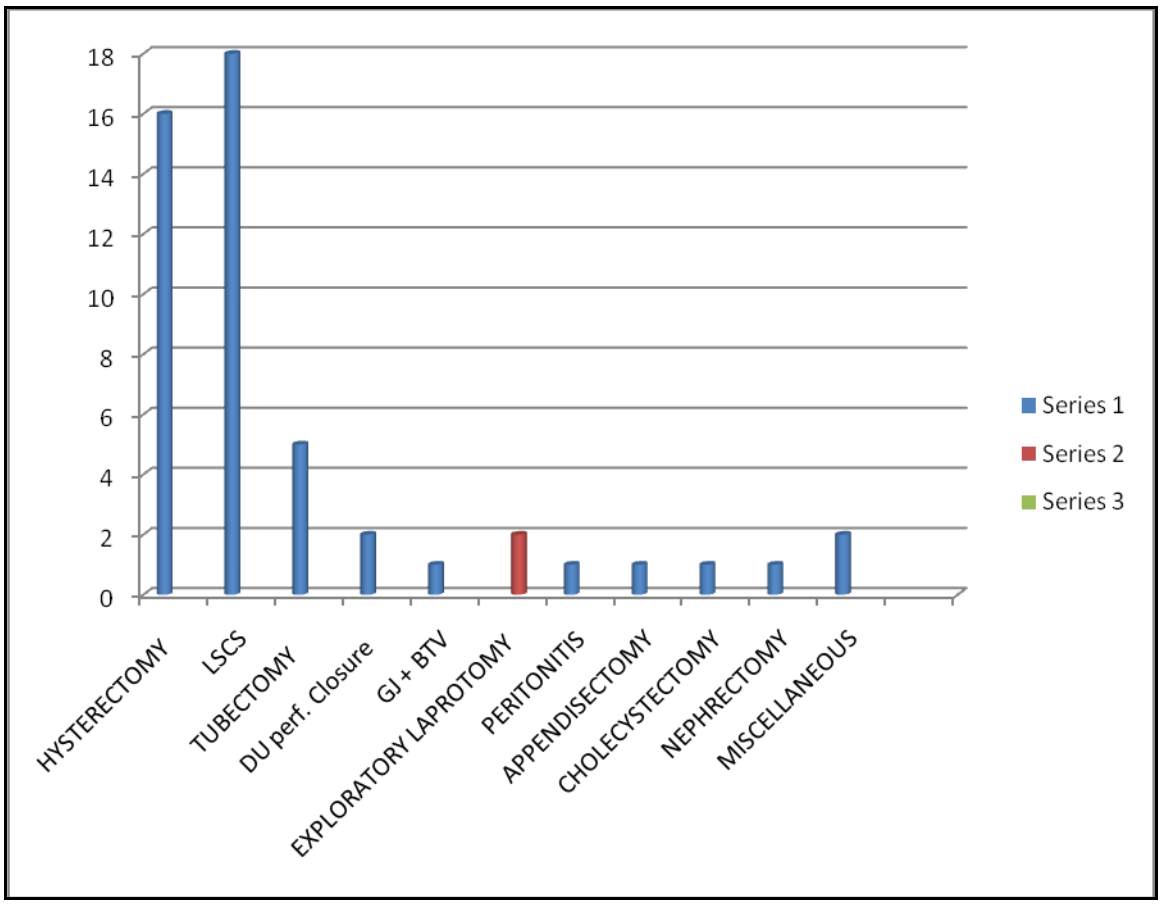
SIZE OF DEFECT	No. of Patients	Percentage
Upto 24 sqcm	25	50
24 to 40 sqcm	20	40
More than 40 sqcm	5	10



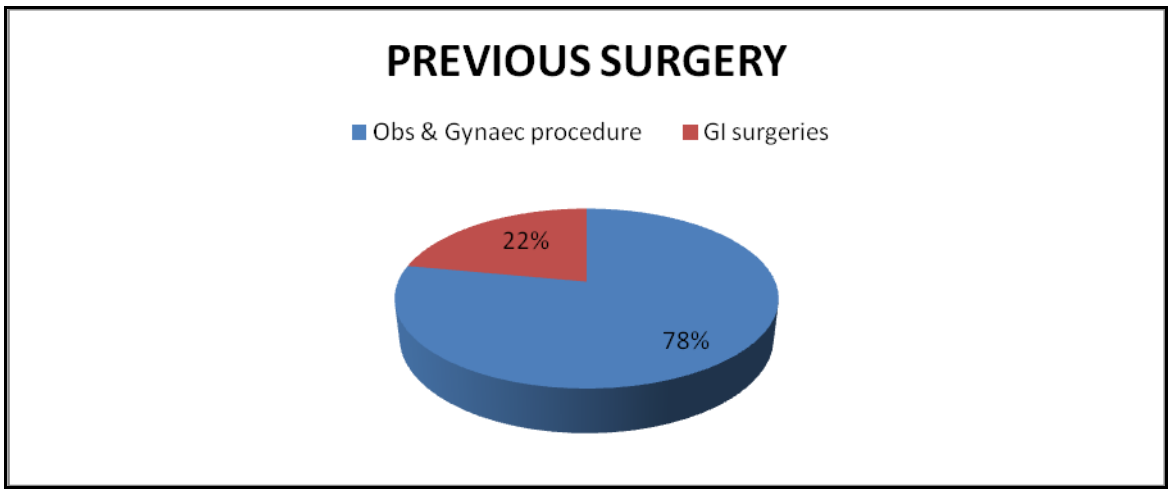
6. Previous Surgery :

Detailed history was taken from the patients regarding the type of operation they had undergone

NAME OF OPERATION	NUMBER OF CASES	PERCENTAGE
HYSTERECTOMY	16	32
LSCS	18	36
TUBECTOMY	5	10
DU perforation closure	2	4
GJ + VAGOTOMY	1	2
Exploratory Laprotomy	2	4
PERITONITIS	1	2
APPENDISECTOMY	1	2
CHOLECYSTECTOMY	1	2
NEPHRECTOMY	1	2
MISCELLANEOUS	2	4

