

A Dissertation on  
**GROIN HERNIAS PRESENTING AS ACUTE  
EMERGENCIES**

submitted to  
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**M.S. (GENERAL SURGERY)**

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CHENNAI.**

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## **CERTIFICATE**

This is to certify that “**GROIN HERNIAS PRESENTING AS ACUTE EMERGENCIAS**” is a bonafide work done by **Dr. ARAVIND S KAPALI**, post graduate in department of **General Surgery, Kilpauk Medical College, Chennai- 10** under my guidance and supervision in fulfillment of regulation of The **Tamilnadu Dr. M. G. R. Medical University** for award of **M.S. Degree Branch I, Part II (General Surgery)** during academic period from **march 2005 to march 2008**.

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### **AIMS OF STUDY**

- 1) To study about various acute surgical emergencies in groin hernia.
- 2) To study various symptoms of presentation
- 3) To study complications
- 4) To study age and sex incidence
- 5) To study types of hernia that present as acute emergency
- 6) To study site of constriction ring
- 7) To study the side affected most
- 8) To study content of hernial sac
- 9) To study duration of hernia to complication
- 10) To study the type of surgery done

## HISTORY

“The history of hernia is history of surgery”<sup>1</sup>

**José F Patino**

The earliest text of hernia appears in Egyptian papyrus of **Ebers** of 1552 BC. **Heliodorus** was the surgeon who performed the first hernia operation.<sup>2</sup> **Aulus Cornelius Celsus** was the first writer to write detailed description of hernia surgery in 50 AD. The concept of *rupture* comes from **Galen** of Pergamum (AD 129-199) in Greco-roman period.

In late eighteenth century there came great anatomists and surgeons and the age came to be known as age of dissection. Great contribution was done by **Percivall Pott, Jean Lou Petit, D August Gottlieb Richter, Don Antonio de Gimbernat, Pieter Camper, Franz K Hesselbach, Antonio Scarpa, and Paston Cooper**<sup>3</sup>. They described the anatomy in detail which led to modern hernia repair.

**Edoardo bassini** (1844-1924) was the first to describe the dissection of hernial sac and high ligation of sac with anatomical reconstruction of posterior inguinal wall. Majority of the procedures which followed were a modification of his technique. Therefore he is rightfully called as *father of modern herniography*.

**William S Halstead** (1852-1922) of John Hopkins developed a modification of Bassini's technique the **Halstead I** and **Halstead II**. He gave credit to **Harvey Cushing** for first performing herniorrhaphy under local anesthesia. Cooper's ligament repair was first described by **George Lothessen** but was popularized and goes by the name of **Chester McVay**.

**Shouldice** a Canadian surgeon in 1960 described the method by overlapping layers with continuous suture. This technique is masterfully performed and a recurrence rate of less than 1 % has been achieved.

**Alexander Thomson** described the iliopubic tract in 1836. **Nyhus** and his colleagues proposed iliopubic tract repair, both anterior and preperitoneal approach. Although **Annandale** proposed preperitoneal approach it was popularized by Nyhus and is called *Nyhus operation*.

**Usher** introduced **polypropylene** prosthetic mesh for reinforcement which led to 'tension free repairs'. **Lichtenstein** and group describe strengthening of posterior wall with mesh and produced very low recurrence rates, under local anesthesia and also the ease with which it can be done in 1989.

A French surgeon **Stoppa** describe the repair of groin hernias with giant mesh prosthesis through lower mid line incision for bilateral hernias and complicated presentation known as **Giant Prosthetic and Reinforcement of Visceral Sac (GPRVS)**<sup>4</sup>.

**Ger** was the first to repair indirect inguinal hernia laparoscopically in 1982<sup>5</sup>. **Arregui** introduced **Trans Abdominal and Preperitoneal repair (TAPP)** in 1991<sup>6</sup>. **Phillips** did **Extraperitoneal Laparoscopic repair (TEP)**<sup>7</sup>. Fitzgibbon introduced **IPOM (intra peritoneal mesh repair)** using prolene mesh<sup>8</sup>. **Kugel** developed an open preperitoneal mesh repair through a small incision in open technique<sup>9</sup>. It was to compete with the laparoscopic repairs. As the newer techniques emerge the story continues until we are able to produce a foolproof method.



## **REVIEW OF LITERATURE**

### **ANATOMY OF GROIN**

There are four groin hernias:

- I. Indirect inguinal hernia
- II. Direct inguinal hernia
- III. External supravesical hernia
- IV. Femoral hernia

### **INGUINAL CANAL**

In adults canal is about 3.75 cms and extends from deep ring to superficial ring, directed downwards and medially to superficial ring<sup>10</sup>.

### **SUPERFICIAL INGUINAL RING**

It is a triangular aperture in external oblique aponeurosis which lies 1.25 cms above the pubic tubercle.

Base is part of pubic crest. Its margins are formed by two crura, superior (medial) and inferior (lateral). Superior crus is formed by the aponeurosis of external oblique and inferior crus by the inguinal ligament<sup>11</sup>.

## **DEEP INGUINAL RING**

It is a 'U' shaped normal defect in the transversalis fascia. Anterior and posterior arms are special thickening of the transversalis fascia, forming a sling. The anterior (superior) crus is formed by transversus abdominal arch. The posterior (inferior) crus is formed by aponeurotic fibers from iliopubic tract<sup>11</sup>.

## **BOUNDARIES OF INGUINAL CANAL**

### **Anterior**

Skin, superficial fascia, external oblique aponeurosis, lateral one third by internal oblique muscle fibers.

### **Posterior**

Laterally by aponeurosis of transversalis abdominis muscle and transversalis fascia. Medially by the internal oblique aponeurosis.

### **Superior**

Arching fibers of internal oblique muscle and transversalis abdominis muscle and aponeurosis.

### **Inferior**

Inguinal ligament and lacunar ligament.

## **CONTENTS**

### **MALES**

- 1) Vas deferens
- 2) Genital branch of genitofemoral nerve
- 3) Ilioinguinal nerve
- 4) Sympathetic nerve
- 5) Artery to ductus
- 6) External spermatic artery
- 7) Internal spermatic artery
- 8) Pampiniform plexus of veins
- 9) External and internal spermatic fascia
- 10) Cremasteric fascia

### **FEMALES**

- 1) round ligament of uterus
- 2) genital branch of genitofemoral nerve
- 3) fascial coverings

## **SUPERFICIAL FASCIA**

This fascia is divided into superficial part (camper) and deep part (scarpa). Superficial layer extends upwards on abdominal wall and downwards continuous with the outer layer of fascia covering the perineum, the penis, the scrotum, and the thigh. This also contains the dartous muscle of the scrotal wall. The deeper layers forms fundiform ligament of penis, continues onto the penis and the scrotum, and then fuses with superficial fascia of the perineum<sup>12</sup>.

## **EXTERNAL OBLIQUE APONEUROSIS**

Below the arcuate line this aponeurosis joins the internal oblique and transversus abdominis aponeurosis to form rectus sheath.

This gives rise to;

- 1) inguinal ligament (poupart's)
- 2) lacunar ligament (gimbernant's)
- 3) reflected inguinal ligament (colle's)
- 4) pectineal ligament (cooper's)

## INGUINAL LIGAMENT

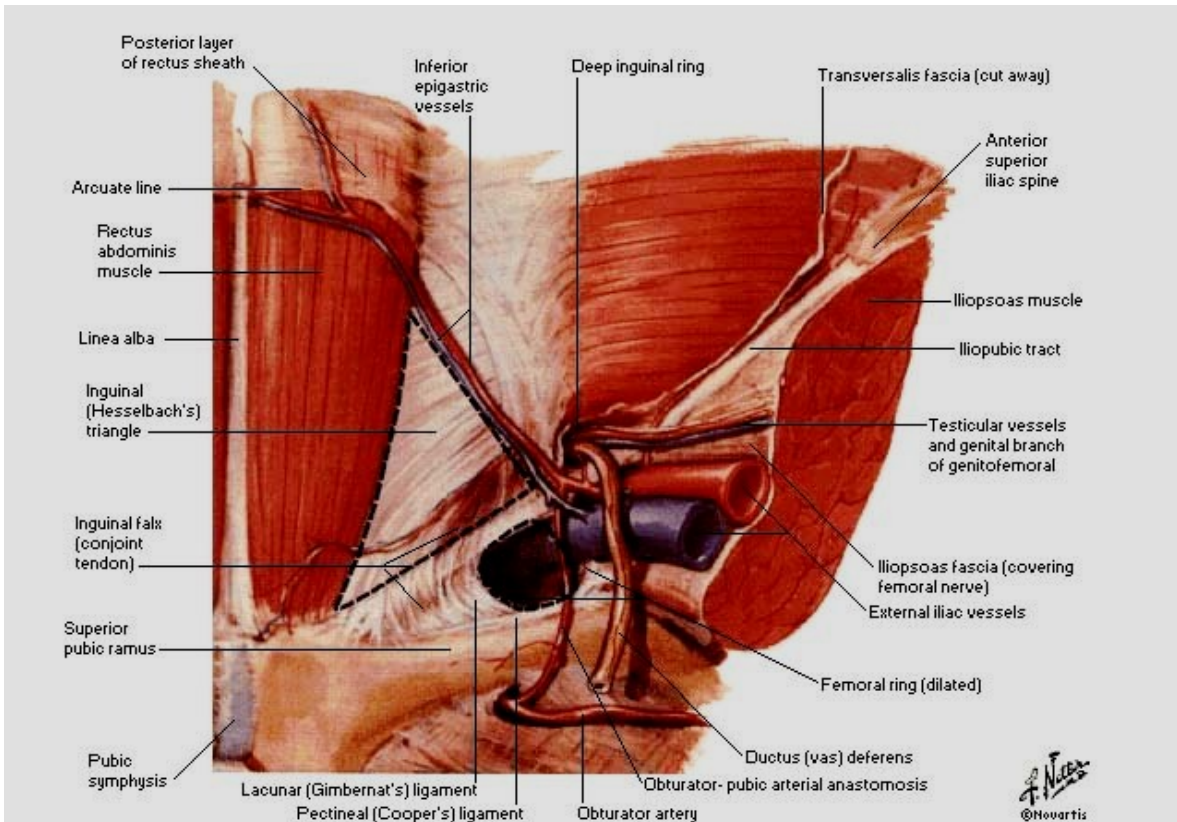
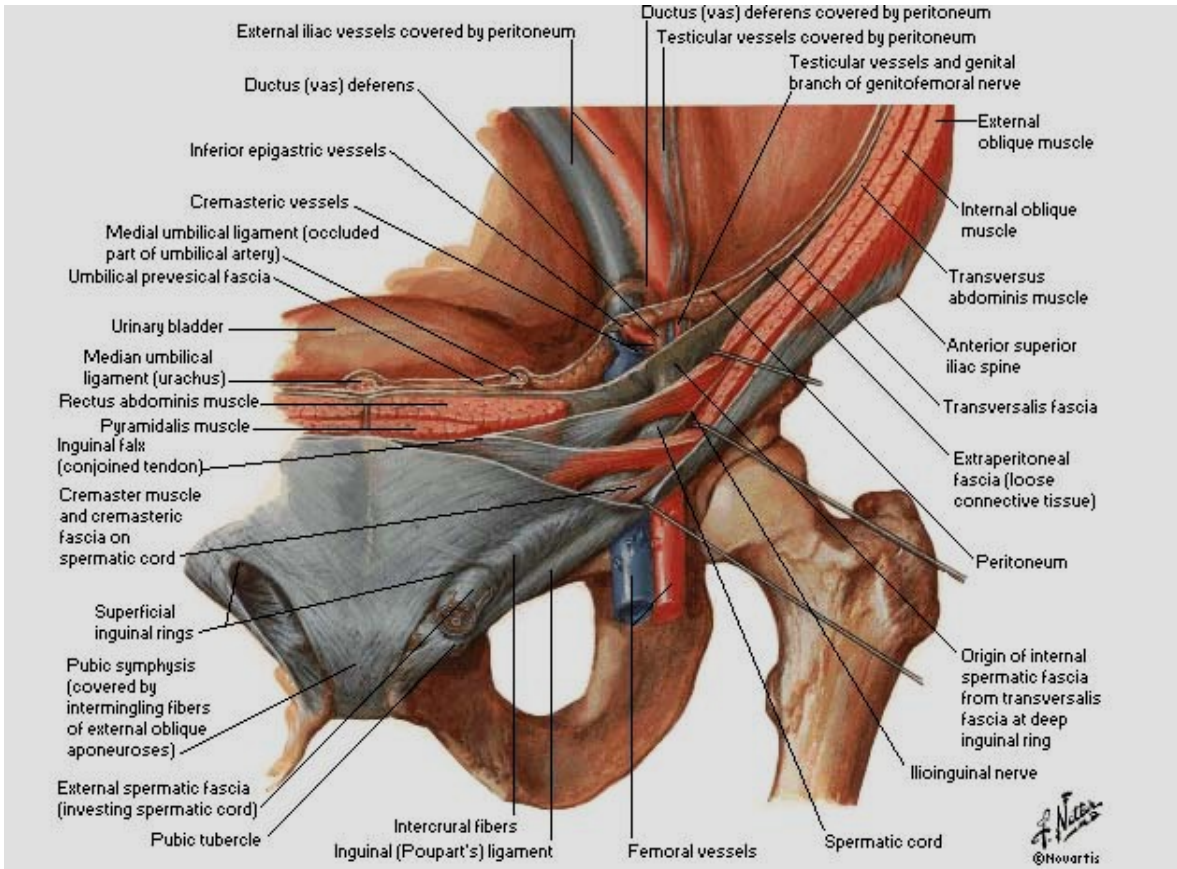
The obliquely arranged anterior-inferior fibers of the aponeurosis of the external oblique muscle folds back (**colle's**) onto themselves to form inguinal ligament. This attaches to anterior superior iliac spine. The medial insertion is dual in most individuals. One portion on the pubic tubercle and pubic bone and the other portion is fan shaped and spans the distance between the inguinal ligament proper and the pectineal line of pubis. This fan shaped portion is **Gimbernant ligament**. This blends laterally with **Cooper's ligament**<sup>12</sup>.

