

A DISSERTATION ON
“A PROSPECTIVE STUDY ON INCIDENCE OF
COMPLICATIONS FOLLOWING
MESH REPAIR VS DARNING
IN COMPLICATED INGUINAL HERNIAS”

Dissertation submitted to

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for the Award of the degree

M.S.BRANCH-I (GENERAL SURGERY)



DEPARTMENT OF GENERAL SURGERY
THANJAVUR MEDICAL COLLEGE

MAY 2018

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled
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is a bonafide original work of
Dr. M . ARUN in partial fulfilment of the requirements for
M.S.Branch-I
(General Surgery) Examination of the Tamil Nadu Dr. M.G.R. Medical
University to be held in MAY 2018 under my guidance and
supervision in 2016-2017

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DECLARATION

I Dr. M. ARUN hereby solemnly declare that the dissertation titled **“A PROSPECTIVE STUDY ON INCIDENCE OF COMPLICATIONS FOLLOWING MESH REPAIR VS DARNING IN COMPLICATED INGUINAL HERNIAS”** is done by me at Thanjavur medical College, Thanjavur during 2016-2017 under the guidance of Prof.Dr.W.EDWINA VASANTHA,M.S,. This dissertation is submitted to The Tamil Nadu Dr.M.G.R Medical University, Chennai towards the partial fulfillment of requirements for the award of M.S.Degree (Branch-I) in General Surgery.

Place: Thanjavur
Date:

Dr.M.ARUN

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AIMS OF THE STUDY

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- To study about various Acute surgical emergencies in groin hernia
- To study duration of hernia before acute presentation
- To study the various symptoms of presentation and complications
- To study content of hernial sac
- To study the type of surgery done, Litchenstein tension free mesh hernioplasty VS Two layered darning repair.
- To study the immediate and delayed post operative complications of the above two procedures.

HISTORICAL ASPECTS

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"Hernia" is derived from Latin term 'a rupture'. Original Edoardo Bassini (Padua 1889) repair is an anterior approach but he opened posterior wall of inguinal canal and did a sutured three layered repair. In modified Bassini repair transverse arch is sutured to the inguinal ligament below .

De Chauliac -differentiated inguinal from femoral hernias (1363).

Kaspar Stromayr- differentiated direct and indirect hernias in 1559.

Ambroise Pare (1550) – used trusses in hernia.

“John Hunter, Astley Paston Cooper (1841) Franz Hesselbach, Antonio Scarpa (1832), Pieter Camper, Jules Germain Cloquet (1883), Bogros, Retzius” - understanding anatomy of the groin. “La Roque, GL Cheatele, JP Hoguet, AK Henry, McVay, McEvedy, Lotheissen, McArthur” used strips of external oblique aponeurosis to approximate conjoined tendon to inguinal ligament Kirschner - thigh fascial grafts, Gallie - strips of fascia lata for repair using his specialized needle called *Gallie's needle*, Handley - silk with stay lace darning, Meick – first multifilament Nylon, Haxton - monofilament Nylon, Moloney -Nylon darn procedure(1948) .

Halsted (John Hopkins Baltimore) - four layered repair shifting cord anterior to the external oblique aponeurosis thus bringing superficial and deep ring directly very close causing higher chances of recurrence.

EE Shouldice (1945) of Toronto did repair of transversalis fascia under local anaesthesia as a tension free 4/6 layered tissue repair.

Usher from Texas in 1958 first used Marlex mesh in posterior wall for repair as tension eliminating.

Lichenstein - did rolled plug mesh repair of femoral hernia in 1970 and tension free repair of inguinal hernia in 1986.

Newman (New Jersey) did tension free inguinal hernia onlay mesh repair.

Lichenstein and Amid made this technique popular worldwide with certain modifications.

Nyhus from Chicago and Condon from Milwaukee popularized open posterior repair from higher approach. Their technique probably became basis for TEP/TAPP.

Stoppa and Rives (France) evolved giant reinforcement of the visceral sac by blocking Fruchaud's myopectineal orifice (MPO) bilaterally.

EH Phillips and JB McKernan started TEP in 1990. Arregui started TAPP in 1992

INTRODUCTION

Inguinal hernia is the most commonly performed surgery in general surgery. Overall risk of developing hernia is 15% in men and < 5% in women. Hernia repair has evolved and turned into a day care procedure nowadays. 75% of all abdominal wall herniae are groin herniae making it the most common hernia among all abdominal wall herniae. About 95% of all groin herniae are inguinal herniae and about 5% are femoral herniae. Inguinal herniae are about 9 times more common in males than in female. Femoral herniae are more common in women, but inguinal herniae are the most common herniae women present with.

It is estimated that 40% cases of femoral herniae present acutely in emergency department with strangulation / incarceration. The prevalence of hernia is more in the extremes of age, which is after an initial peak during infancy they become more prevalent with advancing age. The procedures advocated for hernia repair are simple and decrease morbidity and mortality in a major way. Incarcerated herniae should be operated in less than 12 hrs of presentation and strangulated hernia on an emergency basis to prevent prolonged morbidity and mortality. The need for study arises because though the treatment of groin herniae is simple and can be done as a day care procedure ignorance on the part of the patient might lead to complications like irreducibility, incarceration, obstruction and strangulation resulting in prolonged morbidity and might result in mortality too, which can be prevented if the presenting patients with hernia undergo treatment on an elective basis. In spite of various developments in the treatment modalities of hernia, the morbidity and mortality has not reduced significantly.

Henceforth it becomes necessary to study the various clinical manifestations of complicated inguinal hernia, its management , Lichenstein's hernioplasty Vs Darning repair, and also to study the immediate and delayed post operative complications of above procedures.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Hernia is derived from the Latin word 'rupture'. Hernia is an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Hernial defects commonly involves abdominal wall, especially the Inguinal ligament . In areas where aponeurosis and fascia are not covered by muscles , herniation occurs. "The sites most commonly involved being the inguinal, femoral, and umbilical areas, linea alba, lower portion of the semilunar line, and sites of previous surgical scars".

Groin hernias:

Inguinal hernias are of two types, direct hernia and indirect hernia. Indirect inguinal hernia sac passes from deep inguinal ring obliquely towards superficial inguinal ring and atlast into the scrotum . Direct inguinal hernia sac bulges outward and forward and deep inguinal ring and inferior epigastric vessels lies lateral to it . Surgical management of indirect and direct inguinal hernia being the same , they need not to be differentiated from one another. Combined direct and indirect hernia is called pantaloons hernia .

Incidence :

True incidence of hernia is not known. About 75% of all hernias occur in the inguinal region. Two thirds of these are indirect and the remainder are direct inguinal hernias. Femoral hernias comprise only 3% of all groin hernias. Men are 25 times more likely to have a groin hernia than women. An indirect inguinal hernia is the most common hernia, regardless of gender. In men, indirect hernia

predominate over direct hernias at a ratio of 2 : 1. Direct hernias are not common in women. Although femoral hernias occur more frequently in women than in men, inguinal hernias remain the most common hernia in women. In men femoral hernias are uncommon. Right sided hernias are more common. This can be explained by delay in atrophy of the processus vaginalis after the normal slower descent of the right testis to the scrotum during fetal development. As the loaded sigmoid colon produces a 'tamponading effect on femoral canal' femoral hernia is also more common on right side. **Hernia's incidence, complications like strangulation hence bowel gangrene increases with age, Strangulation, the most common serious complication of a hernia, occurs in only 1% to 3% of groin hernias and is more common at the extremes of life. Mostly indirect inguinal hernias goes for strangulation. Also strangulation is most common in femoral hernia due to narrow neck(15% to 20%), hence once diagnosed, femoral hernia has to be repaired immediately.**

Etiology :

1. Patent processus vaginalis

2. Failure of the transversalis fascia to retain the visceral sac in the myopectineal orifice.

This may be due to erect stance of human beings which promotes herniation by stretching and exposing the groin and permitting the intestines to drop into the hernial sac due to effect of gravity

The myopectineal orifice of Fruchaud is an area of transversalis fascia that is not protected by the posterior rectus sheath or by muscle. This serves as an area of potential weakness through which groin hernias emerge. Some degree of protection is offered by shutter mechanism, where due to increased intraabdominal pressure the curved fibers of internal oblique and the falx inguinalis flatten and move toward the inguinal ligament. Contraction of transverses abdominis muscle also pulls up and tenses the crura of the internal ring.

3. Mechanical disparity between visceral pressure and strength of abdominal musculature: The increased abdominal pressure may be due to excess cough, constipation, prostatism, and lifting heavy weights. Hernia results when a patent processus vaginalis is present or the endo abdominal fascia is attenuated in these situations . Sudden onset of painful hernia in young individuals after lifting heavy weight is most commonly associated with a patent processus vaginalis . In elderly individuals, as abdominal muscles and fascia weakens with ageing process, inguinal hernias occur equally in sedentary and in physically active men.

Vigorous physical activity as such is not a cause of inguinal hernia formation, abut strenuous strain may aggravate predisposing factors and cause herniation.

The fascia transversalis, derives strength from collagen fibers which gets continuously produced and reabsorbed. Disturbance of this balance leads to attenuation of this fascia.

4. Connective tissue disorders like Marfan, Ehlers-Danlos, Hunter-hurler syndrome,prune belly syndrome can lead to hernia formation.

5. Life-styles factors like smoking : It leads to defective collagen production , which reduces tensile strength. Studies have proven the association between between cigarette smoking and groin hernias. Significantly increased elastolytic activity as well as protease substances in smokers (thus disturbed protease/ antiprotease balance) causes destruction of tissue leading to herniation .

6. Abdominal distention and chronic increase in intra abdominal pressure from ascites and peritoneal dialysis can damage the myopectineal orifice and cause a patent processus vaginalis to dilate

7. Genetic factors

A study of congenital indirect inguinal hernias in China on 280 families indicated that the mode of transmission was autosomal dominant, with incomplete penetrance and paternal transmission from their father.