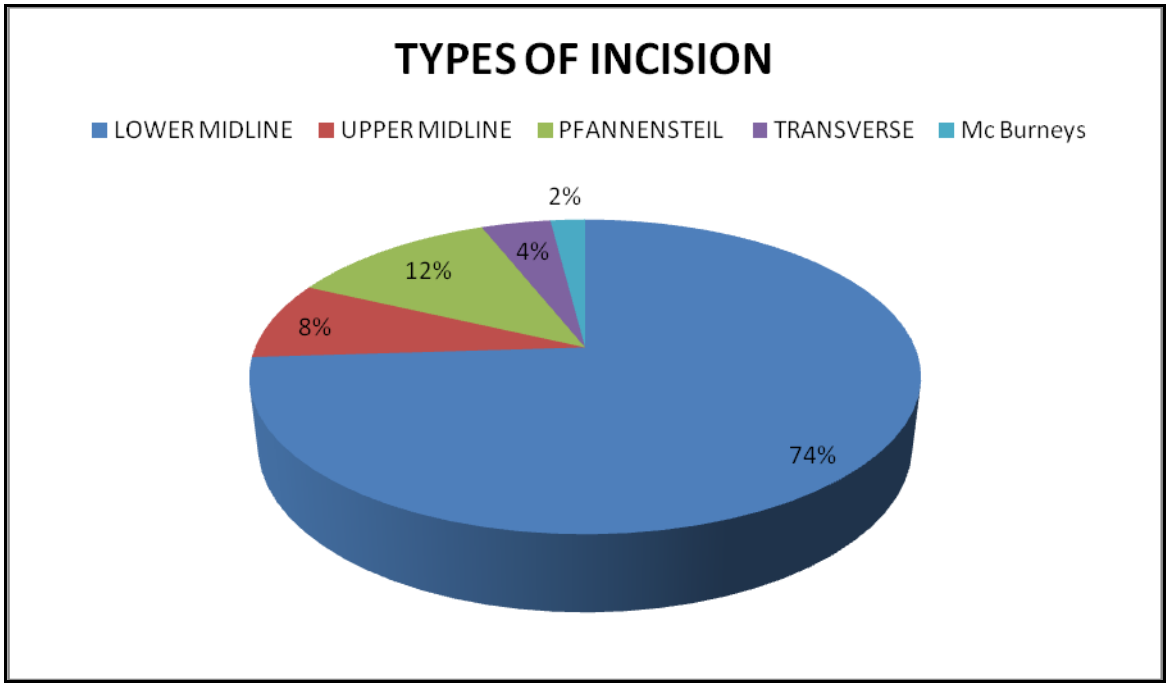


In present study, 78% of Incisional hernia cases were following obstetric and gynaecological operations . Among which LSCS was the most common operation followed by hysterectomy. The GI surgeries account for 22% which includes exploratory laparotomy for intestinal obstruction, DU perforation, GJ and peritonitis.



7. PREVIOUS INCISION USED

Incision type	Number of cases	Percentage %
Lower Midline	37	74
Upper Midline	4	8
Pfannensteil incision	6	12
Transverse	2	4
Mc Burney's	1	2
TOTAL	50	100

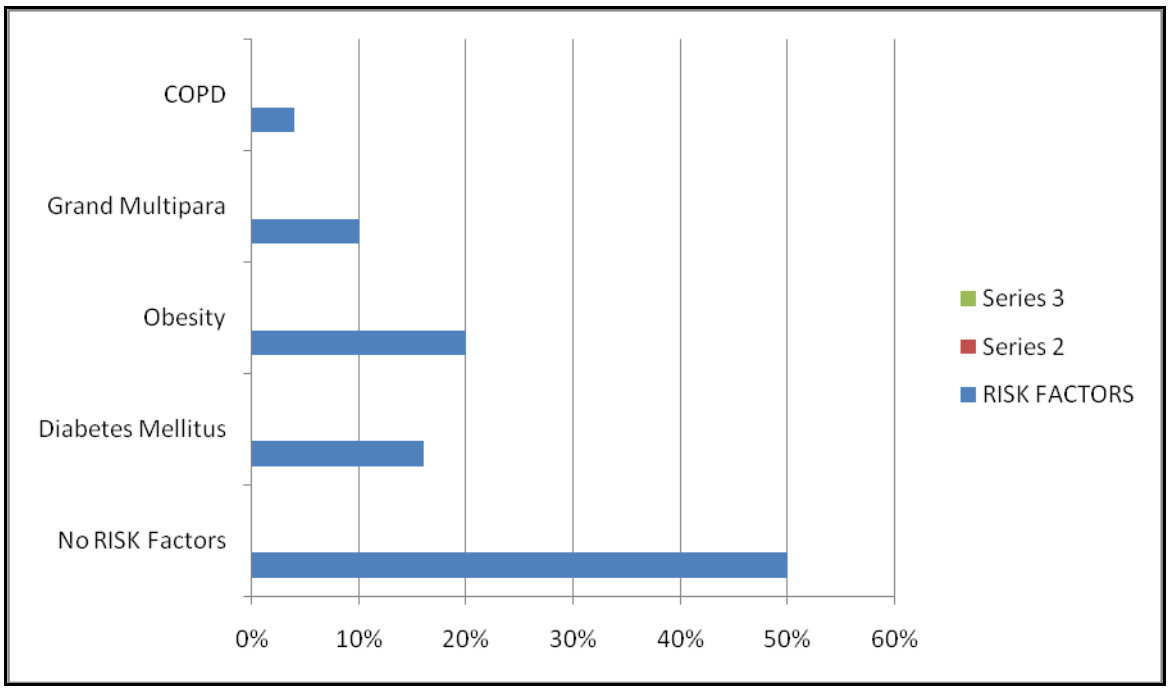


Midline lower abdominal incisions was used in 74% , upper midline abdominal incisions in 8% , Pfannestial incisions in 12%,Mc Burney's in 2%,Transverse incision in 4% of patients was used, This is comparable with A.B. Thakore et al studies and Goel and Dubey studies [41].

Incision	**A.B. Thakore et al**		**Goel – Dubey**		**Present Study**	
	No. of cases	**%**	**No. of cases**	**%**	**No. of cases**	**%**
Lower midline	5 1	67,10	65	44.6	37	74
Upper midline	6	7.8	41	28.0	4	8
Pfannansteil	15	19.65	21	14.2	6	12
Mc burney	4	5.2	5	3.6	1	2
Transverse					2	4
Oblique			14	9.6	-	-
Total	76	100	146	100	50	100