## HESSELBACH'S TRIANGLE

From anterior aspect the inguinal ligament forms the base of the triangle, the edge of the rectus abdominis is the medial border, and inferior epigastric artery as supero-lateral border. This is the site of direct inguinal hernia.

## ILIOPUBIC TRACT

It's a strong facial band that begins laterally along the crest of ilium and at the antero-superior iliac spine. It forms an integral part of the anterior femoral sheath. It is subjacent to inguinal ligament but totally separate from



it. Medially it inserts fan-wise into the superior ramus of the pubis and into the Cooper's ligament<sup>13</sup>.

## **PERITONEUM**

From **laparoscopic** view the peritoneal folds form important landmarks in the preperitoneal space. The **median umbilical fold** extends from the umbilicus to the urinary bladder and covers the urachus. The **medial umbilical fold** is formed due to the presence of the obliterated portion of the fetal umbilical artery. The lateral umbilical fold covers the inferior epigastric artery as it courses towards the posterior rectus sheath and enters it approximately at the arcuate line of **Douglas**.

Between the median and medial ligaments a depression usually exists called the suprapubic fossa. This is the site of **suprapubic hernia**.

**Hesselbach's triangle**<sup>12</sup> is seen as supero-medially as the medial border of the rectus sheath, supero-laterally as the inferior epigastric vessels and inferiorly as Cooper's ligament<sup>11</sup>.

## **TRIANGLE OF DOOM**

It's formed by

- 1) the spermatic vessels laterally,

- 2) the vas deferens medially,
- 3) And inferior flap of peritoneal dissection inferiorly

It contains external iliac vessels hidden beneath it.

## **TRIANGLE OF PAIN**

It is formed

- 1) medially by spermatic vessels
- 2) iliopubic tract superiorly
- 3) laterally by lateral pelvic wall

It contains genital and femoral branch of genitofemoral nerve, the femoral nerve and lateral femoral cutaneous nerve of thigh. Any staples or tacks placed caudal to the iliopubic tract and lateral to the internal spermatic vessels can result in neuralgias.

## **CORONA MORTIS**

Commonly an anastomotic vessel between the obturator vessel and inferior epigastric vessel is present and can be seen arching over coopers ligament, known as the **corona mortis (death crown)**. Called so as inadvertent bleeding may occur during hernia surgery. The veins can also be troublesome, especially when they are larger than the arteries.



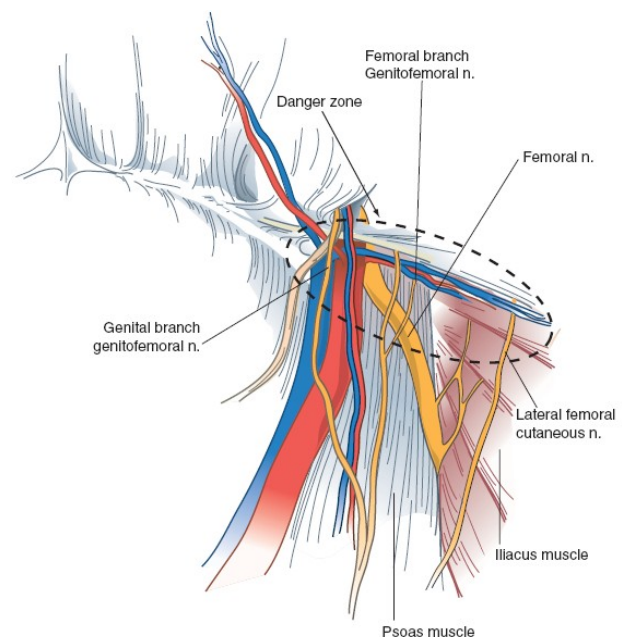
## TRANSVERSALIS FASCIA

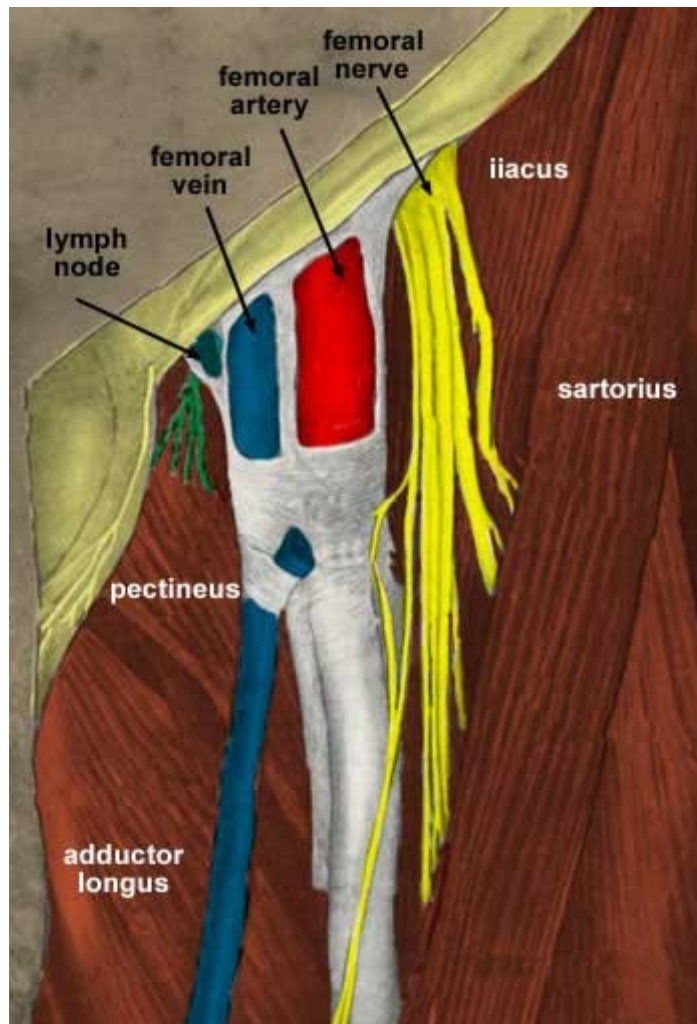
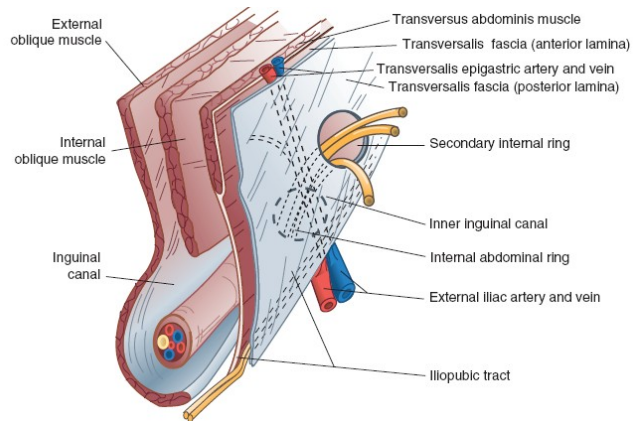
When peritoneum is opened from within the abdomen preperitoneal space is reached. This space is between the parietal peritoneum and **transversalis** fascia. This space is designated in front of the urinary bladder as retropubic space of **Retzius**. The lateral extension of this space is known as space of **Bogros**. The transversalis fascia is continuous laterally and posteriorly with endoabdominal and endopelvic fascia and there by forms with them an extraperitoneal reinforcing layer. The derivatives of transversalis fascia are;

- 1) both the crura of deep inguinal ring
- 2) iliopubic tract
- 3) part of cooper's ligament
- 4) iliopectineal arch<sup>11</sup>

## FRUCHAUD'S MYOPECTINEAL ORIFICE

It is an area bound superiorly by internal oblique and transversus abdominis muscle, medially by the rectus muscle and the sheath, laterally





by the iliopsoas muscle and inferiorly by Cooper's ligament. Critical anatomical landmarks such as inguinal ligament, spermatic chord, and the femoral vessels are contained within this area. This funnel shaped orifice is lined in entirety by the transversalis fascia. Fruchaud's concept is that all groin hernias is failure of the transversalis fascia to retain the peritoneum<sup>12</sup>.