8. Obesity

9 . Pregnancy

10. Chronic constipation

11. Appendectomy causing injury to ilioinguinal nerve –right sided direct inguinal hernia.

Parts Of Hernia:

Hernia consists of three parts:

1. Sac
2. covering
3. content

Sac is a diverticulum of peritoneum with mouth, neck, body and fundus. strangulation of bowel is a likely complication when neck is narrow. Coverings are derived from layers of the abdominal wall through which the sac passes. The content may be omentum (omentocele) or intestine (enterocele). Most common content being small bowel, but it can also be large intestine, appendix or bladder

- When content is a portion of circumference of the intestine it is called Richter's hernia
- When the bladder or bowel forms part of wall of hernia it is called sliding hernia
- Ovary with or without the corresponding fallopian tube.
- Meckel's diverticulum as content is known as Littre's hernia;

Surgical Anatomy of Inguinal Canal:

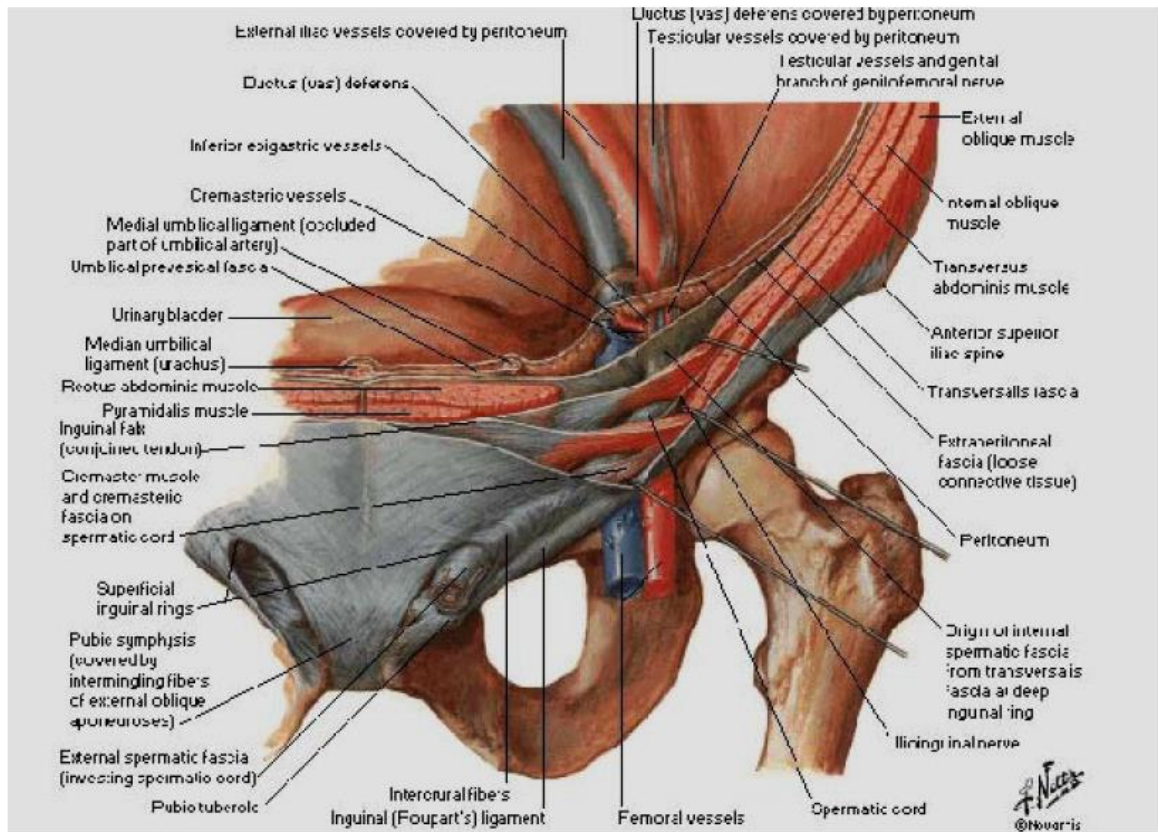
External ring is a triangular opening in external oblique aponeurosis and is 1.25 cm above the pubic tubercle. It consists of a superomedial and an inferolateral crus. Normally tip of the little finger cannot be introduced into the ring. Internal inguinal ring is a U-shaped (or Lambda shaped) condensation of the transversalis fascia, lies 1.25 cm above the inguinal ligament midway between the symphysis pubis and the anterior superior iliac spine (mid inguinal point).

Inguinal canal:

In infants, there is no obliquity of the inguinal canal and the external and deep ring are superimposed. In adults it is 3.75 cm long, directed downwards and medially from the deep to superficial ring. In males spermatic cord passes through the inguinal canal, ilio-inguinal nerve (outside the cord within the inguinal canal) and genital branch of the genito-femoral nerve (within the cord). Cord is covered by cremaster muscle which is a continuation of internal oblique muscle, internal spermatic fascia which is a continuation of transversalis fascia.

Cord contains testicular artery, artery of vas (a branch of superior vesical artery which is derived from the anterior division of internal iliac artery), cremasteric artery, pampiniform plexus of veins, genital branch of genitofemoral nerve, sympathetic plexus and lymphatics. In females, inguinal canal contains round ligament, indistinct sparse cremaster, cremasteric vessels, ilioinguinal nerve, and genital branch of genitofemoral nerve. Inguinal canal in female is known as *canal of Nuck*. Round ligament (in females) is much more intimately adherent to peritoneum than spermatic cord (in males).

Fig 1:Anatomy of inguinal region



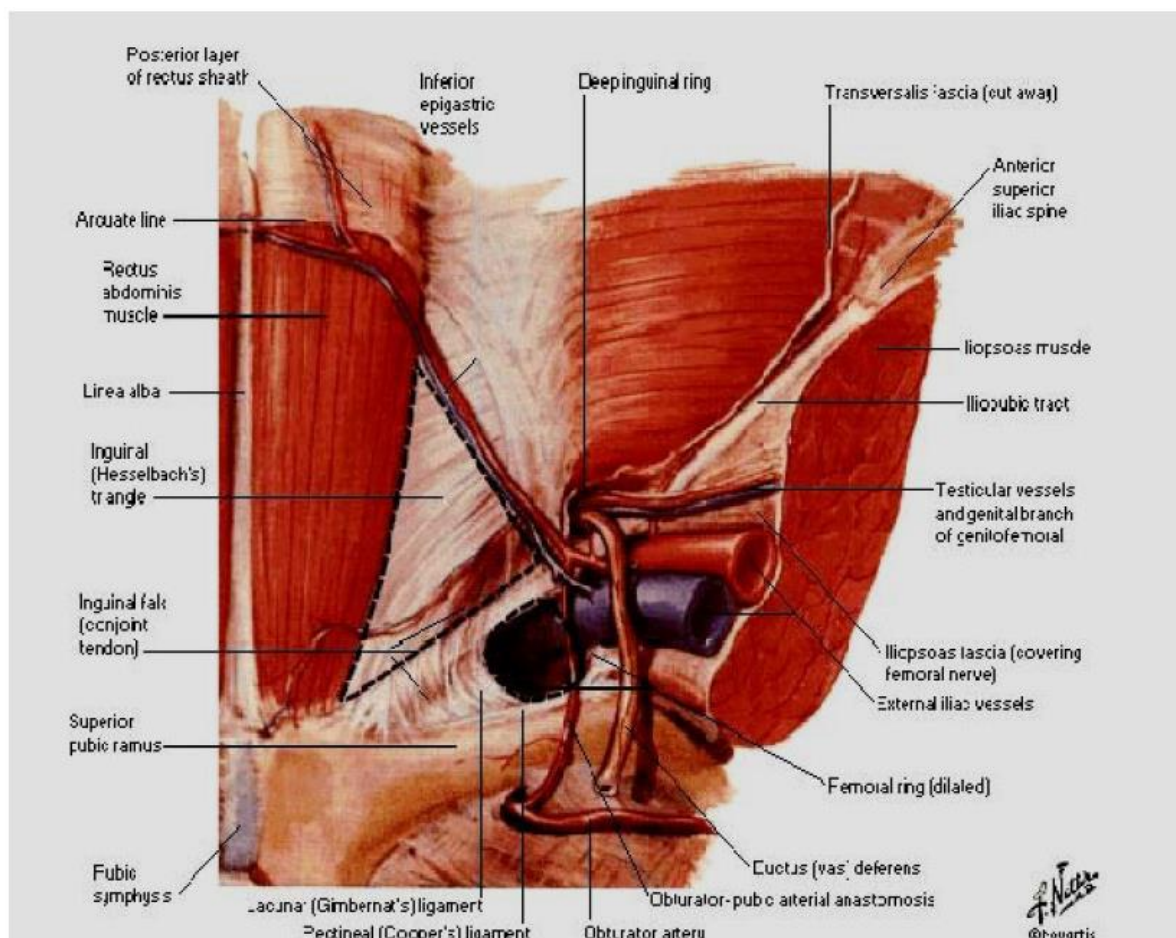


Fig 2: Boundaries of Inguinal Canal

Anteriorly it is bounded by External oblique aponeurosis and conjoined muscle laterally.

Posteriorly it is bounded by Inferior epigastric artery, fascia transversalis and conjoined tendon medially.

Superiorly by arched fibres of internal oblique.

Inferiorly by Inguinal ligament and lacunar ligament .

External ring is a triangular opening in the external oblique aponeurosis lying 1.25 cm above the pubic tubercle. Its superomedial crus is formed by external oblique aponeurosis and inferolateral crus by inguinal ligament.

Internal ring is a normal opening in the transversalis fascia and transverses aponeurosis which is U shaped or lambda shaped; it is 1.25 cm above the midinguinal point (between anterior superior iliac spine to pubic symphysis).