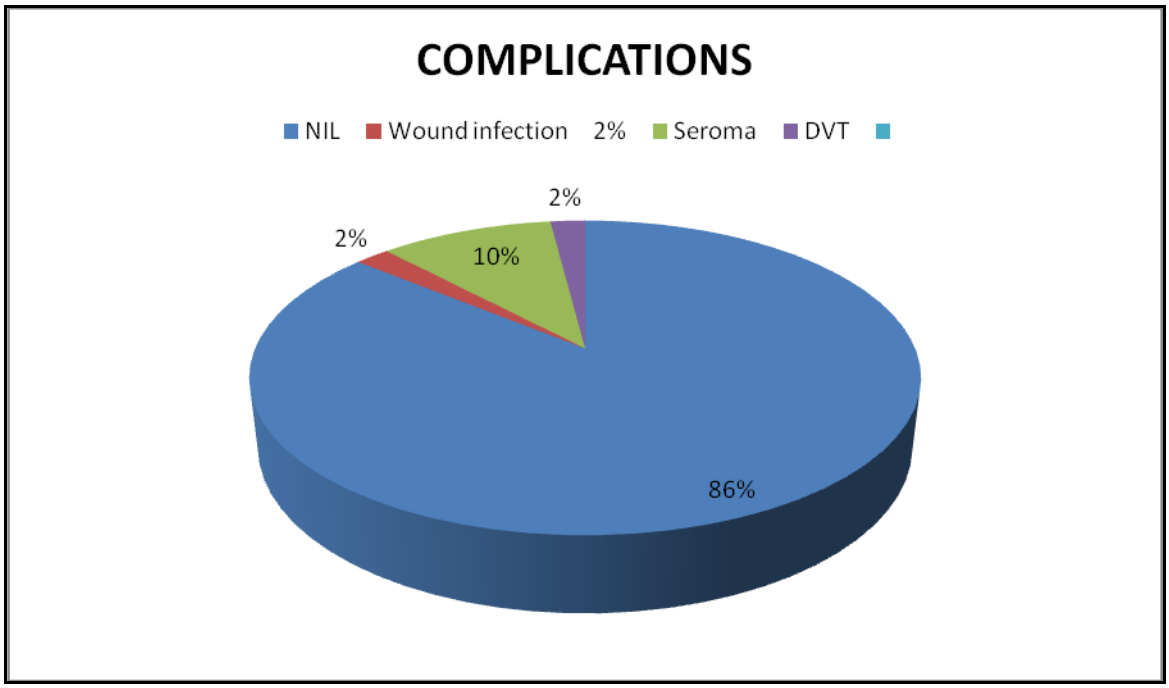
8. ASSOCIATED RISK FACTORS

Risk Factors	Number of Cases	Percentage
No risk factors	25	50
Diabetes Mellitus	8	16
Obesity	10	20
Grand Multipara	5	10
COPD	2	4



9. **Postoperative complications of preperitoneal mesh repair**

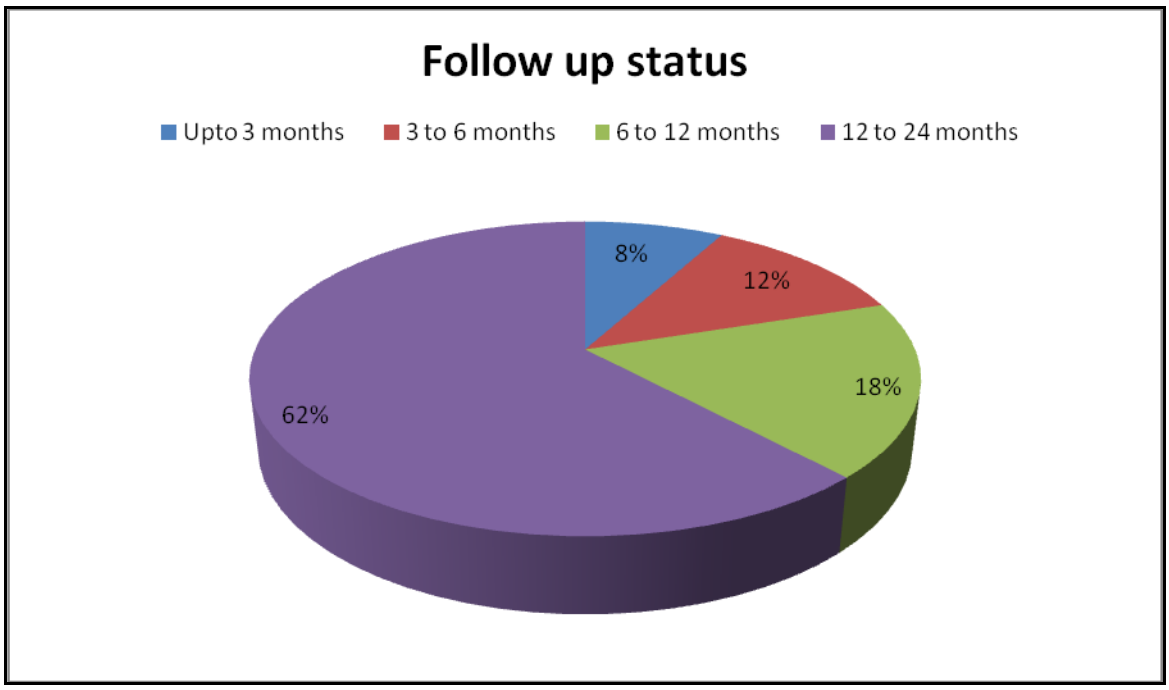
Postoperative complications	Number	Percentage
Nil	43	86
Wound infection	1	2
Seroma	5	10
DVT	1	2
TOTAL	50	100



In present study, there was no postoperative complications in 86% of cases. Only 2% had wound infection, 10% had seroma and 2% had deep vein thrombosis

10. **Follow-up and recurrence status**

Duration of follow up	**Follow up status**	**Recurrence**
Upto 3 months	4 (8%)	Nil
3 to 6 months	6 (12%)	Nil
6 to 12 months	9 (18%)	Nil
12 to 24 months	31 (62%)	Nil



Comparison of postoperative complications in preperitoneal mesh repair (Present study) and other mesh repairs (Other Studies)

Postoperative Complications	PPMR Present Study (n=50)	Other Mesh Repairs – Onlay, inlay and underlay (Leber et al) (n=200)	Onlay Mesh repair (Machiras A et al) (n=43)	Underlay Mesh repair (Antoine Hamy et al) (n=350)
Cellulites	-	14 (7.0%)	-	-
Wound Infection	1 (2%)	8 (4%)	3 (7%)	14 (4%)
Seroma	5(10%)	6 (3%)	6(14%)	
Wound Gapping				
Postoperative Ileus		16(8%)		
Pneumonia		2(1%)		
Pulmonary Embolism		2(1%)		
DVT	1 (2%)	1(0.5%)		
Chronic Infection/Sinus tract		12 (6%)		
Small Bowel Obstruction		11 (5.5%)		
Enterocutaneous Fistula		7 (3.5%)		
Chronic Pain			3 (4%)	2 (0.6%)
Death				2 (0.6%)
Recurrence	-	34 (17%)	7 (9%)	11(3.1%)

DISCUSSION

DISCUSSION

Incisional hernia is produced by deficient wound healing from the very beginning or by gradual yielding of an apparently soundly healed wound. It is estimated that 2- 11% of all abdominal operations result in an incisional hernia . Small hernias less than 2.5cm in diameter are often successfully closed with primary tissue repairs. However larger ones have a recurrence rate upto 30-40% when tissue repair alone is performed alone.