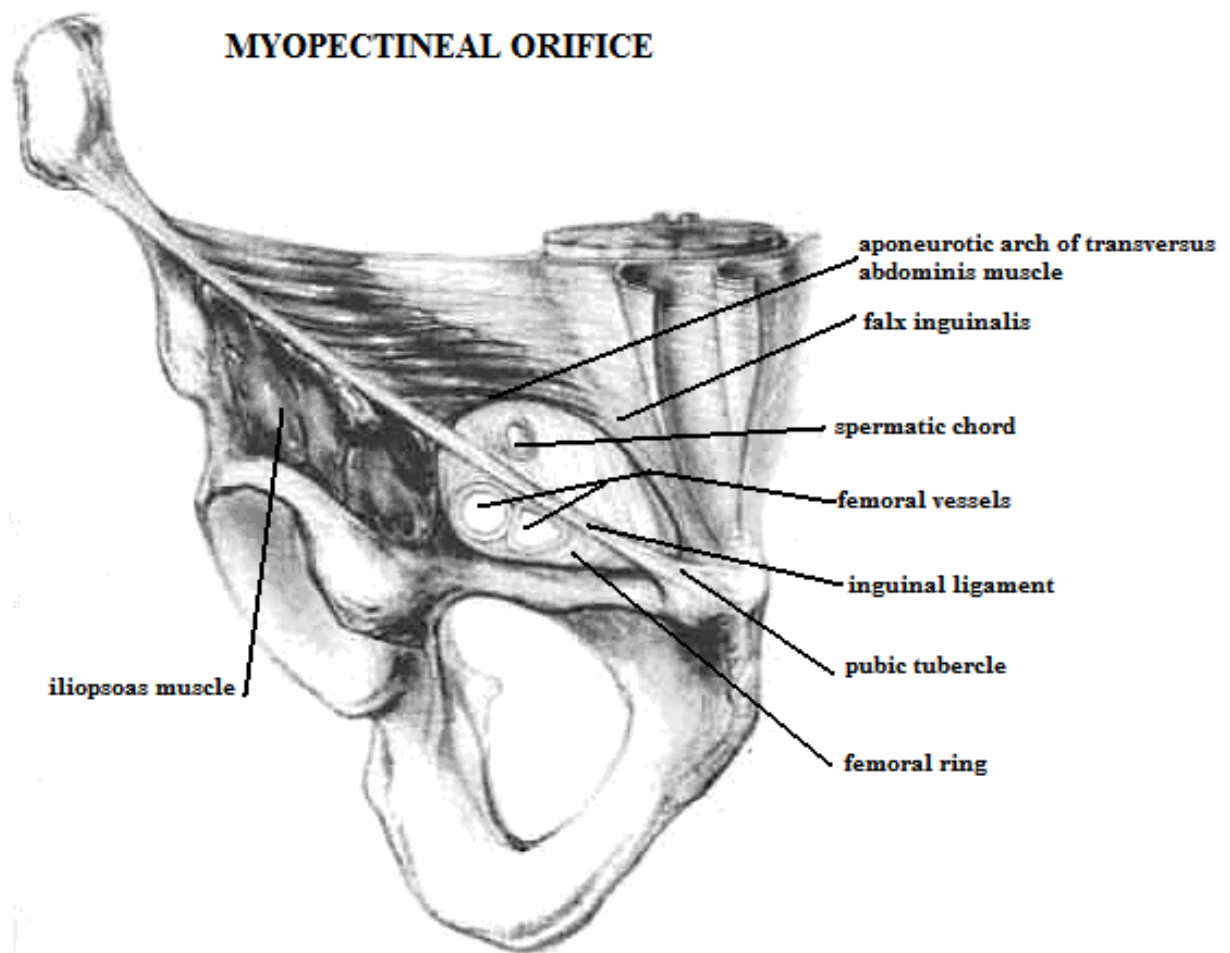
## **FEMORAL SHEATH**

The sheath is a fibrous, tubular, downward prolongation of transversalis fascia. Anteriorly and medially, the walls of the sheath are formed by the transversalis fascia that is continuous with the iliopubic tract. Posterolaterally, the sheath is formed by a continuation of the iliopsoas portion of transversalis fascia. The posteromedial wall of the sheath is derived from the pectineus fascia and iliopectineal arch.

The femoral sheath is divided by septa into a;

- 1) **lateral arterial compartment:** femoral artery and femoral branch of genitofemoral nerve
- 2) **intermediate venous compartment:** femoral vein
- 3) **medial femoral canal:** lymph node of Cloquet, fat, lymphatic

The anterior and posterior walls of the sheath fuse with the adventitia of the vessels<sup>11</sup>.



### FEMORAL CANAL

It is inner most compartment of femoral sheath. It is conical in shape, wide above and narrow below, 2 cms in length. This canal is most likely present for sudden expansion of femoral vein. Walls of the femoral canal are:

Anterior: inguinal ligament or iliopubic tract or both

Posterior: pectineal ligament and fascia iliaca

Lateral: a connective tissue septum and femoral vein

Medial: the aponeurotic insertion of transversus abdominis muscle and transversalis fascia or rarely lacunar ligament.

The femoral ring is wider in females due to wide pelvis and small size of femoral vessels. So femoral hernia is common in females.

**Abnormal obturator artery** may arise from inferior epigastric artery in more than 30% of cases and even more frequently an aberrant vein may pass medial to the femoral ring in the edge of lacunar ligament rather than lateral to the ring. Injury to vein is more troublesome as it is difficult to detect preoperatively<sup>10</sup>.

## **INDIRECT INGUINAL HERNIA**

Herniation takes place through the deep ring. The sac follows the chord in males and round ligament in females. It can be congenital or acquired.

## **DIRECT INGUINAL HERNIA**

The ring of direct hernia is located in **hesselbach's triangle**. The hernial sac passes through the floor of the inguinal canal.

## **EXTERNAL SUPRAVESICAL HERNIA**

It is hernia sac passing through the space between **median umbilical fold** and **medial umbilical fold**. It is a form of direct inguinal hernia occupying medial part of hesselbach's triangle.

## **FEMORAL HERNIA**

Femoral hernia is protrusion of preperitoneal fat or viscus through the femoral canal

## **ETIOLOGY OF GROIN HERNIAS**

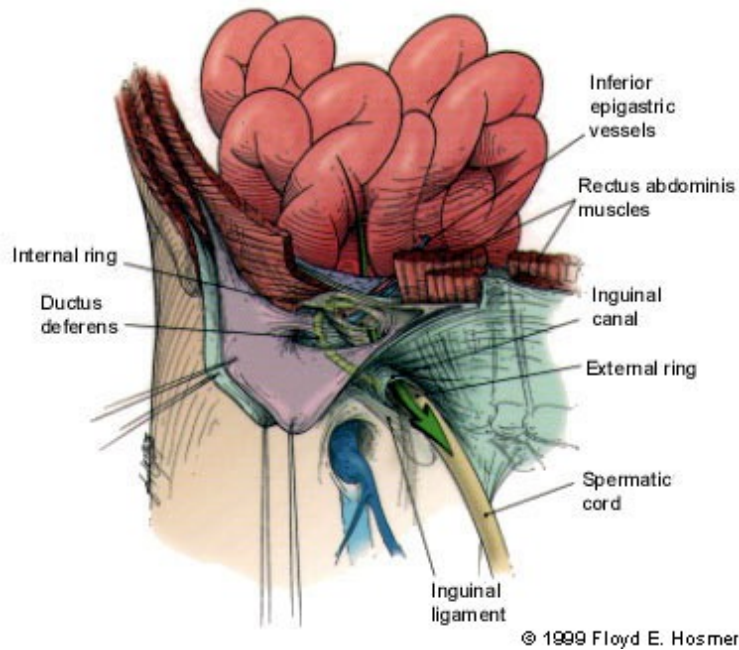
### **1. patent processes vaginalis**

Prime cause of indirect inguinal hernia in infant and children.

Present in 20% of cases. Obliteration of processes is contributed by calcitonin gene related peptide released by genitofemoral nerve.

### **2) Increased intra abdominal pressure**

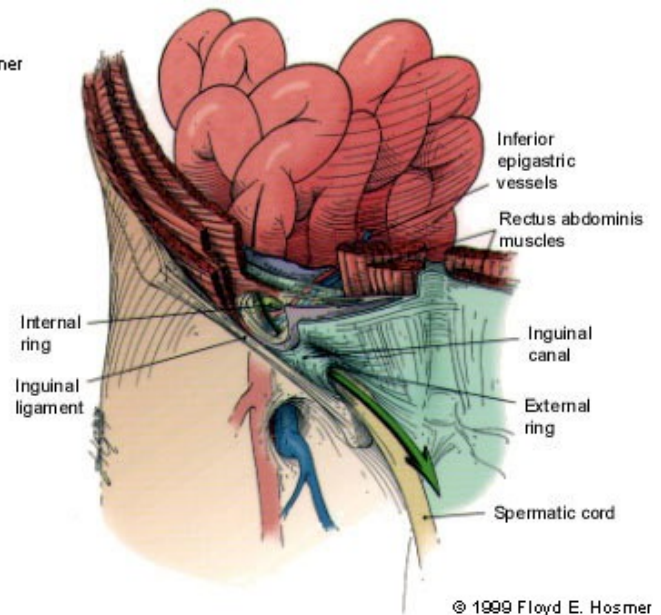
Conditions are cough, bladder outlet obstruction, constipation, pregnancy, obesity. They are important contributory factors even though they cannot cause hernia on their own