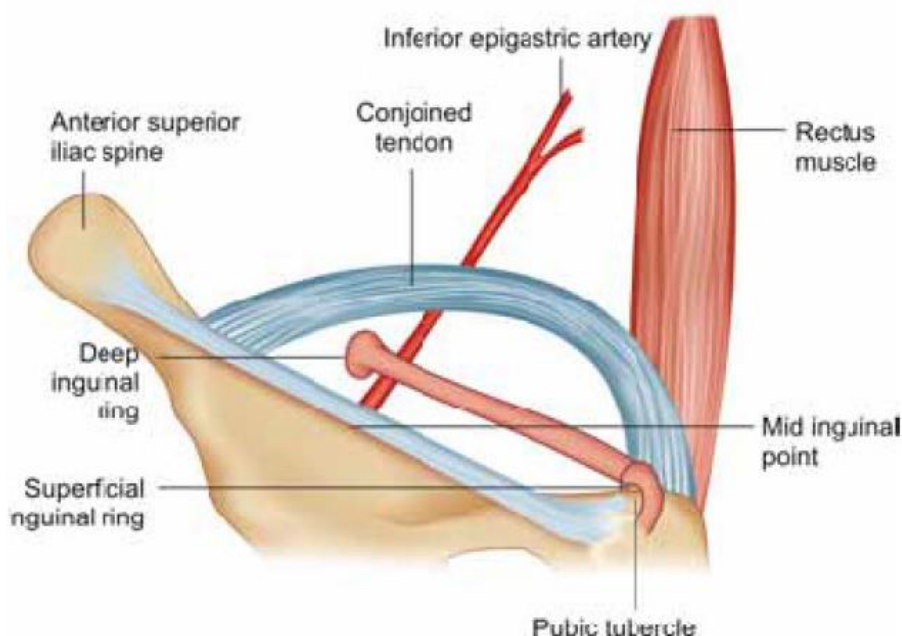
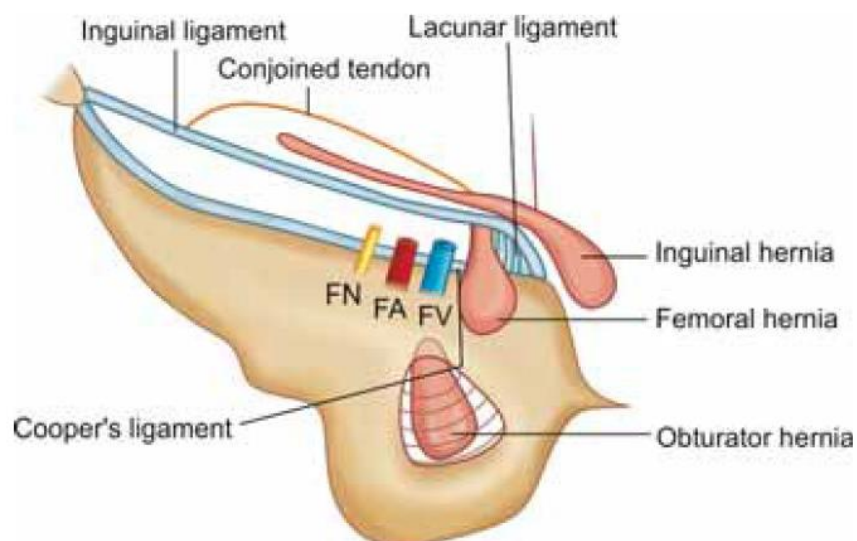
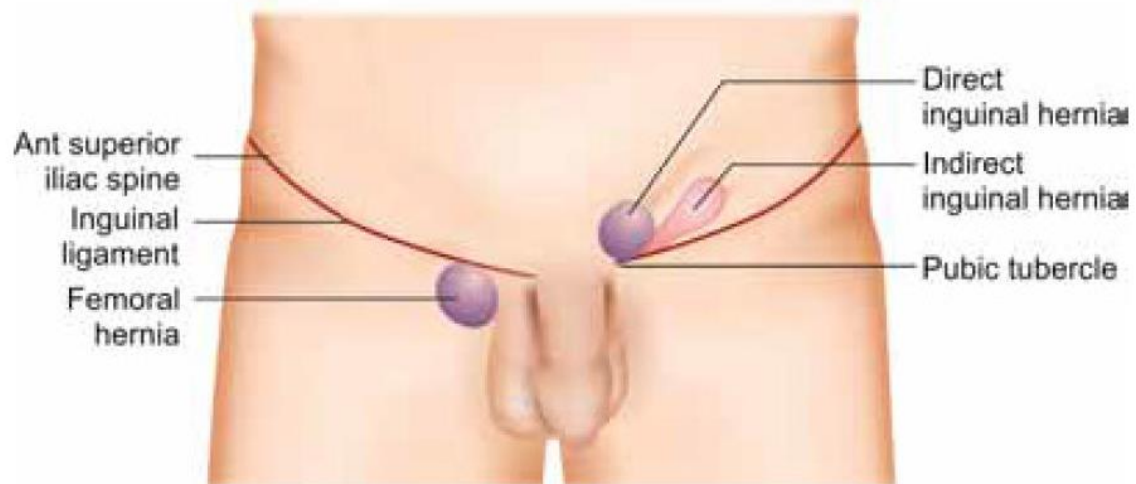


Fig 3: Showing boundaries of the inguinal canal

An indirect inguinal hernia (hernia through deep ring) travels down the canal on the lateral and anterior aspect of the spermatic cord; whereas the direct hernia pops out directly forward through the posterior wall of the inguinal canal. Neck of the indirect sac is lateral to inferior epigastric vessels but direct sac emerges medial to the inferior epigastric vessels with a wide neck. Saddle-bag or pantaloon hernia sac has got both medial and lateral component. Inguinal hernia occurs above and medial to the pubic tubercle. Femoral hernia is below and lateral to pubic tubercle .

Direct hernia occurs through **Hesselbach's triangle** . It is divided into medial and lateral halves by medial umbilical ligament. So direct hernia is classified as

medial or lateral depending on which part of the Hesselbach's triangle, it is arising from. Lateral umbilical ligament is formed by inferior epigastric arteries. Medial type actually is called as external supravesical hernia and this fossa is called as external supravesical fossa



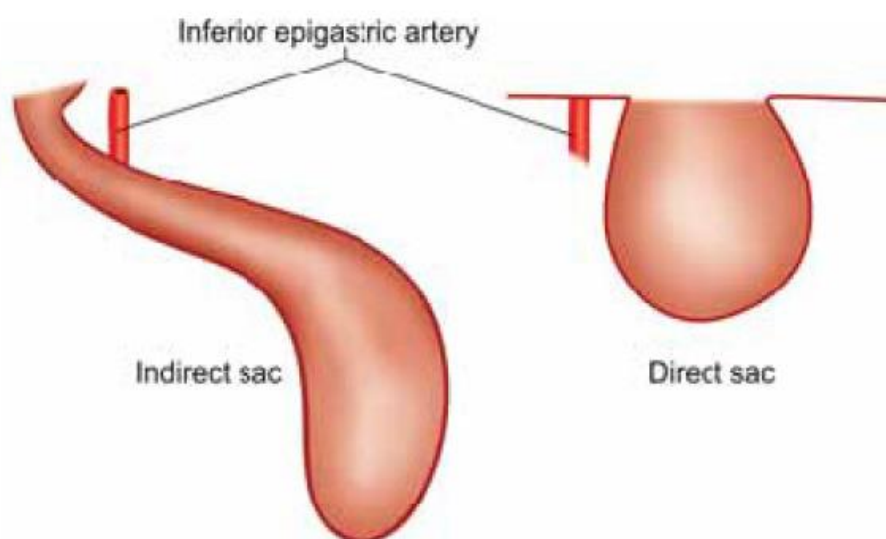


Fig 4: Anatomical relations and locations of the inguinal, femoral and obturator hernias.

Inguinal Defense Mechanisms:

Obliquity of inguinal canal creates flap valve mechanism by

approximating anterior and posterior walls of the canal. Cooper described external oblique aponeurosis as outer barrier of the inguinal canal causing step down effect for the spermatic cord. **Shutter mechanism** of internal oblique ie., roof apposes to floor like a shutter. External ring is guarded by conjoined tendon behind and reflected part of inguinal ligament in front. Internal ring is guarded by fleshy internal oblique. Contraction of external oblique aponeurosis causes pinch cock/slit valve effect by approximation of two crura of external ring. Cremaster muscle on contraction helps cord to plug the external ring—**ball valve mechanism**. **Hormones** also play a role to maintain inguinal muscles. Inguinal ligament is formed by thickened posteriorly folded lower border of the external oblique aponeurosis extending from anterosuperior iliac spine to pubic tubercle; lateral $\frac{1}{2}$ is oblique and rounded and medial $\frac{1}{2}$ is horizontal and grooved. The pectineal part of the inguinal ligament (lacunar) (triangular) is related in front to medial end of the inguinal ligament behind to pectin pubis; apex is

attached to pubic tubercle; base directing laterally forms medial wall of femoral ring. Cooper's pectineal ligament is thickened pectineal fascia which is attached to the pectin pubis lateral to the base of the lacunar ligament. Aponeurotic fibers from the inferior crus of the external ring passing superomedially to linea alba is called as Colles' reflected part of the inguinal ligament.

Cremaster muscle is muscle fascicule embedded in cremaster fascia (Scarpa's sheath) which are attached to inguinal ligament laterally, internal oblique, transverse abdominis and conjoint tendon, pubic tubercle and pubic crest medially. It is seen properly only in males; sparse in females. It is supplied by genital branch of genitofemoral nerve (L1). It suspends the testis in elevated position. It closes during rise in intraabdominal pressure; it protects nerves of the inguinal canal. During hernioplasty if cremaster is excised, testis may hang like clapper bell due to loss of suspensory and retractile function of the cremaster. So if cremaster is excised, medial cut end should be sutured to inguinal ligament or pubic tubercle. Stroking medial aspect upper thigh will cause reflex contraction of cremaster with elevation and retraction of testis—cremasteric reflex which is absent in upper motor neuron disease. Reflex is through femoral branch (stroking of medial thigh) of genitofemoral nerve to genital branch of genitofemoral nerve (cremaster muscle) through spinal cord.

Nerves of inguinal region:

Iliohypogastric nerve arises from the anterior division of L1 nerve runs away from lateral margin of psoas major muscle in front of quadratus lumborum behind kidney and colon to pierce transversus abdominis just above the iliac crest; runs between transversus abdominis and internal oblique; pierces the internal oblique 2.5 cm above the anterior superior iliac spine, runs between internal oblique and external oblique to reach 2.5 cm above the superficial inguinal ring where it pierces the external oblique aponeurosis to supply skin around the area.

Ilioinguinal nerve also arises from anterior division of L1 nerve runs over the quadratus lumborum, iliac crest pierces the transversus abdominis 3.5 cm medial to anterior superior iliac spine; runs between transversus abdominis and internal oblique for a short distance to pierce internal oblique just below and medial to iliohypogastric nerve lateral to deep inguinal ring; runs in inguinal canal outside the cord in males or round ligament (in females), passes through superficial inguinal ring; runs in front of the scrotum to supply anterior part of the scrotum. The genitofemoral nerve arises from ventral divisions of L1, L2 nerves; passes through the medial part of the psoas major muscle running below in front of the muscle; just above the deep ring it divides into medial genital and lateral femoral branches. Genital branch after piercing the psoas sheath runs in front of the external iliac artery and passes through deep ring to enter the inguinal canal within the spermatic cord in males or round ligament in females. It supplies cremaster muscle, runs in the cord to reach anterolateral aspect of the scrotum and supplies that part. In females it gives sensory branches to round ligament and labium majus. Femoral branch passes along with the femoral artery to supply skin over the femoral triangle.