Hernia recurrence is distressing to the patient and embarrassing to surgeon. Nowadays tension free repair using prosthetic mesh has decreased the recurrence to negligible. Despite excellent results, increased risk of infection with implantation of a foreign body and cost factor still exist.Primary tissue repair is associated high unacceptable recurrence rate but nowadays tension free mesh repair is ideal hernia repair technique.

In present study, age ranged from 25 years to 70 years and with peak incidence in 31 to 40 age group (42%). As per the Maingot's studies, mean age was around 45 years [42]. There is a female preponderance noticed with 88%. In Bhutia WT et al study, the female : male ratio was 3 : 1.5 with female preponderance 84% [43].

In this study all patients are presented with history of swelling followed by of which 18cases presented with history of pain. Most of cases in our series, it was reducible hernia (90%) and with 10% of cases has irreducible hernia. We had approximately 30% of cases with early onset of incisional hernia (within one year of previous

surgery) whereas 70% of cases had late onset of incisional hernia (> 1 year of previous surgery), of which 28% of cases presented with > 10 years.

In present study, over 78% of cases occurred following obstetrics and gynaecological operations, and around 22% of cases following general surgical operations. Of 50 cases, 32% of cases had hysterectomy, 26% of cases tubectomy, 20% of cases LSCS, 12% of cases laparotomy and procedure, 2% ofcases appendicectomy, 4% of cases had undergone umbilical hernia and 4% of cases had recurrent incisional hernia, who had undergone anatomical repair.

In present study, 6 patients (12%) had undergone more than one surgery and 2 patients (4%) had already been operated for incisional hernia by anatomical repair. Repeated wounds in the same region or just parallel to each other will often lead to development of herniation as shown by Ponka series . In this study, 74% of cases developed incisional hernia through lower midline incision,12% through Pfannensteil incision, 8% through upper midline incision, 4% through transverse incision, 2% through McBurney's incision**.**

In present study, postoperative wound infection was occurred in 13 cases (26%), which healed by secondary intention. In Ponka series, it accounts for 24%. Bucknell, Cox and Ellis in their of 1129 laparotomy closures, found that 48% of their patients with incisional hernia had previous wound infection and those with wound infection developed hernias almost four times more often [44]. Prevention of wound sepsis is therefore a prime objective in all abdominal operations.

Associated risk factors like diabetes mellitus (16%). Obesity (20%), grand multi para(10%), COPD (4%) seen. In the present study, we encountered 14% of cases with postoperative complications of which 2% of cases with postoperative wound infection, seroma in 10% of cases and deep vein thrombosis in 2% of cases. There was no postoperative complications in 86% of cases.

Postoperative complications was less in present study (14%) when compared with other mesh repair techniques by Leber et al which was 48%. Postoperative ileus ($p=0.047$) and recurrence rate ($p=0.002$) are significantly less in the present study when compared to Leber et al study. But seroma is significantly ($p=0.046$) more in present study compared to Leber et al study [45]**.**

In comparison with onlay mesh repair by Machiras A et al [46], wound infection was noticed in 7%, seroma 14% and chronic pain 7%, whereas in the present study wound infection was 2%, seroma 10% and DVT 2%.In comparison with underlay mesh repair by Antonie Hamy et al [47], wound infection was noticed in 14% of cases, recurrence rate was 3% and death in 0.6% of cases.

In our study, the most of the hospital stay spent in preoperative workup and in the treatment of associated medical illness, if any, to reach the normal parameters for safe surgery. Total duration of hospital stay is increased when risk factors are present with $p=0.103$ and duration of hospital stay after surgery also increased when the risk factors are present with $p=0.390$.

In present study, we had followed up all the patients after discharge for 15 days, 1month, 3 months and few cases upto 24 months of duration. There was no recurrence of incisional hernia noticed in the present study.

Luidendi JK et al reported a recurrence rate of 46% with suture repair technique and 23% with mesh repair technique [48] de Vries Relingh TS et al reported a recurrence rate of incisional hernia following different techniques of mesh repair as follows:

In onlay technique it was 28.3%, inlay technique 44%, and underlay technique 12% Macharias A et al reported a recurrence rate of incisional hernia following onlay mesh repair with 9% of cases .Antonie Hamy et al reported a recurrence rate of incisional hernia following underlay mesh repair with 3.1% of cases.

SUMMARY

SUMMARY

50 cases of incisional hernia which were admitted in Sri Deveraj Urs Medical college,Kolar were studied. The statistical data and analysis of the cases studied during this period are presented in this study.

•Incisional hernia (10%) was the 3rd most common hernia preceded by the inguinal hernia (68%) & Umbilical / Paraumbilical hernia (14.8%).

•It was more common in females than in males with a ratio of approximately 7 : 1.

• Incidence of incisional hernia was highest in the age group ranging from 30-60 years.

• All the patients presented with swelling (100%) and swelling with pain (36%).

• Incisional hernia was more common in patients with previous history of gynaecological operations (78%).

• The incisional hernia was more common in the infraumbilical region (74%).

• In (30%) of the patients the incisional hernia occurred within 3 years of previous operation.

• Wound infection following previous surgery was the most important risk factor associated with wound failure. The other major risk factors were obesity and COPD.

• The size of the hernial defect less than 24sq cms was found in 25 patients (50%).

• 86% of patients had no post operative complications. 2% of patients had wound infection while 10% of patients had seroma collection.

• There was no recurrence in our study.

CONCLUSION

CONCLUSION

1. Less number of postoperative complications noticed in present study.

2. No recurrence noticed in this study.

3. In the present study, preperitonealmesh repair had excellent long-term results with minimal morbidity.

4. Comparing with other types of mesh repair techniques (in literature), the preperitoneal mesh repair is the gold standard treatment for incisional hernia repair.

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BIBLIOGRAPHY

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ANNEXURES

PROFORMA

CASE NO:

IP NO:

NAME: UNIT :

AGE: D O A :

SEX: DOS :

RELIGION DOD :

OCCUPATION

ADDRESS:

FINAL DIAGNOSIS:

SURGERY:

RESULT

I.COMPLAINTS:

1. SWELLING
2. PAIN ABDOMEN
3. VOMITING
4. CONSTIPATION
5. FEVER
6. OTHERS

II.HISTORY OF PRESENT ILLNESS:

1. SWELLING

Mode of onset

Site

Duration

Initial size

Present size

Progress - gradual / rapid

Reducibility - Reducible \Irreducible

2. PAIN

Nature of Pain - Dragging / Colicky / Dull aching / Burning

Site

Radiation

Relation to straining

Aggravating factors

Relieving factors

3. VOMITING

Duration

Frequency

Quality

Relation to pain

Relation to food

Relation to swelling

4. CONSTIPATION

Duration

5.HISTORY OF STRAIN

Chronic cough

Urinary straining

Chronic constipation

Nature of occupation- manual / sedentary work

6. OTHERS

III. PAST HISTORY

1. PREVIOUS OPERATION

Indication for operation

Duration of operation

Type of operation — elective / emergency

Site of incision

Drain - Yes / No from - main wound / Separate wound

GENERAL CONDITION DURING OPERATION

- Anaemia
- Hypoproteinemia
- Obesity
- Diabetes
- Chronic strain - cough / constipation /'urinary straining