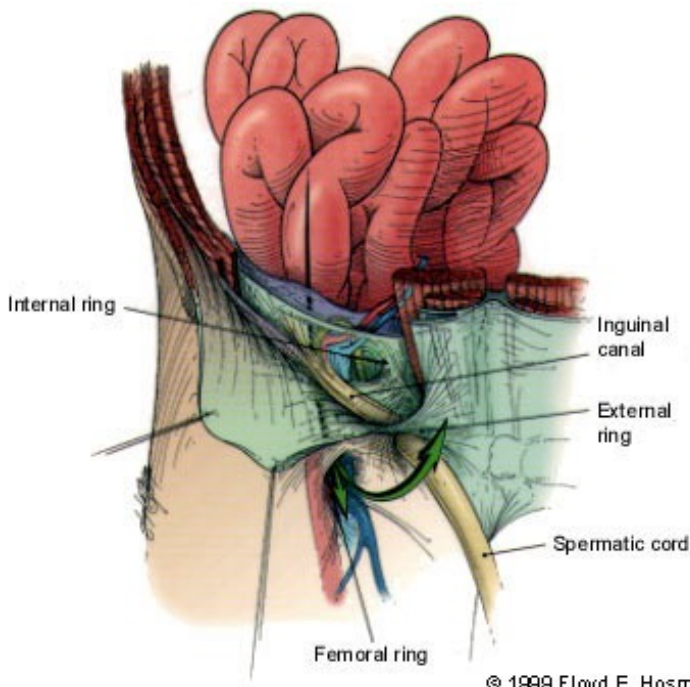
*Indirect inguinal hernia through internal ring lateral to inferior epigastric artery*

© 1999 Floyd E. Hosmer

*Direct inguinal hernia through external ring medial to inferior epigastric artery*



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*Femoral hernia through the femoral canal deep to inguinal ligament medial to femoral vein*

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### 3) Integrity of transversalis fascia

Collagen in transversalis fascia is weakened by factors that interfere with normal production or destruction or cause abnormal collagen. There is decreased polymerized collagen and decreased hydroxy proline. This includes connective disorders like Marfans syndrome, Ehler danlos syndrome, Hurler and Hunters diseases etc.

#### 4) general factors

- a) advancing age
- b) lack of physical exercise
- c) adiposity
- d) multiple pregnancy
- e) long transverse incision of gynecological and urological procedures

#### MECHANISM OF INGUINAL CANAL

- 1) **flap valve mechanism:** two rings do not lie opposite to each other
- 2) **shutter mechanism:** when internal oblique contracts the roof of canal is approximated to the floor of the slit
- 3) **ball valve mechanism:** contraction of cremaster helps spermatic chord to plug superficial ring
- 4) **Slit valve mechanism:** contraction of external oblique approximates crural fibers and closes superficial ring.



- 5) Superficial ring is guarded by conjoint tendon and reflected part of inguinal ligament.
- 6) Deep ring is guarded by internal oblique anteriorly.
- 7) Hormones play a role in inguinal musculature

### **CLASSIFICATION OF INGUNIAL HERNIAS.**

Traditionally hernias have been classified as indirect, direct and femoral hernia. Majority use this classification still. In 1950s Harkins classified it into four grades. Casten classified it into three stages. In 1970 Halverson and Mc Vay classified into five types<sup>14</sup>.

### **HALVERSON AND MCVAY CLASSIFICATION**

Small, indirect
Medium, indirect
Large, indirect and direct
Femoral
Combined-any mixture of above

In 1980 Gilbert created a registry named The Cooperative Hernia Analysis of Types and Surgeries (CHATS) which contained a classification for five types which was later expanded by Rutkow and Robbins into seven types<sup>15</sup>.

## GILBERT CLASSIFICATION WITH ADDITION OF RUTKOW AND ROBBINS

Indirect	
Small	<b>I</b>
Medium	<b>II</b>
Large	<b>III</b>
Direct	
Entire floor	<b>IV</b>
Diverticular	<b>V</b>
Combined	
Indirect and direct	<b>VI</b>
femoral	<b>VII</b>

In 1993 Nyhus published a classification to aid in surgical decision making best matching the type of hernia with specific operation<sup>16</sup>.

## NYHUS CLASSIFICATION

Type I	Indirect, small
Type II	Indirect, medium
Type III A	Direct
Type III B	Indirect, large
Type III C	Femoral
Type IV	Recurrent
Type IV A	Direct
Type IV B	Indirect
Type IV C	Femoral
Type IV D	Combination of A, B, C.

Bendavid in 1994 proposed TSD (Type, Staging, and Dimension) classification. In this classification he used four anatomic regions in groin. Medial and lateral divided by epigastric vessels, anterior and posterior divided by inguinal ligament. Stage reflects degree of descent of sac. Dimension is defect in centimeters. He used several modifiers such as 'R' for recurrence, 'S' for slider, 'I' for incarceration and 'N' for necrosis<sup>17</sup>.

## BENDAVID TSD CLASSIFICATION

Type	Anterolateral (indirect)
	Anteromedial (direct)
	Posteromedial (femoral)
	Posterolateral (perivascular)
Stage	I. sac in canal
	II. sac outside external ring
	III. sac into scrotum
Dimension	Orifice maximum in centimeters
n	

In 1995 Schumpelick and Arit published Aachens classification. Here orifice size is added to traditional classification<sup>18</sup>.

### SCHUMPELICK-AACHEN CLASSIFICATION

L	Lateral (indirect)	
M	Medial (direct)	
Mc	Medial combined	
F	Femoral	
Orifice size	Grade I	< 1.5 cms
	Grade II	1.5-3 cms
	Grade III	> 3 cms

In an attempt to bring together the best features of above classification Robert M. Zollinger, Jr has given unified classification<sup>19</sup>.

### UNIFIED CLASSIFICATION

I	Indirect, small
II	Indirect, medium
III	Indirect, large
IV	Direct, small
V	Direct, medium
VI	Direct, large
VII	Combined- pantaloons
VIII	Femoral
O	Others <sup>a</sup>

a any not classified by number above; femoral + indirect or direct;

Massive. >8 cms (four fingers) inguinal defect; prevascular

## CLINICAL CLASSIFICATION OF TYPES OF INGUINAL HERNIA

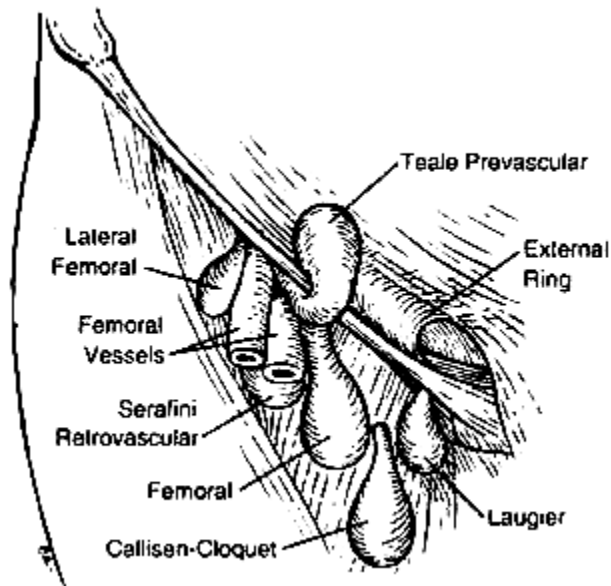
- A) **Simple** : direct and indirect
- B) **Complicated** :
  - 1) irreducible
  - 2) Incarcerated
  - 3) Obstructed
  - 4) Strangulated
  - 5) Inflamed

## CLASSIFICATION OF FEMORAL HERNIA

A) **classical type** : hernia occurs medial to femoral vein

B) **special type**:

- 1) *prevascular hernia of Narath* : sac lies in front of femoral artery
- 2) *External femoral hernia (Hesselbach's hernia)*: sac lies lateral to Femoral artery.
- 3) *Laugier's femoral hernia (lacunar hernia)*: sac passes through Lacunar ligament
- 4) *Sarafini hernia*: sac descends behind femoral vessels
- 5) *Deep femoral hernia (pectineal, cloquet's hernia)*: sac passes deep to femoral vessels deep to deep fascia, cannot protrude through saphenous opening.



## **PATHOPHYSIOLOGY OF COMPLICATED GROIN HERNIA**

**1) Irreducible hernia:** when sac contents cannot be reduced into abdomen without any complication.

### **Causes**

- a) Adhesions of its content with sac.
- b) Adhesions of its contents within the sac
- c) Adhesions of one part of sac to other
- d) Sliding hernia
- e) Huge scrotal hernia

**2) Incarcerated hernia:** this term is used often loosely, as an alternative to obstruction or strangulation, but it is the condition where lumen of that portion of bowel occupying the sac is blocked with faeces.

**3) Obstructed hernia:** irreducible hernia containing intestine which is obstructed without interference of blood supply to intestine. Symptoms are mild colicky abdominal pain and tenderness over the hernia site. Onset of symptoms is more gradual than in strangulated hernia.

**4). Strangulated hernia:** the intestine is obstructed and its blood supply is impaired. Initially venous return is impeded; the intestinal wall becomes congested and bright red, with transudation of serous fluid into sac. As congestion increases the wall of intestine becomes purple in colour and the arterial supply becomes impaired.

Blood is extravasated under serosa; intestine loses its tone and becomes friable. Bacterial transudation occurs and sac fluid becomes infected. Gangrene appears at the ring of constriction and the at antimesenteric border of bowel. If the strangulation is unrelieved perforation and hence peritonitis ensues.

Clinical features are sudden pain at the hernial site then in whole abdomen, nausea and vomiting occurs. Hernia is irreducible, extremely tense and tender. There will be no expansile impulse on cough.

Gangrene may occur as early as 5-6 hours after the onset of first symptom. Although inguinal hernia is ten times more common than femoral hernia, strangulation is more common in femoral hernia.

**5). Inflamed hernia:** inflamed hernia can occur from inflammation of content of sac, example acute appendicitis (Amayands hernia) or salpingitis, or from external cause like trophic ulcers that develops in dependent areas. Hernia is tender and the skin is red and oedematous.

#### **TYPES OF STRANGULATED HERNIA:**

**1). Classical:** small bowel as the content.

**2). Omentocele:** omentum as the content.

Initial symptoms are similar to those of strangulated bowel. Vomiting and constipation are absent. Onset of gangrene is delayed since omentum can survive on a meager blood supply.

Gangrene occurs initially in the centre of the fatty mass. Gangrene causes abscess formation and then terminates into scrotal abscess.

**3). Richters hernia:** part of the circumference of the bowel is involved. Here operation is frequently delayed because clinical feature mimics gastroenteritis. Since of strangulation are not obvious. Patient may not have any symptoms of intestinal obstruction. Absolute constipation is delayed until paralytic ileus supervenes.

**4). Littre's hernia:** Meckel's diverticulum is the content. It is rare. Many present with gastrointestinal bleeding, as irreducible hernia, or with



intestinal obstruction and faecal hernial fistulas. Treatment is resection of the Meckel's diverticulum.

**5). Maydl's hernia:** two loops of bowel remain in the sac and may appear normal. The intervening connecting loop in the abdomen becomes strangulated. So the intervening loop has to be observed during the surgery.