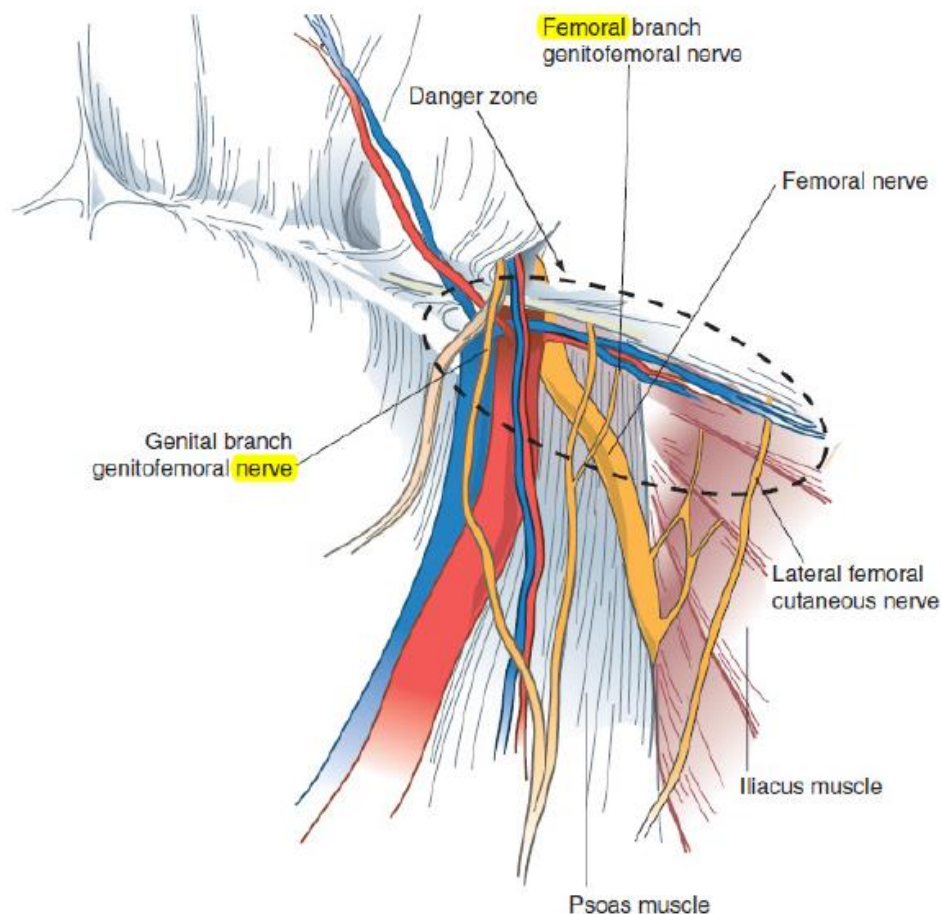


Fig 5: Nerves in inguinal region

Fascia Transversalis (Cooper's Fascia):

It is the fascia that lines the inner surface of the transversus abdominis muscle separated from the peritoneum by extraperitoneal connective tissue. In front it is adherent to linea alba above the umbilicus; behind merges with anterior layer of thoraco lumbar fascia and renal fascia; above with diaphragmatic fascia; below it is attached to inner lip of iliac crest, inguinal ligament; medially it is attached to pubic tubercle, pubic crest and pectineal line which prolongs down as anterior layer of femoral sheath. It also forms internal spermatic fascia around the cord. In the inguinal area transversalis fascia is bilaminar enclosing the inferior epigastric vessels. Space of Bogros is extension of the retropubic space of Retzius which is located beneath the posterior lamina of transversalis

fascia and in front of the peritoneum. Inlay preperitoneal mesh repair is done by placing mesh in this space. Thickening of the transversalis fascia at medial side of the internal ring and in front of the inferior epigastric vessels is called as interfoveolar Hesselbach's ligament.

Endoabdominal Fascia:

Endoabdominal fascia is connective tissue that lines inner aspect of the entire abdominal musculature. Part in relation to transverse abdominis is called as fascia transversalis. It forms iliac, diaphragmatic and renal fascia.

Inferior epigastric artery (IEA)

Originates from external iliac artery just above the inguinal ligament, runs upwards and medially in the extraperitoneal connective tissue between peritoneum and posterior lamina of transversalis fascia initially medial to internal ring; pierces the transversalis fascia at the lateral border of the rectus muscle; runs in front of the arcuate line supplying the rectus. Iliopubic tract is confused with inguinal ligament. It is an aponeurotic band extending from iliopectineal arch (thickened medial part of the iliopsoas fascia) and anterior superior iliac spine to superior ramus of the pubis forming deep musculoaponeurotic layer with transverses abdominis muscle, aponeurosis and transversalis fascia; it runs medially along inferior margin of the deep ring, anterior margin of the external iliac vessels, femoral sheath to attach to the pectineal ligament of Cooper

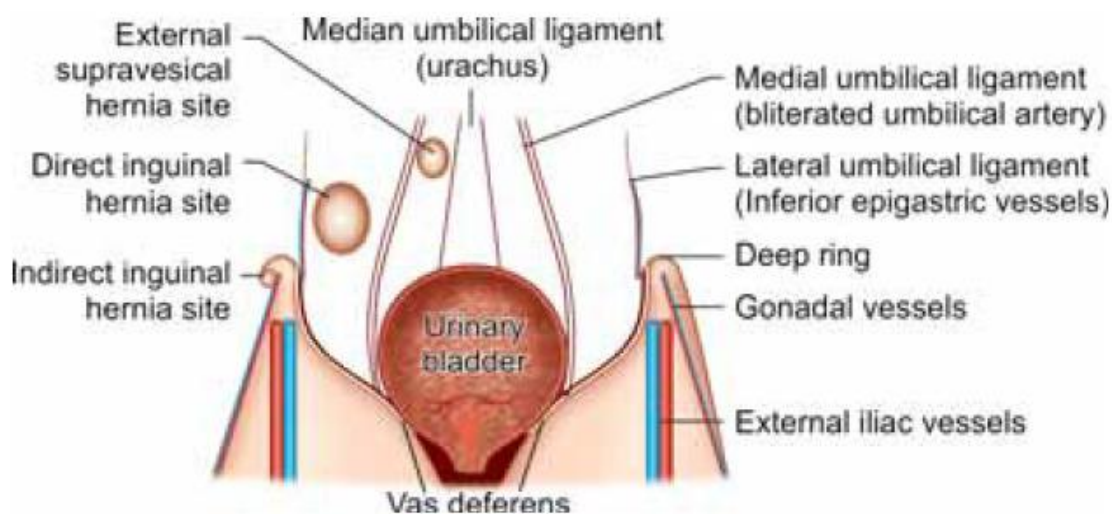


Fig 6: Ligaments related to groin and hernia surgery.

Arteries related to inguinal region :

It is divided into superficial and deep vessels. Superficial vessels are superficial epigastric, superficial circumflex iliac and superficial external pudendal arteries—are branches of femoral artery. They travel towards umbilicus in subcutaneous plane. Superficial epigastric artery anastomosing with superior epigastric artery. Branches are—muscular, cremasteric, pubic, and cutaneous. Cremasteric branch after travelling laterally towards deep ring supplies cremaster and runs along the spermatic cord. Pubic branch runs medially along the pubic bone to communicate with pubic branch of anterior division of obturator artery. Often obturator artery may be replaced by this pubic branch of inferior epigastric artery as abnormal/aberrant obturator artery. This pubic branch crosses over femoral ring and Cooper's ligament. This may be injured during fixation of mesh in TEP repair or femoral hernia repair causing torrential bleeding from both cut ends. As medial cut end retracts deep into the obturator fat and fascia it is difficult to control bleeding. This area is often called as circle of death. Inferior epigastric vein is medial to IEA

Deep circumflex iliac artery arises from lateral side of the external iliac artery behind the inguinal ligament which after piercing the transversalis fascia runs along the iliac crest; at its middle it again pierces the transversus abdominis and internal oblique to reach adjacent to anterior superior iliac spine where it anastomoses with superior gluteal, superficial circumflex iliac, lateral circumflex femoral arteries. Here it also gives ascending branch which runs in abdominal wall which may be injured in TEP causing large haematoma.

Bendavid circle:

It is the circle where venous network is situated in space of Bogros formed by branches of inferior epigastric, iliopubic, suprapubic, and retropubic veins. They communicate with aberrant obturator vein which is commonly existing (70%). During laparoscopy (TEP/TAPP) due to high insufflation pressure veins will collapse and will not bleed during dissection but bleeds later in postoperative period.

Triangle of doom:

It is observed in laparoscopic hernia procedure. It is a triangle formed medially by vas deferens, laterally by testicular vessels and peritoneal reflection below with the apex at internal ring. External iliac vessels lie in this triangle and so extreme care should be taken while dissecting the hernia sac in this triangle.

Preperitoneal Space of Nyhus:

It is the space between transversalis fascia and peritoneum. Medially, it is in front of the urinary bladder and behind pubic bone as retropubic space of Retzius (1858).

Laterally it continues as space of Bogros.. Below it is limited at iliopubic tract; laterally to anterior superior iliac spine and iliopsoas fascia. Iliopubic tract is analogue of the inguinal ligament, extends from Cooper's ligament to anterior superior iliac spine which divides endoscopic view of pre-peritoneal space into superior compartment (contains inferior epigastric artery, Hesselbach's triangle, cord structures and is site of inguinal hernia) and inferior compartment

(contains femoral canal, iliac vessels (vein medially and artery laterally) iliopsoas muscle, genitofemoral nerve, lateral femoral cutaneous nerve). External iliac vessels lie in a triangle formed by gonadal vessels laterally, vas deferens medially and peritoneal reflection inferiorly (triangle of doom). Aberrant obturator artery which is an occasional branch of inferior epigastric artery replacing its pubic branch travels across Cooper's ligament, which during fixation of mesh can cause torrential haemorrhage - circle of death. Triangle of pain is formed by gonadal vessels medially, iliopubic tract laterally and peritoneal reflection below.

Genitofemoral nerve and lateral cutaneous nerve of thigh traverse this triangle. Injury to these nerves either by dissection causes severe post operative pain. Tacks/staplers should not be placed in this triangle.

Fruchaud's Myopectineal Orifice (MPO):

It is an osseo-myo-aponeurotic tunnel and through which all groin hernias occur. Medially it is bounded by lateral border of rectus sheath, above by the arched fibres of internal oblique and transverse abdominis muscle; laterally by the iliopsoas muscle; below by the pectin pubis and fascia covering it.

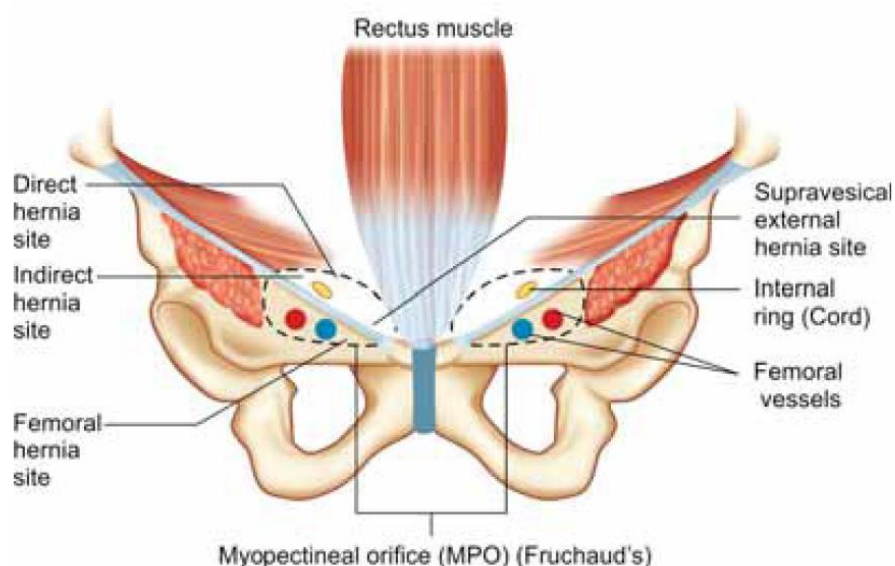


Fig 7: Myopectineal orifice of Fruchaud's.