COMPLICATIONS

F PREVIOUS OPERATION:

Wound Collection

Wound Infection

Wound dehiscence

Mode of treatment

2. PREVIOUS ATTACK OF

Pain	Yes / No	Duration
Vomiting	Yes / No	Duration
Constipation	Yes / No	Duration
Irreducibility	Yes / No	Duration

3.ANY OPERATION FOR OTHER HERNIAS

4. PAST HISTORY

Pulmonary

Tuberculosis

Constipation

Urinary infection and Straining

Diabetis Mellitus

5. **OTHERS**

IV. PERSONAL HISTORY

- Diet
- Appetite
- Weight
- Smoking
- Bowel
- Micturition
- Habits

V.**MENSTRUAL HISTORY**

- Menarche
- Cycles
- Pregnancies
- Nature of delivery
- Menopause

GENERAL EXAMINATION:

Appearance	Healthy / ill
Built	Poor / Moderate / Well / Obese
Anaemia	
Clubbing	
Jaundice	
Cyanosis	
Oedema	
Generalized lymph adenopathy	
Pulse	
B.P.	
Respiration	
J.V.P.	
Temperature	

ABDOMINAL EXAMINATION

Examination of patient in standing position and in recumbent position

INSPECTION

1. SHAPE OF ABDOMEN

Umbilicus

- Situation
- Everted / Inverted
- Cough impulse

2. PREVIOUS SCAR SITE

Upper / Mid / Lower

Upper / Mid / Lower - RT / LT

Vertical -Midline

-Paramedian

-Transverse

- Oblique

Previous scar nature

- Primary intention
- Secondary intention
- Any Cough impulse

Reducibility — By change in position

3. Swelling :

- Number
- Site
- Shape
- Size
- Surface
- Extent
- Visible peristalsis
- Skin over the Swelling
- Scar
- Pigmentation - Hypo / Hyper

PALPATION:

1. SWELLING

- Warmth
- Tenderness
- Position extent and

  borders

  Surface
- Consistency
- Reducibilily - Partial - Complete
- Impulse on Coughing

CONDITION OF ABDOMINAL WALL MUSCLES - STRONG / WEAK

1. ANY MASS
2. ANY ORGANOMEGALY

PERCUSSION:

Swelling - Resonant / Dull

Evidence of Free Fluid

AUSCULATION:

Swelling - Bowel sounds - heard / not heard

Rest of the abdomen - Bowel sounds - Heard / not Heard

EXAMINATION OF OTHER HERNIAL ORIFICES:

Inguinal - Right / Left

Femoral - Right / Left

EXAMINATION OF EXTERNAL GENITALlA:

Meatus - stricture - phimosis

PER RECTAL EXAMINATION:

EXAMINATION OF RENAL ANGLE:

EXAMINATION OF SPINE:

INVESTIGATIONS

1. Urine — Albumin
   Sugar
   Microscopy

2. Stool — Ova
   Cyst
   Occult Blood

3. Blood- Hb% TC DC ESR

3. Blood sugar

4. Blood urea / Serum creatinine

6. Chest - screening / X-ray

7. Abdomen X-ray - Plain - Barium meal series

8. Ultra sound abdomen

9. Endoscopy

10. Others

TREATMENT

1. Pre operative preparation:
   a. Treatment of associated medical problems
   b. Conservative treatment - Strapping / Belts
   c. Local preparation

2. Operative Procedure

    - Date
    - Surgeon
    - Hospital
    - Anaesthesia : Spinal / GA
    - Name of the operation
    - Material used
    - Operative notes
    - Drain
    - Size of defect

3. Immediate post operative period:

    - Recovery from anaesthesia
    - Any respiratory embarrassment

4. Late postoperative period:

    - General Condition
    - Condition of wound
    - Data of drain removal
    - Data of skin suture removal

5. Condition on Discharge:

    - General Condition
    - Local Condition

6. Nature of advice on discharge

    - Regarding diet
    - Regarding work
    - Regarding treatment present/future

FOLLOW UP:

	1st Month	**3rd Month**	**6th Month**	**1 Year**
General condition				
Condition of the wound				
Any recurrence				

KEY TO MASTER CHART

1. Serial No:

2. Name:

3. Age:

4. Sex:

5. Duration : Months - mth

6. I. P. No : In patient Number.

7. D.O.A. - Date of Admission.

8. D.O.S. - Date of Surgery.

9. D.O.D. - Date of Discharge.

10. Associated Conditions-

DM – Diabetes Mellitus.

HTN- Hypertension.

Hb - Haemoglobin.

Gm- Grand Multiparra

11. Previous Surgeries :

LSCS - Lower segment Caesarian Section.

D.U - Duodenal Perforation.

TAH+BSO - Total Abdominal Hysterectomy + Bilateral Salpingo-Oophorectomy.

Exp- Lap - Exploratory Laparotomy.

GJ + BTV - Gastrojejunostomy + Bilateral Truncal Vagotomy

12. Operative procedure – PPMR- Pre peritoneal Mesh Repair

13. No Recurrence - NR

MASTER CHART

Sl no	Name Age/Sex Occupation	I.P. No. DOA DOS DOD	Presenting complaints with duration	Previous surgery Complications Previous` Incision Duration (previous Surgery)	Pre Op Condition	Hernia defect Operative procedure Drains used	Postoperative Complication Recurrence
1.	Bhagyamma 43 yrs/F House wife	568231 4/05/08 6/05/08 11/05/08	S welling-1yr	Cholecystectomy NIL R : Paramedian 2 Yrs. ago	Hb-11.4g COPD HTN	5cm x 4cm PPMR Suction drain	Nil NR
2.	Sarojini 46 yrs /F Teacher	523456 15/05/08 17/05/08 24/05/08	Swelling-5yrs Pain- 6 mths	LSCS NIL Infra umbilical 18 yrs back	Hb-10.2g Gm	6cm x 3cm PPMR Suction drain	Nil NR
3.	Laxmi 49 yrs/F Farmer	576890 2/06/08 4/06/08 11/06/08	Swelling- 1yr	LSCS NIL Infra umbilical 20 yrs back	Hb-13.4g No risk	4cm x 5 cm PPMR Suction drain	Nil NR
4.	Chinamma 52 yrs/F Vendor	583245 15/06/08 18/06/08 25/06/08	Swelling- 7 yrs Pain- 5 mths	LSCS NIL Infra umbilical 28 yrs back	Hb-10.4g No risk	3cm x 6cm PPMR Suction drain	Nil NR
5.	Khyser Bano 68yrs/F House wife	589067 2/07/08 5/07/08 15/07/08	Swelling- 3 yrs	Laparotomy for Peritonitis Resp. Complications Upper Midline 10 Yrs ago	Hb-9.2g Obesity HTN	8 cm x 6 cm PPMR Suction drain	Seroma NR
6.	Kamalamma 41yrs/F House wife	543678 22/07/08 24/07/08 30/07/08	Swelling- 2yrs	LSCS NIL Infra umbilical 11 yrs back	Hb-12.8g Gm	4cm x 4cm PPMR Suction drain	Nil NR