**6). Amayands hernia:** this is a rare hernia, in which appendix may be gangrenous. Patient presents with symptoms similar to obstructed hernia. There may be inflammation of the scrotal wall and severe tenderness on palpation. On per operative findings there will be an inflamed appendix in the hernial sac, which may be gangrenous.

#### **MANAGEMENT OF COMPLICATED GROIN HERNIAS:**

Obstructed hernia and strangulated hernia can not be clinically differentiated, so prompt intervention is a must.

#### **PREPARATION OF PATIENT:**

Fluid and electrolyte balance should be corrected, preoperative antibiotics and analgesics to be administered

#### **Procedure:**

1. Liberal inguinoscrotal incision.
2. Sac opened at the fundus before dealing with the ring.
3. Toxic fluid is aspirated or let out.

4. Constriction ring is released.

5. Dealing with the contents.

Omentum: if omentum appears to be with compromised vascularity, omentectomy is done.

Bowel management:

Viable bowel- is pink, peristaltic and pulsatile.

Gangrenous bowel- black, green, purple, malodorous, non pulsatile.

Gangrenous bowel should be resected.

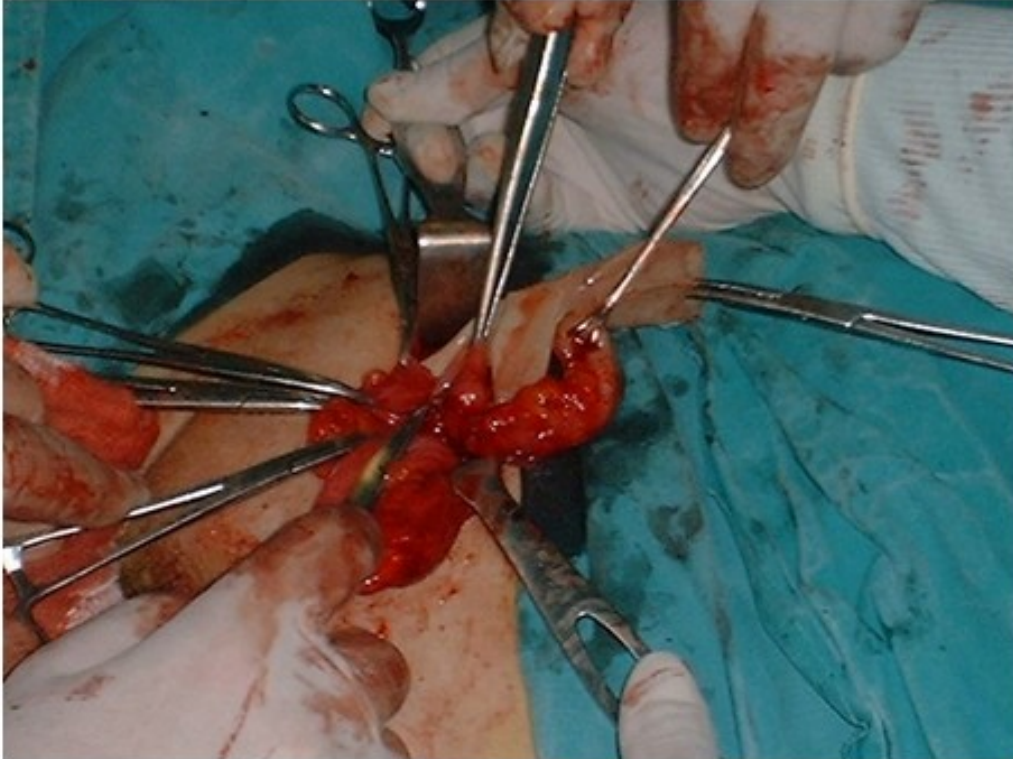
In case of doubtful vascularity, hot moist saline pack is placed for 5 minutes on the bowel with 100% oxygen saturation. Viability of the bowel is checked. If bowel is viable, it is reduced and proceeded with hernia repair. If gangrenous, the segment is resected.

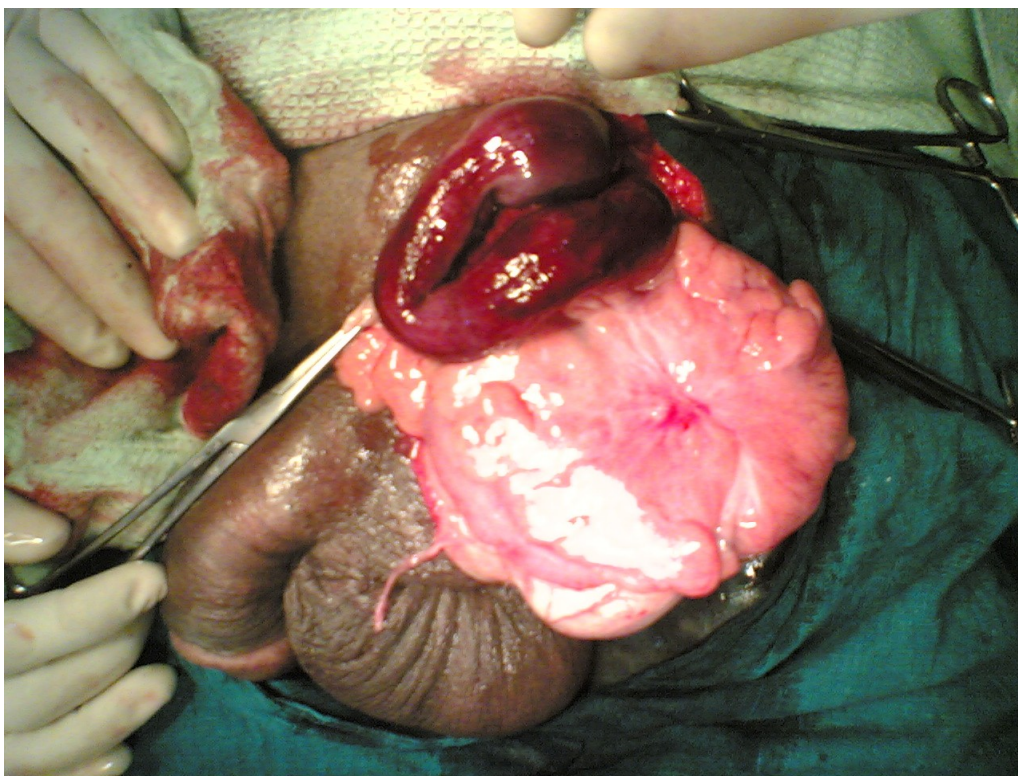
#### **VARIOUS SURGICAL PROCEDURES FOR HERNIA REPAIR:**

**Bassini's repair:** inguinal canal is opened by splitting external oblique.

Cord structure is lateralized after the Cremasteric muscle is dissected, ligated and cut. Transversalis fascia is opened from medial end of pubic tubercle extending laterally beyond the deep inguinal ring so that the spermatic cord is completely free. The worn out and redundant portion of transversalis fascia is resected. The inguinal floor reconstruction is done by approximating triple layer consisting of internal oblique muscle, the

transversus abdominis muscle and the transversalis fascia superiorly. The inguinal ligament and the iliopubic tract inferiorly interruptedly with silk sutures<sup>20</sup>.





### **Modified Bassini's repair:**

1. Transversalis fascia is not opened
2. Conjoint tendon is approximated with inguinal ligament with interrupted nylon sutures.
3. Deep ring is narrowed (Lytles repair)
4. Relaxing incision on the rectus sheath reduces tension in hernioplasty.

### **Cooper's ligament repair or Macvay repair:**

It is the only anterior herniorrhaphy that repairs all of the hernia defects that occurs in the groin. Here interrupted non absorbable sutures are placed in between transversus abdominis arch and the cooper's ligament, as far

laterally as the medial edge of the femoral vein. Femoral canal is closed by three transitional sutures between the Cooper ligament and the femoral sheath. No sutures are placed lateral to the cord in this layer. Relaxing incision is put on the rectus sheath. If the defect is too large, Marlex mesh patch may be used on the rectus sheath. It is indicated in direct, large indirect, femoral and recurrent hernias<sup>21</sup>.

**Shouldice procedure:**

This procedure is done under local anaesthesia. Here division of the transversalis fascia from the internal ring to the pubic crest is of the paramount importance. Originally monofilament stainless steel wire 32 or 34 gauge has been used for many years but any non absorbable suture can be used. Continuous suture is considered to be important because it allows even distribution of tension throughout the floor of the inguinal canal. The repair begins near the pubic crest by approximating the iliopubic tract to the medial flap made of lateral edge of the rectus, internal oblique and transversus abdominis muscles, and the transversalis fascia. The running continuous sutures are continued towards the internal ring. The suture is then reversed towards the pubic crest. It approximates the medial edge of internal oblique and the transversus muscle to the shelving edge of the inguinal ligament. This is the second layer. Another two layers are made by

a second wire started near the internal ring picking up full thickness of the muscles superiorly to the external oblique aponeurosis slightly superficial to the inguinal ligament. This is reversed at the pubic crest to form the fourth layer towards the internal ring<sup>22</sup>.

**Moloney darn:**

A nylon darn repair using usual elements of the abdominal wall medially to the inguinal ligament laterally in three layers to create a weave that one might consider similar to a mesh.

**Rives prosthetic mesh repair:**

Placing a mesh between transversalis fascia and the peritoneum. Internal oblique and the transversus abdominis muscle are sutured to the inguinal ligament in front of the mesh.

**Stoppa's giant prosthesis for reinforcement of visceral sac (GPRVS):**

The operation is most often used for recurrent hernias, multiple herniations associated with different types of groin hernias, and groin hernias associated with one or multiple lower incisional hernias.

It is done through an infra umbilical mid line incision. The preperitoneal space is reached and a cleavage space of retzius and bogros spread widely medially and laterally is separated from the anterior abdominal wall muscles.

The external iliac vessels and the iliopsoas muscles are exposed. The

parietalization of the cord structure is achieved and a Dacron mesh with a vertical dimension of 15 cms and a transverse dimension equal to the distance between the right and left anterior superior iliac spine, minus 2 cms is cut into chevrons shape. The mesh is placed in such a way that it widely envelopes the peritoneum and extends well beyond the myopectineal holes and also protects the midline sub umbilical incisional wound. One stitch fixes the middle of the upper edge of the mesh to the lower margin of Richet's umbilical fascia<sup>23</sup>.