Fossae :

There are three fossae on the inner surface of the anterior abdominal wall above the ligament and below the umbilicus. Lateral fossa is lateral to lateral umbilical ligament (which contains inferior epigastric artery) which is the site of indirect inguinal hernia. Lateral fossa contains deep inguinal ring. Medial fossa is between lateral and medial umbilical ligament (obliterated umbilical artery). Here direct hernia develops. Supravesical fossa is between medial and median (obliterated urachus) umbilical ligament which is the site of external supravesical hernia. Internal supravesical hernia develops in relation to urinary bladder directly, as anterior prevesical, posterior retrovesical and lateral paravesical.

CLASSIFICATION OF INGUINAL HERNIA:**Stoppa's Classification:**

Type I – Indirect hernia with a normal internal ring measuring $<2\text{cm}$. Inguinal floor is solid.

Type II – Indirect hernia with internal ring $>2\text{cm}$. Inguinal floor solid.

Type III – Indirect hernia + direct hernia + femoral hernia with a weak inguinal floor

Type IV – Recurrent hernia

Nyhus Classification:

It is based on size of the internal ring and posterior wall weakness.

Type I: Indirect hernia with normal deep ring.

Type II: Indirect hernia with dilated/widened deep ring.

Type III: Posterior wall defect.

a. Direct.

b. Pantaloon hernia: Indirect with posterior wall weakness.

c. Femoral hernia.

Type IV: Recurrent hernia

Gilbert Classification:

Type I: Hernia has got snug internal ring through which a peritoneal sac passes out as indirect sac.

Type II: Hernia has a moderately enlarged internal ring which admits one finger but is lesser than two finger breadth. Once reduced it protrude during coughing or straining.

Type III : Hernia has got large internal ring with defect more than two fingerbreadth. Hernia descends into the scrotum or with sliding hernia. Once reduced it immediately protrudes out without any straining.

Type IV: It is direct hernia with large full blow out of the posterior wall of the inguinal canal. The internal ring is intact.

Type V: It is a direct hernia protruding out through punched out hole/defect in the transversalis fascia. The internal ring is intact.

Type VI: Pantaloon/double hernia.

Type VII: Femoral hernia.

TYPE VI and VII are Robbin's modifications

Bendavid Classification:

Type I: Antero-lateral defect (indirect).

Type II: Antero medial. (direct).

Type III: Postero-medial (femoral).

Type IV: Posterior-prevascular hernia.

Type V: Antero-posterior defect: Inguino-femoral hernia.

European Classification:

L – lateral ; M – medial; F – femoral

P – Primary ; R – Recurrent

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.

Types Of Indirect (Oblique) Inguinal Hernia:

This is the most common type of hernia. It is more common in younger age group as compared to direct inguinal hernia which is more common in elderly. It is more common on right side in 1st decade but in 2nd decade the incidence is equal on both sides. Hernia is bilateral in 30% of cases. Sac is thin in indirect type. Neck is narrow and, lies lateral to inferior epigastric vessels

Types:

- (1) Bubonocoele, where the hernia is limited to inguinal canal;
- (2) Funicular where processus vaginalis is closed just above the epididymis. Contents of the sac can be felt separately from testis, which lies below the hernia.
- (3) Complete (Scrotal) where testis appears to lie within the lower part of hernia.

It can occur in any age group. It occurs in a congenital preformed sac (processus vaginalis). More commonly contents descend into the pre-existing sac only when there are precipitating causes which force the content down

Presentation of Inguinal hernias:

Presentation may be from asymptomatic hernia (which is seen in about 30% of patients) to a painful lump (commonest presentation - 66% of patients), this pain is mild in about 53.9% and severe in less than 1% of patient . focal pain in hernia is unusual ,in such case we should suspect hernia incarceration or strangulation. The most common symptom is a dull feeling of discomfort or heaviness in the groin region, which gets aggravated by activities causing increased intra abdominal pressure. Pain develops as a tight ring of fascia outlining the hernia defect compresses intra-abdominal structures with a visceral neuronal supply. pain gets worse at the end of the day after prolonged standing

Irreducible hernia:

The contents cannot be reduced back into the abdomen, but there are no other complications. It occurs because of adhesions between the sac and its contents or from overcrowding within the sac. Irreducibility without other symptoms is almost diagnostic of an omentocele, and any degree of irreducibility can lead to strangulation.

Obstructed hernia:

An irreducible hernia containing intestine which is obstructed from without or within, but there is no interference to the blood supply to the bowel. Patient will have colicky abdominal pain and tenderness over hernia site, and the symptom may gradually progress due to strangulation, but more often than not the obstruction culminates in strangulation. clinically distinction between obstruction and strangulation is difficult, and hence

strangulation should be anticipated and treated accordingly. incarcerated omental fat can also produce significant pain and tenderness on physical examination.

Incarcerated hernia:

The term “incarceration” can be used to indicate obstruction or strangulation, but it actually is the lumen of the bowel occupying a hernial sac is loaded and blocked with faeces. here the contents of the bowel can be indented with finger.

Strangulated hernia:

It is an irreversible hernia with obstruction to blood flow. strangulation occurs when the venous outflow is blocked, resulting in congestion, edema, and tissue ischemia, which leads to reduced arterial flow to hernia contents, gangrene may occur as early as 5-6 hours after the onset of the first symptoms. femoral hernia often undergo strangulation due to the narrow neck .Strangulation causes intense pain in the hernia followed quickly by tenderness, and signs and symptoms of sepsis. Here cough impulse will be absent. Incarceration and strangulation of a groin hernia may present as a bowel obstruction when the tight hernia defect constricts the lumen of the viscus. All patients with symptom of bowel obstruction needs a detailed physical examination of the groin region for inguinal and femoral hernias. If there is no bowel in the hernia sac, an incarcerated groin hernia may alternatively present as a hard, painful mass that is tender to palpation. The physical exam differs between an incarcerated and a strangulated hernia. The incarcerated hernia may be mildly tender due to venous congestion from the tight defect. The strangulated hernia will be tender and warm and may have surrounding skin erythema secondary to the inflammatory reaction from the ischemic bowel. The patient with the strangulated hernia may have a fever, hypotension from early bacteremia, and leukocytosis. The incarcerated hernia requires operation on an urgent basis within 6 to 12 hours of presentation. If the operation is delayed for any reason, serial physical exams are mandated to follow any change in the

hernia site indicating the onset of tissue loss. The strangulated hernia clearly requires emergency operation immediately following diagnosis.

History and Clinical Examination:

Hernias develop due to increased intra abdominal pressure ,may be a respiratory, urinary or bowel cause, or while doing a peritoneal dialysis. Usually hernia is noticed while standing or straining, the patient knows that the lump disappears on lying down and he gets it back and becomes uncomfortable after exertion.

Symptoms due to complications of hernia, like abdominal distention and colicky abdominal pain, may be noticed first before the groin lump.

Examination should be done with the patient in both supine and standing position.

One should look for “ asymmetry, bulges, or a mass”. Coughing or doing a Valsalva maneuver can facilitate identification of a hernia

Examination :

1. surgeon is seated with patient standing
2. surgeon visualizes the inguinal canal areas for bulge
3. A provocative cough is necessary to expose the hernia

Do the following

- 1, ask the patient to repeat cough
2. Invaginate scrotum
- 3.try to feel impulse in inguinal region
- 4.assess the diameter of internal ring
- 5.palpate the cord structure by finger rolling perpendicular to long axis of cord structures just medial to internal ring
- 6.put index cffinger on internal ring , middle finger on external ring and ring finger on femoral ring . Ask the patient to cough . read the impression of the test . if you feel impulse at index finger then this is indirect inguinal hernia , if it is at middle finger this suggests direct inguinal hernia ,ring finger denotes femoral

hernia .When attempting to identify a hernia , look for a swelling or mass in the area of fascial defect

7. place a fingertip into scrotal sac and advance up into the inguinal canal . if the hernia is elsewhere on the abdomen , attempt to define the borders of the defect

8.If the hernia comes from superolateral to inferomedial and strikes the distal tip of the finger ,it most likely is an indirect hernia.

9.If the hernia strikes the pad of the finger from deep to superficial, it is more consistent with a direct hernia.

Investigations:

With ultrasound examination in supine and upright positions supported by a Valsalva maneuver, inguinal hernia is diagnosed with a sensitivity and specificity of more than 90% . The accuracy of distinguishing indirect from direct hernias, even with the aid of Duplex-ultrasonography, is not higher than 73% . When there is a palpable mass, sonographic examination can differentiate between incarcerated hernia and lymph nodes.

Duplex-ultrasonography of testicular perfusion can be used to assess pre-existing deficiencies and avoid postoperative litigation, especially in patients with recurrent hernias or testicular changes. In rare cases of inguinal pain without clinical or sonographic findings, computed tomography is indicated to rule out obturator hernias.

Differential diagnosis:

The differential diagnosis of an inguinal hernia includes the following:

1. Femoral hernia
2. Hydrocele
3. Undescended testicle
4. Lymph node
5. Lipoma
6. Femoral artery aneurysm
7. Saphena varix

VARIOUS SURGERIES DONE FOR REPAIR OF HERNIA :

It includes Herniotomy(. excision of hernial sac) Herniorrhaphy or hernioplasty (strengthening of the posterior wall of inguinal canal either by repair or mesh)

Repair may be**Pure tissue repair :**

Shouldice, Mac Vay (still very useful repair) and modified Bassini

Prosthetic repair: Lichtenstein, Rives, Gilbert, Stoppa, TEP, TAPP

It means repair or strengthening of the posterior wall of the inguinal canal. By principle defective first layer which is transversalis fascia should be used in repair. Strengthening can be done by tissue or prosthetic repair. Strengthening by tissue repair has got various approaches where transversalis fascia or tendinous

fascio-aponeurotic upper part is approximated to iliopubic tract or Cooper's ligament or shelved edge of the inguinal ligament. Upper leaf taken for repair should be tendinous fascio-aponeurotic layer not fleshy red muscle. Non absorbable monofilament sutures like polypropylene should be used ideally. In few centers delayed absorbable sutures are used but it is not considered to be ideal. Prosthetic repair is done by placing mesh or prosthesis by onlay /inlay/ sublay /sublay intra peritoneal method. Tissue prosthesis like tensor fascia lata or temporal fascia are not used now. Polypropylene mesh is commonly used with different modifications. Approach for repair may be **anterior** through inguinal canal (for tissue repair and mesh repair either onlay or sublay) or **posterior** through high supra inguinal pre peritoneal approach.

Shouldice procedure:

This procedure is done under local or regional 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.