7.	Munnireddy 54yrs/M Vendor	569081 2/08/08 4/08/08 10/08/08	Swelling-5 mth Pain- 1 mth	DU Perforation NIL Right Lower paramedian 1Yr ago	Hb-10.6g DM HTN	7cm x 4cm PPMR Suction drain	Nil NR
8.	Rukhsana 36 yrs/F House wife	543890 12/08/08 15/08/08 21/08/08	Swelling-3 yrs Pain- 2 mths	Tubectomy NIL Infraumblical 7 Yrs ago	Hb-13.6g No risk	2cm x3cm PPMR Suction drain	Nil NR
9.	Sangeeta 47yrs/F Business	532100 5/09/08 8/09/08 14/09/08	Swelling-6yrs	LSCS NIL Infra umbilical 17 yrs back	Hb-11.2g Obesity HTN	5cm x 5cm PPMR Suction drain	Nil NR
10	Sushelamma 43yrs/F Farmer	543106 19/09/08 22/09/08 29/09/08	Swelling-3yrs	LSCS NIL Infra umbilical 13 yrs	Hb-13.4g No risk	6cm x 5cm PPMR Suction drain	Nil NR
11	Shazia khatun 62 yrs/F House wife	567213 7/10/08 11/10/08 18/10/08	Swelling-2 mths Pain-Ten days	Left Nephrectomy Wound infection Left Lumber 1/2 Yrs ago	Hb-12.8g DM	5cm x 5cm PPMR Suction drain	Nil NR
12	Sharadamma 52yrs/F House wife	598745 19/10/08 22/10/08 30/10/08	Swelling- 1 yr	Hysterctomy NIL Infraumbilical 2 Yrs ago	Hb-11.4g No risk	9cm X 5 cm PPMR Suction drain	Nil NR
13	Jayashree 32yrs/F Teacher	521346 7/11/08 10/11/08 17/11/08	Swelling- 2yrs	Tubectomy NIL Infraumblical,5 Yrs ago	Hb-10.6g No risk	3cmx 2cm PPMR Suction drain	Nil NR

14	Rajappa 57yrs/M Technician	567432 15/11/08 18/11/08 25/11/08	Swelling- 2 yrs Pain- 3 mths	Exp. Lap NIL Right Upper paramedian 4 Yrs. ago	Hb-9.4g Obesity HTN	5cm x 5cm PPMR Suction drain	Nil NR
15	Rehana 35yrs/F House wife	543256 2/12/08 5/12/08 12/12/08	Swelling- 3 yrs	LSCS NIL Infra umbilical 6 yrs	Hb-11.4g Gm	3cm x 3cm PPMR Suction drain	Nil NR
16	Mangamma 53 yrs/F Labourer	576890 14/12/08 16/12/08 23/12/08	Swelling-5yrs Pain- 2 mths	LSCS NIL Infra umbilical 2 9 yrs back	Hb-9.4g No risk	6cm x 5 cm PPMR Suction drain	Nil NR
17	Kiran 58yrs/F House wife	623410 1/01/09 3/09/09 13/09/09	Swelling-5 Mths	Hysterectomy Wound infection Infra umbilical 1Yr ago	Hb-9.8g DM	9cm x 5cm PPMR Suction drain	Seroma NR
18	Veena 65 yrs/F House wife	645321 8/01/09 10/01/09 16/01/09	Swelling-3 mths Pain- 10 days	Hysterectomy Wound infection Infra umbilical 9 months ago	Hb-11.4g Obesity	8cm x 4cm PPMR Suction drain	Nil NR
19	Sitamma 54 yrs/F Labourer	654317 20/01/09 22/01/09 29/01/09	Swelling- 5 yrs	TAH+BSO NIL Pfannensteil's 7 Yrs ago	Hb-10.4g No risk	6cm x 5cm PPMR Suction drain	Nil NR
20	Saroja 48yrs/F Labourer	635678 2/02/09 5/02/09 12/02/09	Swelling- 3 yrs Pain- 7 mths	LSCS NIL Infra umbilical 20 yrs back	Hb-9.4g Obesity HTN	3cm x 3cm PPMR Suction drain	Nil NR

21	Padmavati 31yrs/F House wife	689011 10/02/09 12/02/09 19/02/09	Swelling- 2 yrs	Tubectomy NIL Infraumblical 4 Yrs ago	Hb-10.6g No risk	4cm x 3cm PPMR Suction drain	Nil NR
22	Raadhika 59 yrs/F House wife	678912 15/02/09 18/02/09 25/02/09	Swelling- 6 mth	Hysterectomy Wound infection Infra umbilical 1Yr ago	Hb-12.4g DM	5cm x 5cm PPMR Suction drain	Nil NR
23	Muniyama 50 yrs/F Labourer	643581 1/03/09 3/03/09 13/03/09	Swelling- 3 Mth	Hysterectomy Wound infection Infra umbilical 1Yr ago	Hb-11.4g DM	6cm x 5cm PPMR Suction drain	Seroma NR
24	Rehman 36yrs/M	689013 19/03/09 22/03/09 29/03/09	Swelling- 2 mth	Appendectomy Wound infection Mcburning Grid iron 7 months back	Hb-13.4g No risk	3cmx2cm PPMR Suction drain	Nil NR
25	Jayamma 54yrs/F House wife	678901 7/04/09 10/04/09 16/04/09	Swelling- 6 mth Pain- ten days	Hysterectomy Wound infection Infra umbilical 1Yr ago	Hb-10.4g DM	6cm x 6cm PPMR Suction drain	Nil NR
26	Doddamma 5Oyrs/F Farmer	645789 15/04/09 18/04/09 24/04/09	Swelling- 5 yrs	LSCS NIL Infra umbilical 25 yrs back	Hb-9.4g Obesity	4cm X 4cm PPMR Suction drain	Nil NR
27	Shankari 28yrs/F ,BPO	647890 22/04/09 24/04/09 30/04/09	Swelling- 3mth Pain-ten days	Tubectomy NIL Infraumblical 1 Yrs ago	Hb-10.4g No risk	3cmx 1 cm PPMR Suction drain	Nil NR