#### **Lichtenstein mesh repair:**

This is done under local anaesthesia. The femoral ring is routinely evaluated via the space of bogros through a small opening in the canal floor. A sheet of 8 X16 cms mesh is placed over the floor of the inguinal canal. Fixing the mesh inferiorly to the inguinal ligament and to the cooper's ligament if there is a femoral hernia continuously. A slit is made at the lateral end of the mesh and a new internal ring is created by overlapping the two tails beyond the cord structures. Medially it is fixed on the rectus sheath and superiorly to the abdominal wall muscles through interrupted sutures<sup>24</sup>.

#### **Laparoscopic hernia repair:**

There are two types.

### **Transabdominal pre peritoneal approach (TAPP):**

Through sub umbilical port pneumoperitoneum is created to 12 mm Hg. A thirty degrees scope is introduced to define the hernia. Land marks like external iliac vessels, umbilical fold, vas, testicular vessels. Accessory ports are inserted under direct vision. Peritoneum is opened from anterior superior iliac spine to umbilical ligament. Hernial sac is dissected from cord and iliac vessels. The sac is excised. Anterior leaf of the peritoneum elevated from inguinal ligament, conjoint tendon, pubic tubercle, inferior epigastric vessels. A prolene mesh is introduced and fixed to the cooper's ligament, rectus sheath, and conjoint tendon. Peritoneum is closed over the mesh<sup>25</sup>.

### **Total extra peritoneal approach (TEP):**

Here the incision is made at the umbilicus as if one were planning to perform open laparoscopy. The rectus sheath is opened on one side and rectus muscle is retracted laterally. The space is enlarged by placing a blunt instrument. Once below arcuate line the surgeon enters preperitoneal space under vision. Some times water or air filled balloon dissectors are used to dissect pre peritoneal space. A 15 X 11 cms or greater prolene mesh is placed on the myopectineal orifice and hence closing all the possible spaces of groin hernia<sup>26</sup>.



## **TEP vs. TAPP**

The most problematic part of the TAPP repair is closure of the peritoneum as it is very thin and tears off quite easily. The disadvantage of TEP is that it's a more demanding procedure initially because of limited work space but has the advantages of not entering peritoneum and hence avoiding injury to intraabdominal organs, intestinal obstruction due to adhesive complications or trocar site hernia.

## **INTRAPERITONEAL ONLY MESH PROCEDURE (IPOM)**

This method was proposed as extensive dissection in preperitoneal space is required in both TEP and TAPP. This has limited the advantage of minimally invasiveness of laparoscopy as in other operations. Here the initial method of pneumoperitoneum and port placement is similar to TAPP. But the mesh is kept intraperitoneally. This was associated with unacceptable complication of adhesions, visceral erosion with fistula formation, and infection and sepsis. So it is considered as experimentally<sup>27</sup>.



Figure 1: right sided obstructed inguinal hernia

Figure 3 strangulation resection anastomosis done

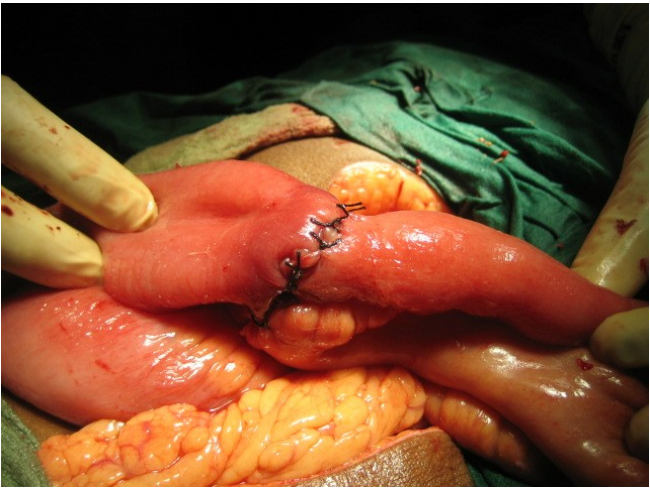


Figure 2 air fluid levels in erect x-ray abdomen



## **COMPLICATIONS OF HERNIA SURGERIES**

- 1) Recurrence
- 2) Chronic groin pain
- 3) Injuries to cord and testicles
- 4) Bladder injuries
- 5) Wound infection
- 6) Seroma
- 7) Hematoma
- 8) Osteitis pubis
- 9) Enterocutaneous fistula after resection for strangulation
- 10) Prosthetic complication usually inguinodynia
- 11) Laparoscopic complication: vascular injuries, visceral injuries, trocar site complication, bowel obstruction, and others.
- 12) General complications like urinary retention.

## **PROCEDURE FOR FEMORAL HERNIA**

- 1) Lockwood or low approach
- 2) Lothessen or inguinal approach
- 3) Mcevedy or high approach.

## **MCEVEDY**

This is the procedure of choice in strangulated femoral hernia. A vertical incision is made over femoral canal extending over inguinal ligament for three inches. After rectus sheath is incised and muscle retracted medially, sac is drawn upwards. Neck of the sac is ligated. Repair is done between conjoint tendon and ligament of Cooper. The advantages are sac is dealt with high ligation, direct access to femoral ring, if strangulation has occurred resection can be done through same incision.

## **LOTHESEN**

Approach is similar to that of repair of inguinal hernia. Fascia transversalis is incised. Hernial sac is pulled out of femoral canal and is excised. Ring is closed by approximating conjoint tendon or inguinal ligament to the Cooper's ligament. Utmost care is taken to avoid injury to femoral vein. Disadvantage is it weakens the posterior wall. So inguinal repair has to be combined with femoral repair.

## **LOCKWOOD**

Here a low inguinal incision is made. Fundus of sac is opened and contents inspected for viability. If viable it is pushed in and sac transfixed and the canal opening closed with non absorbable suture. The disadvantages are the

deeper content cannot be visualized and in case of strangulation another lower mid line incision is necessary for repair<sup>28</sup>.

## **RISK FACTORS FOR GROIN HERNIAS TO PRESENT AS ACUTE EMERGENCIES**

- 1) advancing age
- 2) large hernias with small opening
- 3) delay in hospitalizations
- 4) coexisting medical complications

In inguinal hernia the probability of strangulation was not more than 2% per year. But the probability of strangulation for femoral hernia is about 40% per year.

### **1) Age**

Obstruction and strangulation occurred predominantly in middle age and elderly age group

Andrew et al 1981	80 yr
Waddington et al 1971	60 yr
Mc entee et al 1989	70 yr
Bahadur kulah et al 2001	60 yr <sup>29</sup>
Gallegos et al 1991	65 yr <sup>30</sup>
Maingot text book	75 yr

## 2) Sex

In case of inguinal hernia males are twice prone for complication than female sex.

In femoral hernia females are thrice prone than males for complication.

## 3) Side

Right sided hernia is more prone for complication than left sided hernias

Inguinal hernia	Right	Left
Andrew 1981	2.9	1
Aird 1957	4	1
Waddington 1971	1.8	1

## Anatomical basis for right sided hernias

- a) right testis descends later than left testis
- b) line of attachment of small bowel mesentery is left side of L2 to right iliac fossa

## 4) Constriction ring

Deep ring is the most common site of obstruction.

## 5) Types

Femoral hernia is more prone to strangulation than inguinal hernia.

## **6) Duration of hernia**

Galleos<sup>29</sup> et al 1991: the risk of groin hernia to produce complication is maximum in first three months due to tight ring. Later yielding of ring increases so complication decreases

## **7) Content**

Small bowel is the most common content. Omentum is the next common\.  
Slider is the next common type with large bowel as content.

## **8) Delay in hospitalization**

It is an important factor that determines resection and subsequent morbidity and mortality. Mortality was 1.4% when hospitalization is within 48 hrs.

Mortality is 10% and 21% at 47 hrs and 48 hrs. sepsis and wound infection were two important causes of death in patients with gangrenous bowel.

## **MATERIALS AND METHODS**

This study was a prospective study done in **Kilpauk Medical College Hospital** from **May 2005** to **October 2007**. The study group was managed only by department of surgery.

Patients are of age group of 20-88 yrs. Duration ranges from 2 hrs to 10 days, **87** cases were studied.

These cases were studied from time of admission till discharge and followed up in out patient department. A detailed history was elicited and clinical examination was done. All patients were given pre-operative antibiotics and the same was continued for 4 day post operatively.

Patients in our study include those with good health to those with associated medical disorders.

The results of study were later analyzed and have been presented in this study.



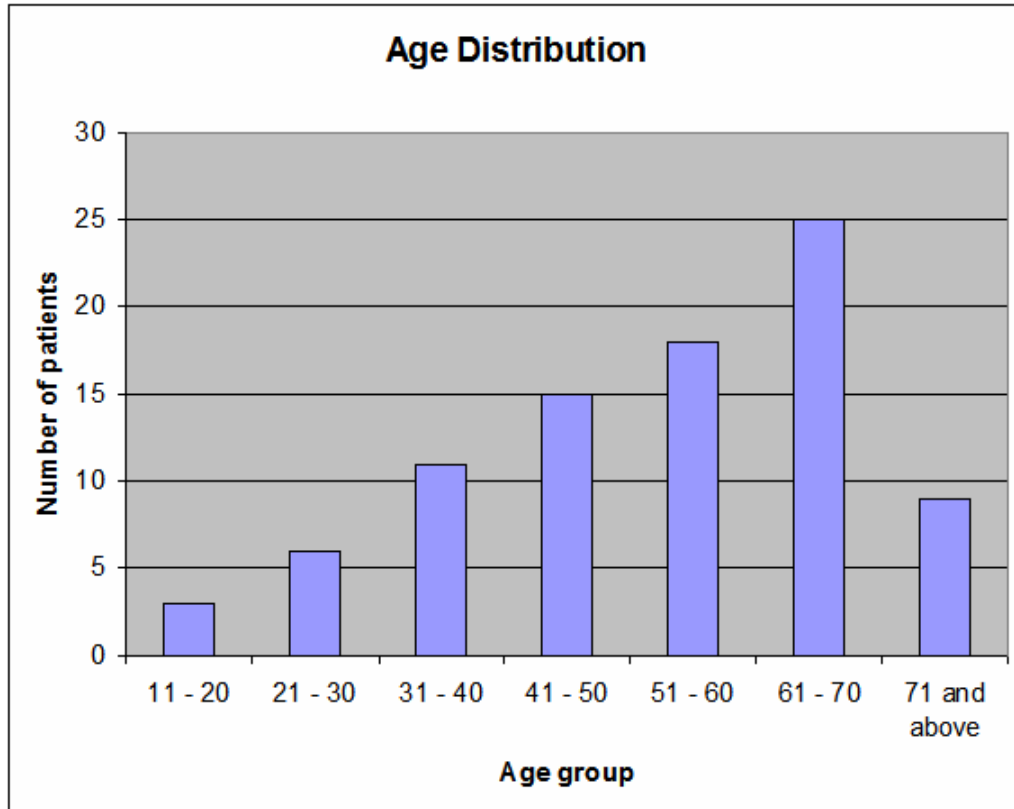
## OBSERVATION AND ANALYSIS

Eighty seven patients were studied. Mean age of the patients was 53.25 years

### **Age group:**

<b>Age group</b>	<b>Frequency</b>	<b>Percentage</b>
11 - 20	3	3.4
21 - 30	6	6.9
31 - 40	11	12.6
41 - 50	15	17.2
51 - 60	18	20.7
61 - 70	25	28.7
71 and above	9	10.3
Total	87	100.0

In various studies done the mean age group involved in complicated groin hernia is 60 - 70 years. In my study complicated hernia is widely distributed in age groups from 30- 70 years with maximum incidence in age group of 60 – 70 years.