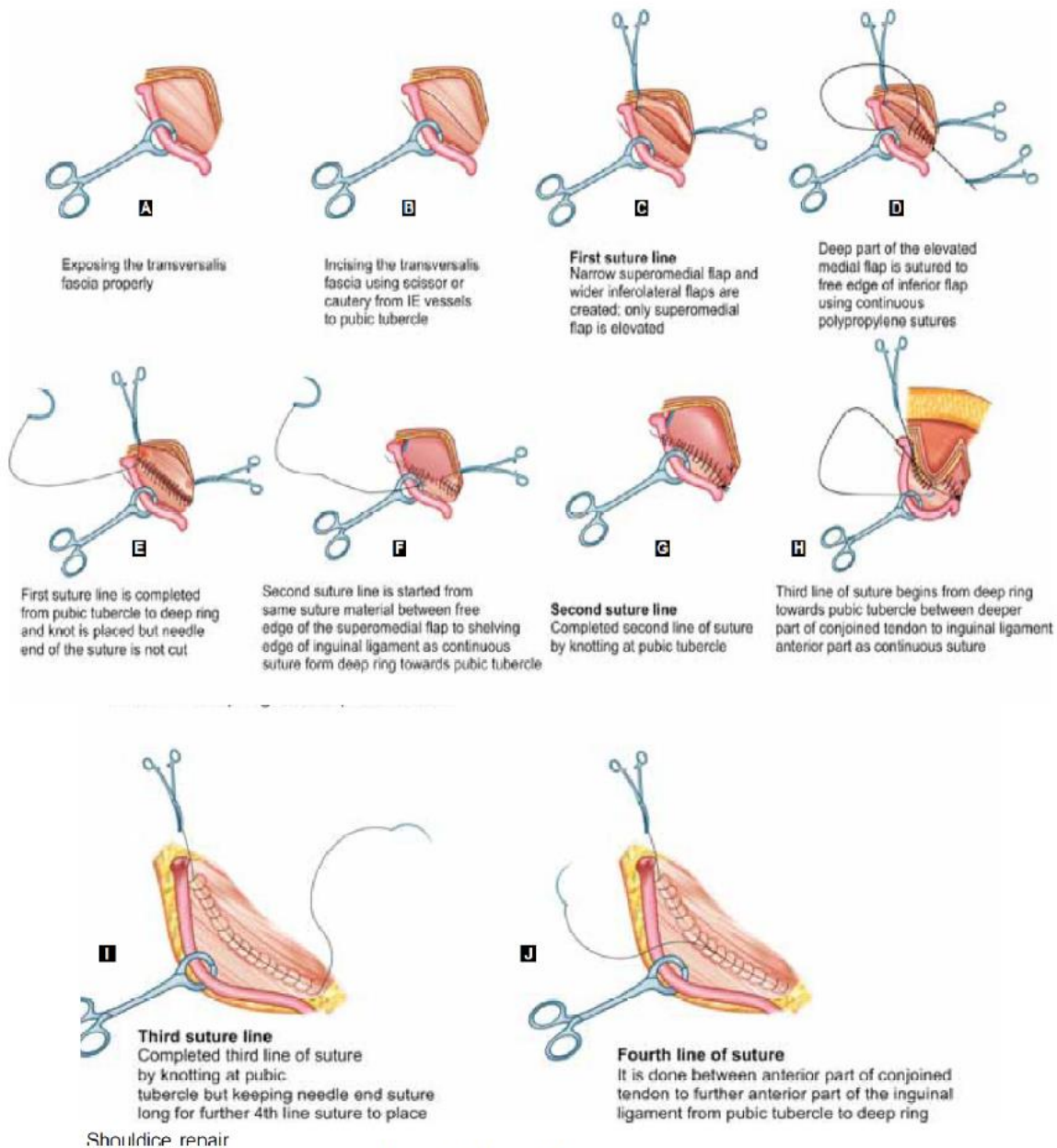


Fig 8: Shouldice repair

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.

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 approximated with silk sutures

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 (Lytle's repair)
4. Relaxing incision on the rectus sheath reduces tension in hernioplasty.

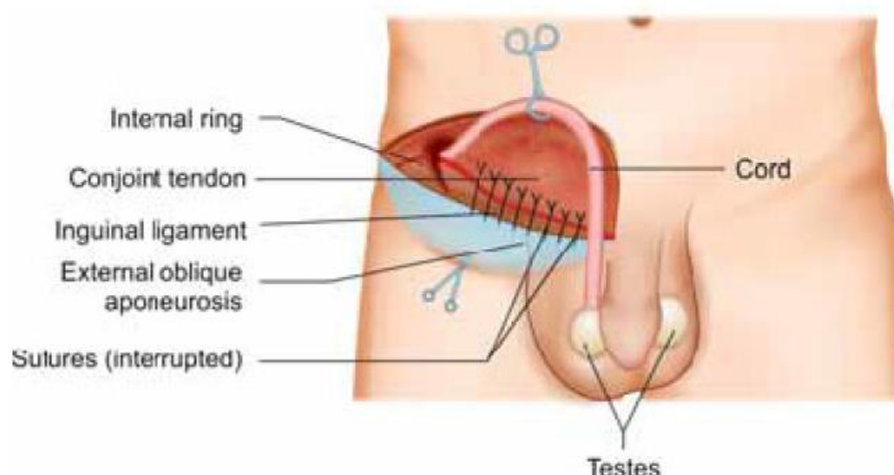


Fig 9: Modified bassini repair

Cooper's ligament repair/ McVay 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.

Lichtenstein tension free mesh repair:

This is done under local or regional 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

1122 SECTION X ABDOMEN

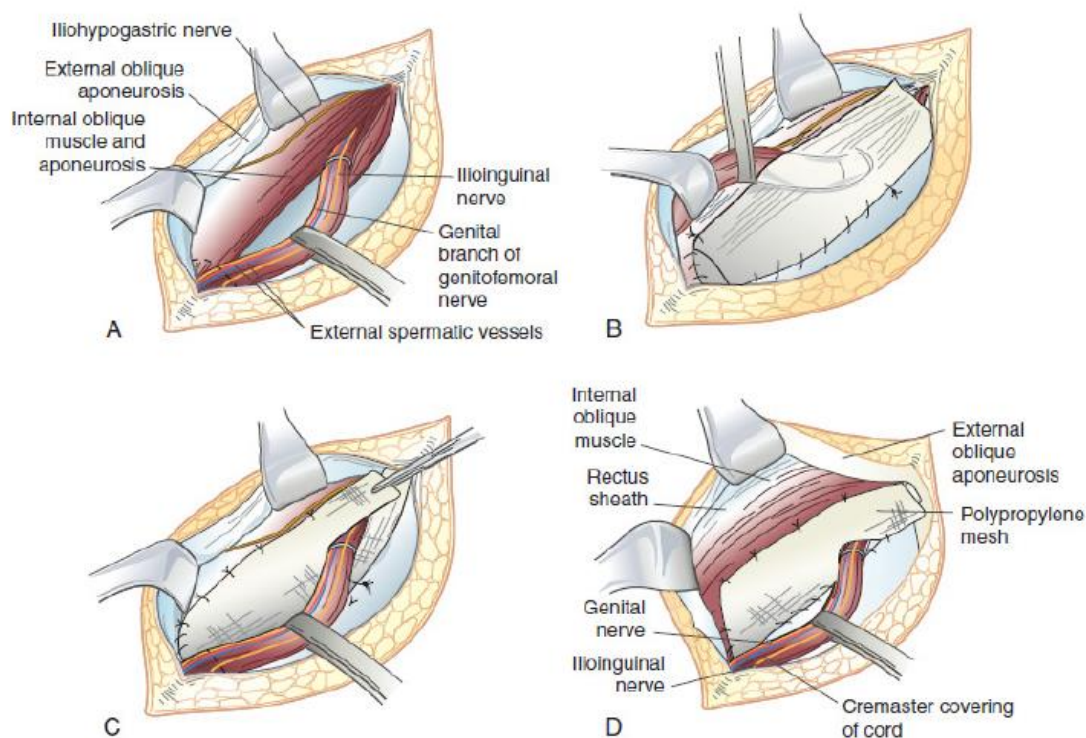


Fig 10: Lichtenstein tension- free hernia repair

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 ileac 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.

Laparoscopic Repair:

The two most popular techniques being,

1. Totally extraperitoneal (TEP)
2. Transabdominal preperitoneal (TAPP) approach.

The main difference between these two approaches is the sequence of gaining access to the pre peritoneal space.

TEP	TAPP
Dissection begins in the preperitoneal space using a balloon dissector	the preperitoneal space is accessed after initially entering the peritoneal cavity
preperitoneal dissection is quicker and potential risk for intraperitoneal visceral damage is minimized	risk for intraperitoneal visceral damage is there

Working space is limited and it may not be possible to create a working space if the patient has had a prior preperitoneal operation	More work space is present Can be done in patient who had a previous preperitoneal operation
Dissection balloons are costly	No balloons are used

TECHNIQUE OF DARNING :

Standard inguinal incision was given in the cases and inguinal canal was opened. The nature of hernia was assessed after delivering the sac. The sac was either incised or reduced and the gapping internal ring was narrowed where required. The posterior wall of inguinal canal was strengthened with prolene darn. Polypropylene (prolene) size 1 strength mounted on round bodied atraumatic was used as a suture. The continuous began at the medial end of repair by taking good bite of fascia over pubis, medial end of uinguinal ligament and lowest portion of medial end of rectus sheath. This suturing continued laterally in simple over and over fashion in the form of figure of eight, approximating the lower edge of conjoint tendon to the upper edge of inguinal ligament without tension. Good bites of inguinal ligament where caught on the tip of the needle to safe guard the femoral vessels and at various levels in order to avoid the tearing of inguinal ligament. This is continued slightly beyond the internal inguinal ring by displacing the spermatic cord laterally. The same suture then took the reverse direction as the second layer of darn and was tied medially at the pubic tubercle. Then cord ws placed on darn and anterior wall of inguinal canal was re constituted followed by closure of subcutaneous and skin. Hemostasis was secured. No drain was kept.

Results of Hernia Repair

The true measure of success for the various types of hernia repair is based on the results. The best information on the results of hernia repair is available from large prospective randomized trials, meta-analyses of clinical trials, and two large national registries, the Danish Hernia Database and the Swedish Hernia Register. The Danish Hernia Database includes more than 98% of inguinal hernia repairs; the capture rate of the Swedish Hernia Register is approximately 80%.^{10,11} In spite of the randomized nature of some trials, caution must be used when interpreting the results. Many of these patients were highly selected and most trials excluded recurrent hernias, obese individuals, and large inguinal hernias. Also, some follow-up results were completed by telephone interviews and not by physical examination. The national registries only collect information on operations, so the incidence of recurrence is lower than if all patients had been interviewed and examined. The mortality of all types of repair is low and there are no significant differences reported among the various techniques. There is a greater mortality associated with the repair of strangulated hernias. Otherwise, the risk of death is related to individual comorbid conditions and should be evaluated in each patient. The type of anesthetic does not affect the recurrence rate.

There are important differences in the results of primary hernia repair. Hernia recurrence is the primary outcome assessed by most studies. Large series, including multiple types of repairs, have suggested that recurrence ranges from 1.7% to 10%. The results of tissue repairs were often based on reports consisting of personal or single institutional series that were not prospective or randomized and had erratic follow-up periods. Not surprisingly, recurrence was variable. A recent Cochrane review of 16 studies of more than 4000 tissue repairs has found that the Shouldice repair has a lower recurrence rate than other non mesh repairs. Follow-up in these series was variable; patients were highly selected and may not have represented the population at large. Tension-free repairs have a lower rate of recurrence than tissue repairs. Results from the Danish Hernia Database have demonstrated that hernia recurrence resulting in reoperation following the Lichtenstein repair is only 25% that of nonmesh repairs. A recent meta-analysis comparing the Lichtenstein, mesh plug, and bilayered repairs has reported no significant differences in the rate of recurrence, chronic groin pain, other complications, or time to return to work. Approximately 50% of recurrences are found within 3 years after primary repair. Recurrence continues to occur after this time in nonmesh based repairs, but is uncommon with tension-free repairs. The bilayered repair was found to have a 20% hernia recurrence when used for large direct or recurrent hernias in one study. These results demonstrate the limitations of a fixed mesh size in these circumstances.