28	Meher bano 36 yrs/F House wife	656890 1/05/09 3/05/09 10/05/09	Swelling- 5 yrs	LSCS NIL Infra umbilical 8 yrs	Hb-9.8g Gm	4cm X 4cm PPMR Suction drain	Nil NR
29	Anita 21yrs/F Receptionist	654390 15/05/09 18/05/09 25/05/09	Swelling-6 mth	LSCS Wound infection Infra umbilical,1 yr	Hb-11.4g No risk	5cm x 5cm PPMR Suction drain	Nil NR
30	Munniswamy 66 yrs/M Farmer	678098 4/06/09 7/06/09 14/06/09	Swelling- 1 yr Pain- 3 mths	DU Perforation closure Wound infection Upper Midline 2 1/2 Yrs. ago	Hb-8.8g COPD	5cm x 3cm PPMR Suction drain	Nil NR
31	Asha 52 yrs/F Business	643897 10/06/09 12/06/09 24/06/09	Swelling- 2 yrs	TAH+BSO NIL Pfannensteil's 9 Yrs ago	Hb-12.6g Obesity	8cm x 4cm PPMR Suction drain	Seroma NR
32	Chaitanya 30yrs/F BPO	634567 2/07/09 5/07/09 11/07/09	Swelling-3 mths	Tubectomy NIL Infraumblical 1 Yrs ago	Hb-13.4g No risk	2cm x 2cm PPMR Suction drain	Nil NR
33	Sumitra 68yrs/F House wife	674532 7/07/09 9/07/09 25/07/09	Swelling-2 mths Pain- ten days	Hysterectomy Wound infection Infra umbilical 7 months back	Hb-9.8g DM	9cm x 3cm PPMR Suction drain	Wound infection NR
34	Anandi Bai 55 yrs/F Business	675463 2/08/09 4/08/09 10/08/09	Swelling- 1 mth	Hysterectomy Wound infection Infra umbilical 6 months ago	Hb-10.4g No risk	7cm x 6 cm PPMR Suction drain	Nil NR

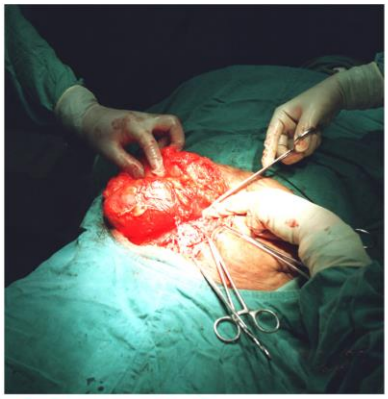
35	Laxmi 57yrs/F House wife	653247 10/08/09 13/08/09 20/08/09	Swelling- 1 yr Pain- 1 mth	TAH+BSO NIL Pfannensteil's 2Yrs ago	Hb-11.4g No risk	4cm x 4cm PPMR Suction drain	Nil NR
36	Ashok 36yrs/M Clerk	679023 15/08/09 18/08/09 25/08/09	Swelling- 1 yr	GJ + BTV Wound dihiscence Supra umbilical 2 1/2 Yrs. Ago	Hb-10.6g No risk	5cm x 4cm PPMR Suction drain	Nil NR
37	Rukhsar 58yrs/F House wife	689043 2/09/09 4/09/09 10/09/09	Swelling-2 mths	Hysterectomy Wound infection Infra umbilical 1Yr ago	Hb-11.4g Obesity	7cm x 5cm PPMR Suction drain	Nil NR
38	Rajappa 46yrs/M Professor	689073 10/09/09 13/09/09 20/09/09	Swelling-1 yr Pain- one mth	Not known Wound infection Upper Midline 2 Yrs. ago	Hb-13.4g No risk	3cm x 3cm PPMR Suction drain	Nil NR
39	Muniyamma 49yrs/F House wife	689032 18/09/09 20/09/09 26/09/09	Swelling-6 mth	TAH+BSO NIL Pfannensteil's 3 Yrs ago	Hb-12.4g No risk	5cm x 5cm PPMR Suction drain	Nil NR
40	Manjula 30yrs/F Teacher	690845 2/10/09 5/10/09 12/10/09	Swelling- 2 yrs Pain- 1 month	LSCS NIL Infra umbilical 5 Yrs	Hb-13.8g No risk	3cm x 2cm PPMR Suction drain	Nil NR
41	Mohani 51yrs/F House wife	634567 7/10/09 10/10/09 17/10/09	Swelling- 3 yrs	Exp. Lap NIL Right Upper paramedian 7 Yrs. ago	Hb-11.8g No risk	6cm x 6cm PPMR Suction drain	Nil NR

42	Sultana 47yrs/F House wife	690876 2/11/09 5/11/09 15/11/09	Swelling- 2 yrs	TAH+BSO NIL Pfannensteil's 7 Yrs ago	Hb-10.8g Obesity	8 cm x 6 cm PPMR Suction drain	Seroma NR
43	Rashmi 33yrs/F Teacher	678098 15/11/09 18/11/09 25/11/09	Swelling- 2yrs Pain- 6 mth	LSCS NIL Infra umbilical 7 Yrs	Hb-9.4g Gm	4cm x 3cm PPMR Suction drain	Nil NR
44	Mahadevi 28yrs/F Engineer	689056 4/12/09 6/12/09 13/12/09	Swelling- 1 yr	LSCS NIL Infra umbilical,3yrs	Hb-13.4g No risk	5cm x 4cm PPMR Suction drain	Nil NR
45	Muniyamma 49yrs/F House wife	609876 1/01/10 4/01/10 11/01/10	Swelling- 2 yrs	Hysterctomy NIL Infra umbilical 9 yrs back	Hb-10.4g Obesity	7cm x 5cm PPMR Suction drain	Nil NR
46	Aarti 27yrs/F Banker	605678 7/02/10 11/02/10 17/02/10	Swelling- 9mth	LSCS NIL Infra umbilical 3 Yrs 6 Months	Hb-11.6g No risk	4cm x 4cm PPMR Suction drain	Nil NR
47	Sulakshna 44yrs/F Professor	612567 3/03/10 5/03/10 12/03/10	Swelling- 2 yrs Pain- 2 mth	Not known Wound infection Upper Midline 8 Yrs. ago	Hb-10.8g DM	3cm x 3cm PPMR Suction drain	Nil NR
48	Mira 38yrs/F House wife	634561 15/03/10 17/03/10 23/03/10	Swelling- 2 yrs	LSCS NIL Infra umbilical 8yrs back	Hb-11.4g No risk	8cm x 4cm PPMR Suction drain	Nil NR