**Sex distribution:**

	<b>Frequency</b>	<b>Percentage</b>
Female	3	3.4
Male	84	96.6
Total	87	100.0

In our study majority of the cases were males, with male to female ratio of 28:1. This shows increased incidence of complicated hernia among men.

### Types of hernia with sex:

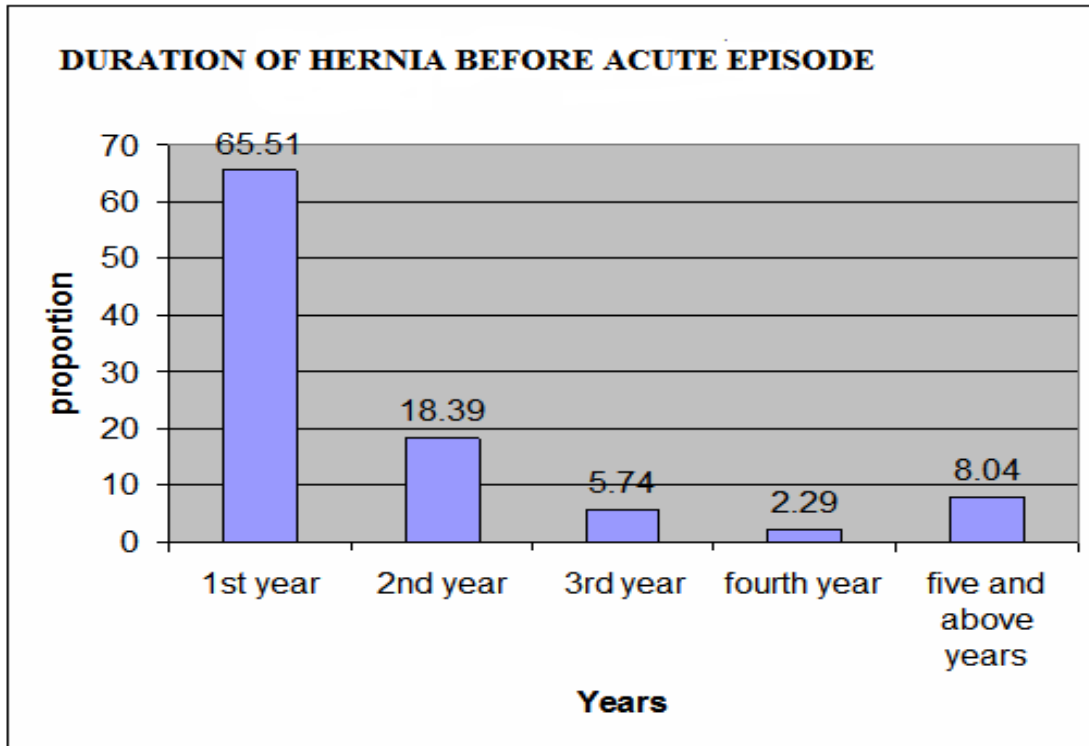
	<b>Inguinal</b>	<b>Femoral</b>
Female	1	2
Male	84	0
Total	85	2

In my

study complicated femoral hernia was found to be more common among women, and complicated inguinal hernia was more common in men.

### Duration of hernia before acute episode

	<b>Frequency</b>	<b>Percent</b>
1st year	57	65.5
2nd year	16	18.4
3rd year	5	5.7
4th year	2	2.3
5 and above years	7	8.0
Total	87	100.0



**Side of hernia most commonly complicated**

	Frequency	percentage
Right side	67	77.01
left side	20	22.99
Total	87	100

In my study right sided hernia was found to be more common than left sided hernia with **rt : lt** ratio of **3.35: 1**

**Symptoms:**

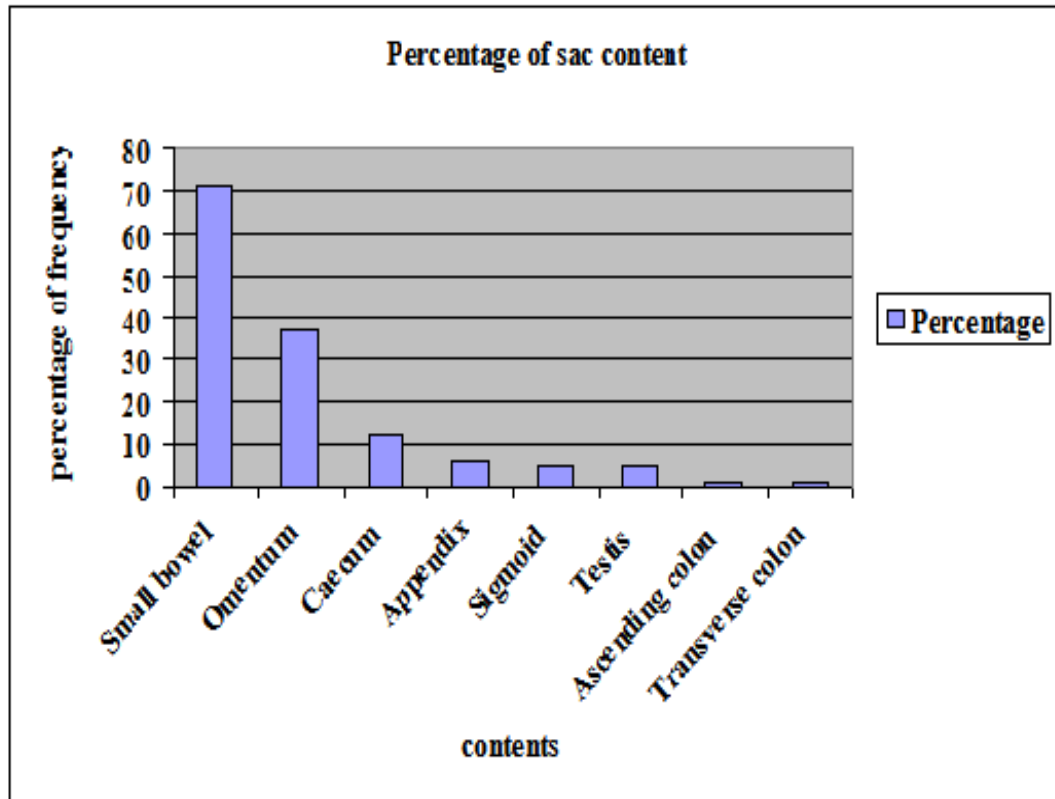
	<b>Frequency</b>	<b>Percentage</b>
Pain with groin swelling	86	98.9
Vomiting	50	57.5
Irreducibility	21	24.1
Abdominal distension	16	18.4
Obstipation	11	12.6
Nausea	5	5.7
Fever	2	2.3
Feculent vomiting	1	1.1

In my study the most common symptom was groin swelling with pain followed by vomiting.

**Contents of the hernial sac: -**

	<b>Frequency</b>	<b>Percentage</b>
Small bowel	62	71.3
Omentum	32	36.8
Caecum	10	12.5
Appendix	5	5.7
Sigmoid	4	4.6
Testis	4	4.6
Ascending colon	1	1.1
Transverse colon	1	1.1

According to Andrew et al the most common content in the hernial sac was small intestine. In my study also the small intestine was the commonest content followed by omentum.



**Site of obstruction:**

	<b>Frequency</b>	<b>Percentage</b>
Deep ring	48	55.2
Superficial ring	37	42.5
Femoral ring	2	2.3

In standard studies most common site of obstruction is the deep ring. In our study also the most common site of obstruction was the deep ring.

**Optimum procedure done:**

	<b>Frequency</b>	<b>Percentage</b>
Herniorrhaphy only	46	52.8
Omentectomy	18	20.7
Orchidectomy	12	13.8
Resection anastamosis	9	10.3
Kuntz	6	6.9
Eversion of sac	2	2.3
Appendicectomy	1	1.1
Ileostomy	1	1.1