An extensive systematic review of randomized controlled trials was published in 2002 by the European Union Hernia Trialists Collaboration. The authors reported a meta-analysis of 4165 patients in 25 studies. Based on the available data, the laparoscopic repair resulted in a more rapid return to normal activity and decreased persistent postoperative pain. The recurrence rate for the laparoscopic repair was lower compared with open no mesh repairs; however, open and laparoscopic mesh repairs had similar recurrence rates.

A prospective trial sponsored by the Veterans Administration randomized 1983 patients to undergo an open Lichtenstein repair or laparoscopic repair, of which 90% were TEP repairs. Most surgeons in this study may have had a suboptimal experience with the laparoscopic approach; only 25 prior repairs were necessary to be eligible to enroll patients, which is consistent with the seemingly high conversion rate of 5%. Despite these factors, the investigators found a twofold higher incidence of recurrence after laparoscopic repair (10%) than open repair (5%). This difference in recurrence remained for primary hernias (10% laparoscopic versus 4% open); however, recurrent hernias repaired by the laparoscopic approach tended to have fewer rerecurrences (10% versus 14%). In a Cochrane review of more than 1000 patients in eight non randomized trials, there was no difference in hernia recurrence between TAPP and TEP repairs.

TAPP procedures were associated with more port site hernias and vascular injuries, whereas the TEP approach had a greater conversion rate.

On inexperience with laparoscopy and surgeon age older than 45 years were both predictors of recurrence after laparoscopic repair. What can be concluded from these results? This trial demonstrates that the laparoscopic repair of inguinal hernias may have a definite learning curve to achieve an acceptably low recurrence rate.

STRANGULATED INGUINAL HERNIA

Irreducibility, obstruction and strangulation are the complications of the inguinal hernia. First irreducibility occurs which leads into obstruction and strangulation

Features of strangulated hernia	Causes of stangulation
<ul style="list-style-type: none"> • Tense tender irreducible • No impulse on coughing • Shock, toxicity • Features of obstruction when there is no enterocele • Abdomen distension ,vomiting • Rebound tenderness 	<ul style="list-style-type: none"> • Narrow neck • Adhesions • Irreducibility • Long time, large hernia with adhesions

Patient with strangulated inguinal hernia presents with irreducibility, pain and tenderness, distension of abdomen, vomiting, and toxic features. Initial resuscitation is done with nasogastric aspiration, fluid and electrolyte therapy, antibiotics, urinary catheterization. Erect Xray abdomen may show multiple air fluid levels. *Emergency surgery* is needed under general anaesthesia. Inguinal incision extending into the groin is placed. Incision is deepened to reach the external oblique aponeurosis which is cut across the superficial inguinal ring

Incision is extended and deepened downwards along the root of the scrotum. Sac is identified and held. One should also hold the contents in the sac so as to prevent contents getting reduced and also toxic fluid spilling into the peritoneal cavity. Sac is opened carefully; all toxic fluid in the sac is sucked out thoroughly. Content, either bowel or omentum is held with Babcock's forceps. Viability of the bowel is checked by its colour, texture, peristalsis, mesenteric pulsation or when in doubt by giving 100% oxygen to the patient or after covering the bowel wall using hot mops. If bowel is not viable resection and anastomosis is done. For this, incision may be adequately extended laterally along the lateral abdominal wall. Closing this wound and separate laparotomy incision is not mandatory. Anastomosis is done using interrupted single layer silk or vicryl sutures. *Strangulated omentum* is not uncommon which is treated by omentectomy. *Drains* are placed into the peritoneal cavity as well as into the inguinal wound.

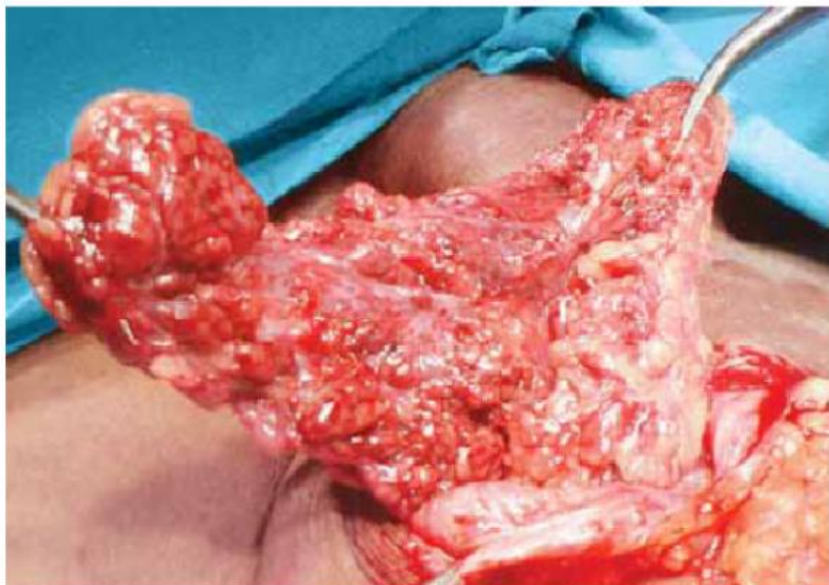


Fig 17: Gangrenous omentum

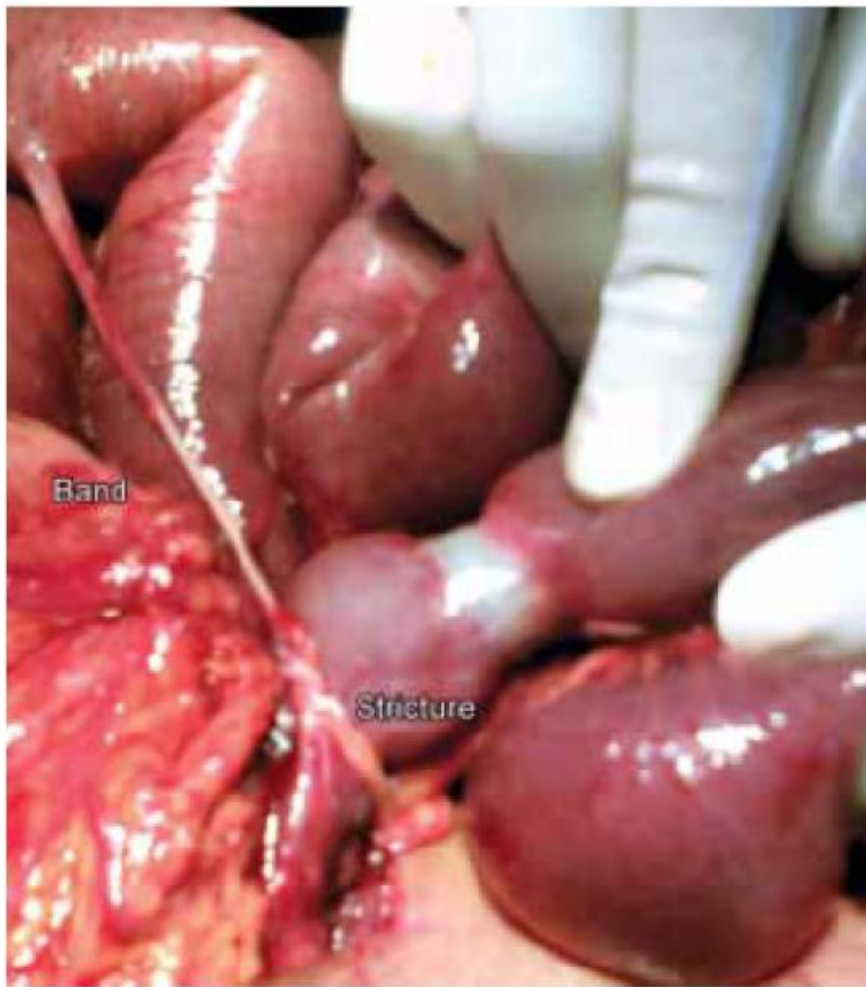


Fig 18: Garry's stricture in long standing obstructed hernia

Inguinal canal is strengthened by *modified Bassini's repair* using interrupted monofilament polypropylene sutures. Prosthetic mesh is not used as field is contaminated. In later period if hernia recurs then prosthetic mesh is used for repair. Biological mesh can be used during the surgery for strangulated hernia. *Problems in strangulated hernia are:* sepsis, leak and fistula formation, ileus, wound infection, peritonitis, intra abdominal abscess formation like pelvic or subphrenic, electrolyte imbalance, respiratory complications like pneumonia and ARDS, DIC.

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 groups

- Andrew et al 1981 80 yr
- Waddington et al 1971 60 yr
- MC entee et al 1989 70 yr
- Bahadur kulah et al 2001 60yrs
- Gallegos et al 1991 65 yrs
- 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 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

MATERIALS AND METHODS

This study was a prospective study done in **Thanjavur Medical College Hospital** from September 2016 to September 2017. The study group was managed only by department of general surgery. The subjects of this study were patients who underwent either Mesh replacement or Darning procedure at our hospital, Thanjavur Medical College. We evaluated and compared the efficacy of the above procedures, analgesic requirement in the first 24 hours, operative time, hospital stay, early postoperative complication, time until return to work and recurrence between patients who underwent LMH (Group A) and patients who underwent DR (Darn Repair). Tests done for operative suitability included CBC, Urinalysis, CXR, ECG. Post operative patients were followed on weekly basis till return to normal physical activity achieved. Overall postoperative followup was done for 10 – 12 months. Patients are of age group of 24 to 86 yrs. 47 cases have been studied. These cases are studied from time of admission till discharge and followed up in outpatient 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 postoperatively. All patients were further followed up weekly for first two months and every monthly from third to tenth month. The results of study were later analyzed and have been presented in this study.

INCLUSION CRITERIA :

1. Both sex, with age >18 years, with inguinal hernias presenting in emergency.
2. All patients presenting with irreducible / incarcerated / strangulated inguinal hernias ,
3. Cases which were regular for post treatment follow-up.
4. Patients willing to be part of this study.