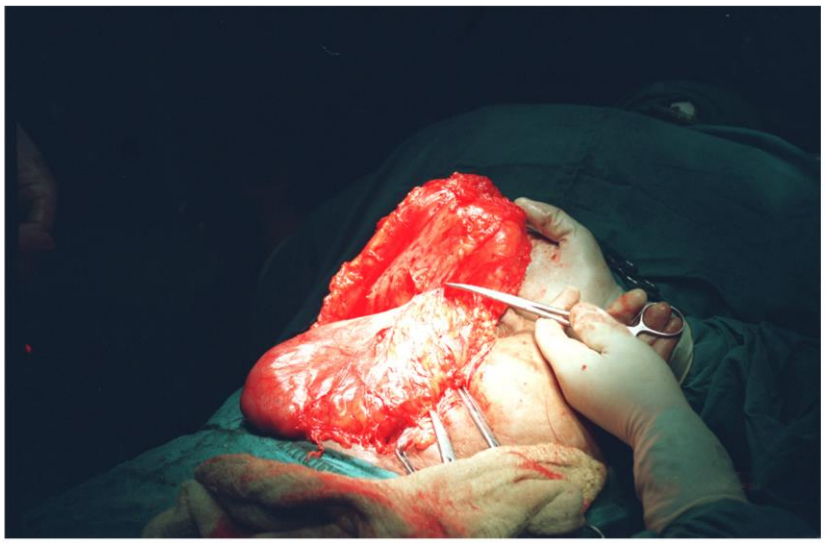
49	Rajkumari 46yrs/F Business	689012 7/04/10 9/04/10 23/04/10	Swelling- 1 yr	TAH+BSO NIL Pfannensteil's 4 Yrs ago	Hb-9.4g No risk	5cm x 5cm PPMR Suction drain	DVT NR
50	Ratna 39yrs/F Engineer	609867 5/05/10 8/05/10 15/05/10	Swelling-6 mths	LSCS NIL Infra umbilical 10 Yrs 6 Months	Hb-13.4g No risk	3cm x 3cm PPMR Suction drain	Nil NR

OPERATIVE STEPS- PRE PERITONEAL MESH REPAIR

PRE - OPERATIVE



ADHESIONS RELEASED



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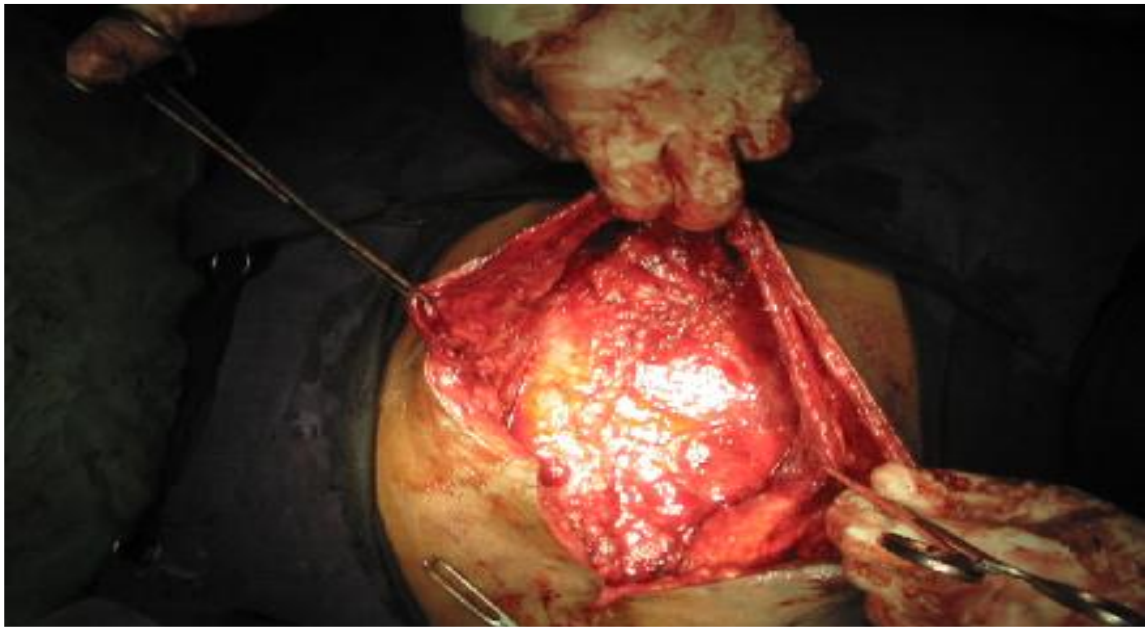
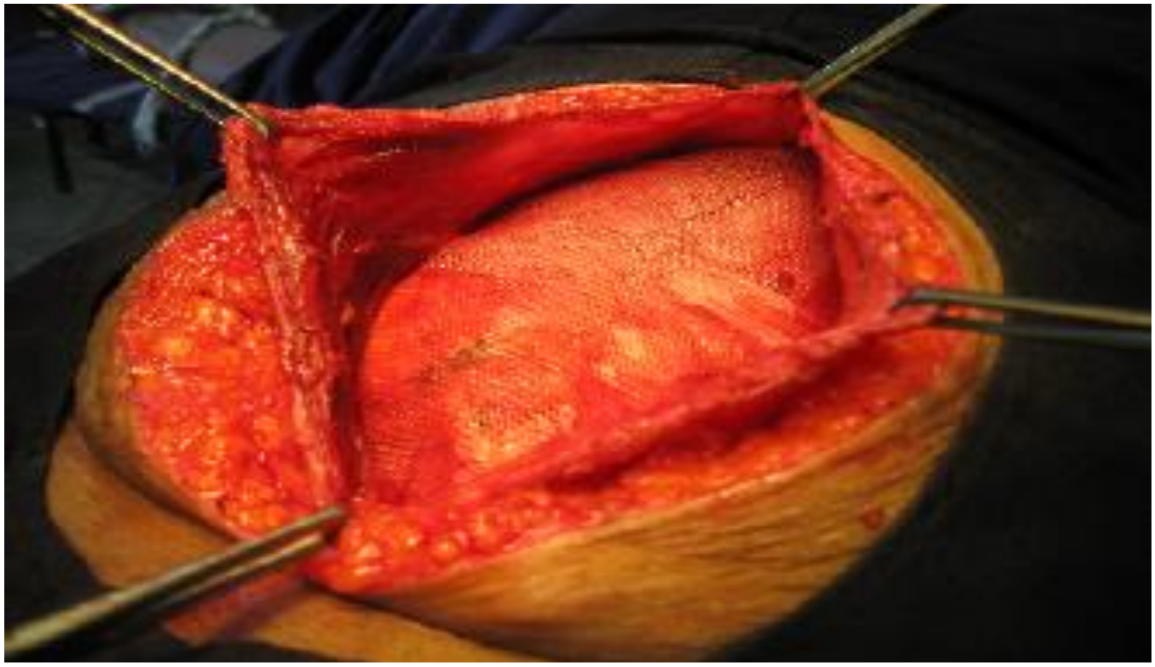


Pre Peritoneal plane being prepared



Pre Peritoneal Mesh Repair