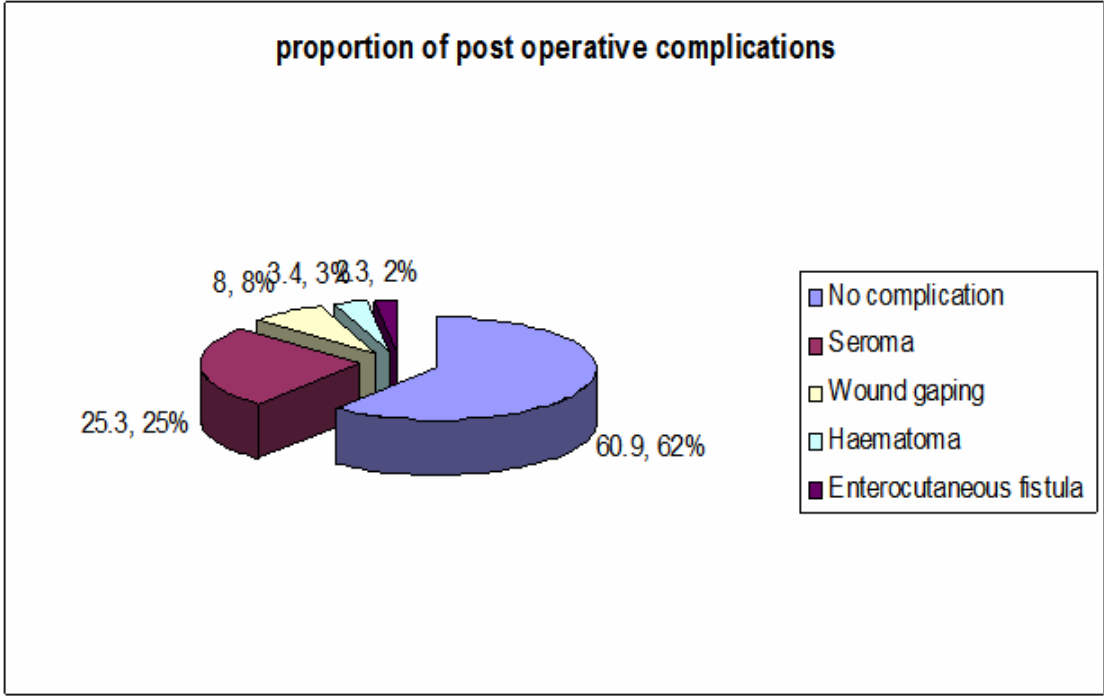
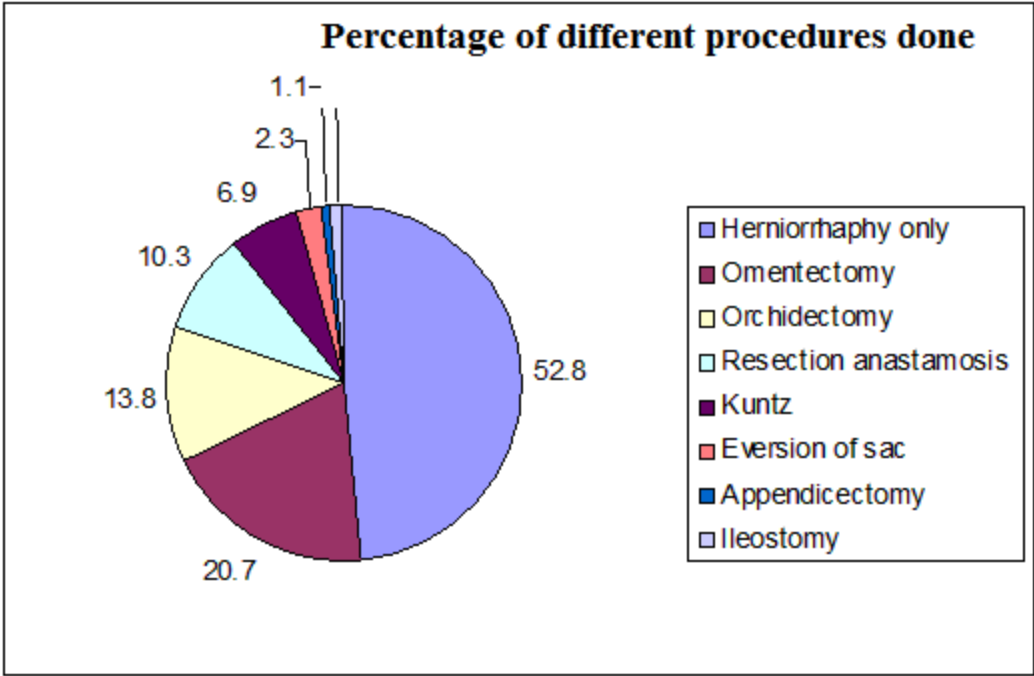
In my study all patients underwent Moloney's darn repair because prolene mesh was not available in emergency settings. Darn repair was done with 1- Prolene with three layers darn. The most common procedure done was Herniorrhaphy alone among 52.8% of the patients, followed by omentectomy in 20.7% of the patients. Resection anastamosis was done in 10.3% of the patients. Kuntz repair was done for aged and recurrent hernia patients.

**Post operative complication:**

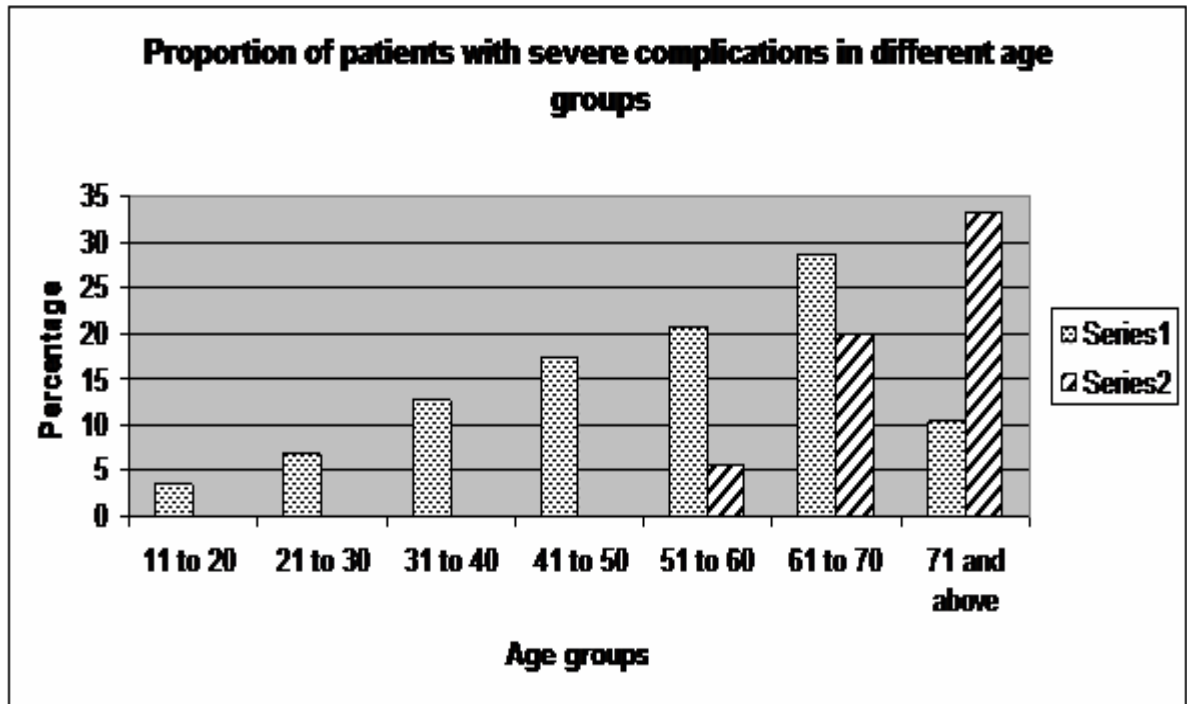
	<b>Frequency</b>	<b>Percentage</b>
No complication	53	60.9
Seroma	22	25.3
Wound gaping	7	8
Haematoma	3	3.4
Enterocutaneous fistula	2	2.3



All the patients were given preoperative antibiotic, ampicillin 1 gm IV at the beginning of the procedure and continued for four days post operatively. Most of the patients recovered without any complication (60.9%). Most common complication was found to be seroma (25.3%) which was managed conservatively. There were three cases of hematoma of which two needed evacuation on the third post operative day. There were seven cases of wound gaping, for which culture and sensitivity was done and appropriate antibiotics were given. All underwent secondary suturing after the infection was controlled. Two cases had enterocutaneous fistula, of which one patient died post operatively on fourth day due to systemic inflammatory response syndrome (SIRS), and the other patients were managed conservatively with spontaneous closure of the fistula.



## THE RISK OF STRANGULATION IN DIFFERENT AGE GROUP



Series 1: proportion of patients in that age group

Series 2: proportion of patients with severe complications

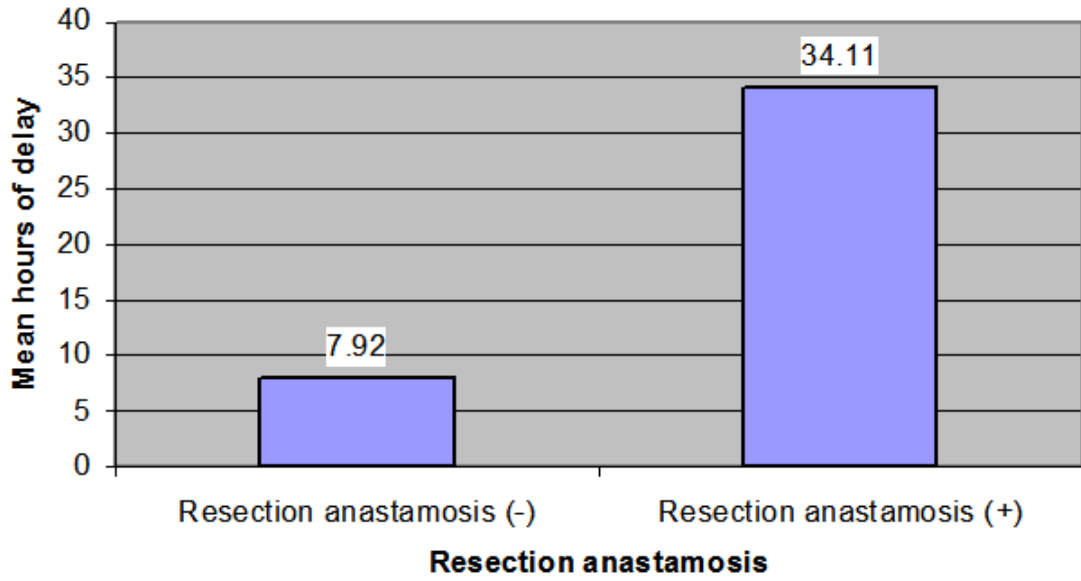
The patients in the age group above 50 yrs were found to have strangulation. the highest numbers were seen between the age group of 61 to 70 yrs. The incidence of strangulation increased as the age increased. The percentage of patients in older age group were found to have higher incidence of strangulation with highest being in 71 yrs and above.

**DELAY IN HOSPITALIZATION:**

<b>Delay in Hospitalization (In Hours)</b>	<b>Frequency</b>	<b>Percent</b>
0-6	37	42.5
7-12	33	37.9
13-24	10	11.5
25-36	4	4.6
37-48	2	2.3
49-60	1	1.1
Total	87	100.0

Mean hours of delay in hospitalization among those who underwent resection anastomosis was 34.07 hours compared to 7.55 hours of delay among those who did not undergo resection anastomosis. This difference was found to be statistically significant with  $p < 0.001$

### Delay in Hospitalization associated with strangulation



## CONCLUSION

The following observation was made in this study

- 1) Incidence of acute complication of groin hernia was found to be highest in age group of 60yrs to 70yrs.
- 2) Complication of inguinal hernia was more common in males than females and complication of femoral hernia was more common in females than males
- 3) The incidence of acute complication of groin hernia is three times commoner on the right side than on the left side.
- 4) The average duration of hernia before acute episode was 19,45 months. Majority of acute presentation was within first year of developing hernia and more than 80% of them presented within first two years.
- 5) The most common symptom was groin swelling with pain followed by vomiting
- 6) The most common content found in the sac was small bowel followed by omentum
- 7) The deep ring was found to be the most common site of obstruction
- 8) The most common procedure followed in my study was only herniorraphy. It was followed by omentectomy.

- 9) Majority of the patients post operative period was uneventful. The most common complication encountered was seroma.
- 10) The patients with older age group were found to have strangulation more commonly than younger age group. The percentage of strangulation progressively increased from 50 years and above.
- 11) The average delay in hospitalization was 10.37 hours of which those who had strangulation had an average of 34.07 hours and those with out strangulation was 7.55 hours. This was found statistically significant as the time duration increased so also the chances of strangulation.

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