EXCLUSION CRITERIA :

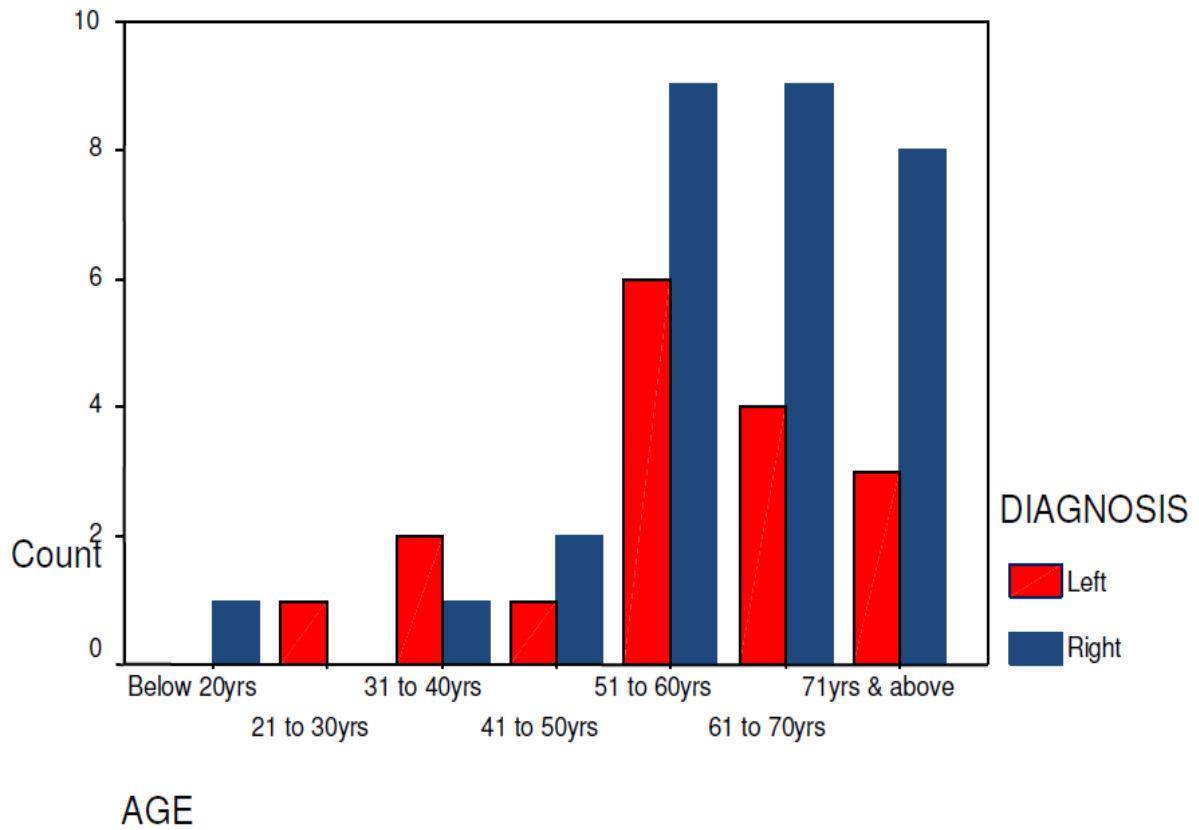
1. Patients < 18 years presenting without any features of obstruction.
2. Ventral, femoral and incisional hernias.
3. patients not fit or willing for surgery
4. Cases which did not come for regular follow-up and who did not complete or receive any medical or surgical treatment.
4. Patients not willing to be part of this study.

OBSERVATION AND ANALYSIS

Forty seven cases are studied. Mean age of patients **is 60.17 years**

AGE GROUP:

Age	Frequency	Percent (%)
Below 20yrs	1	2.1
21 to 30yrs	1	2.1
31 to 40yrs	3	6.4
41 to 50yrs	3	6.4
51 to 60yrs	15	31.9
61 to 70yrs	13	27.7
71yrs & above	11	23.4
Total	47	100.0



In various studies done complicated hernia is most prevalent in the age group of 60 to 70 years. In the current study complicated hernia is widely distributed in the age group of 24 to 86 years and maximum prevalence being in the age group of 51 to 60 years .

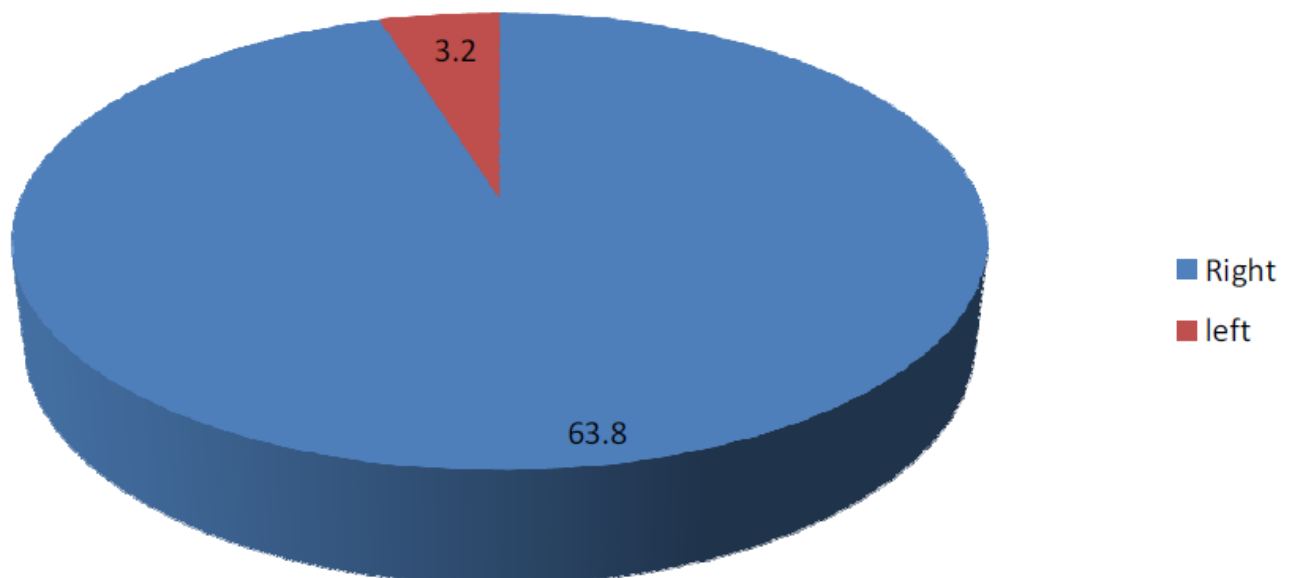
DURATION OF HERNIA BEFORE ACUTE EPISODE:

	Frequency	Percent
Immediate(<1 wks)	3	6.4
1st year	16	34.0
2nd year	10	21.3
3rd year	8	17.0
4th year	2	4.3
5th year	8	17.0
Total	47	100.0

In this study 34% patients developed acute complications within 1 year of developing hernia.

SIDE OF HERNIA MOST COMMONLY INVOLVED

	Frequency	Percent
Left	17	36.2
Right	30	63.8
Total	47	100.0

Laterality

In the current study right sided hernia is found to be more common than left sided hernia with rt :lt ratio of 1.76:1

SYMPTOMS :

HERNIA TYPE	PAIN AND INCARCERATION	OBSTRUCTION	BOWEL STRANGULATION
Inguinal	17	30	7
Percentage	36.17%	63.8%	14.8%

In the current study ,36.17% of groin hernia patients presented with pain and incarceration.

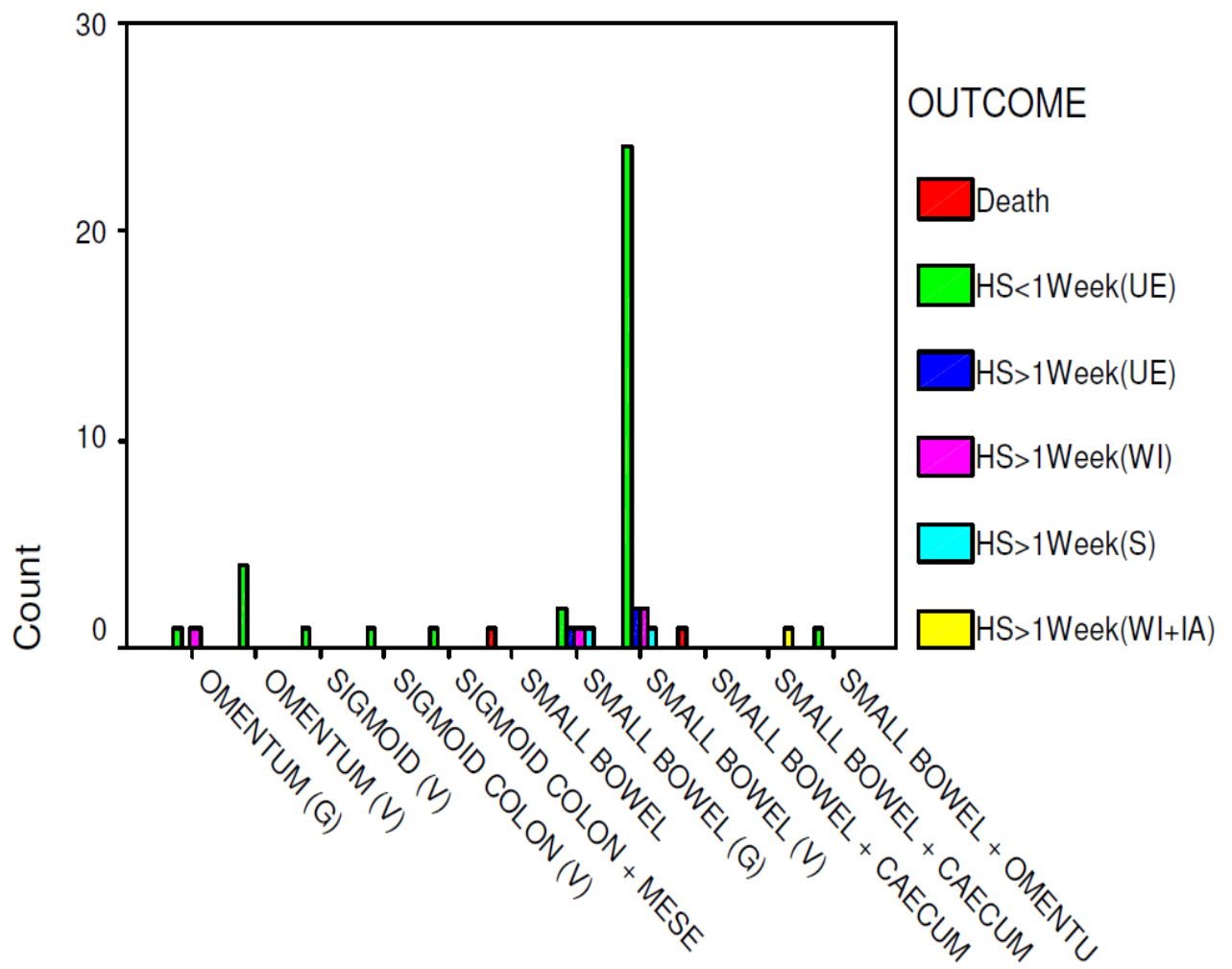
63.8% of patients presented with obstructive symptoms.

Bowel strangulation was present 14.8% of cases.

Of the total no of inguinal hernia cases(47), 5.5% cases had gangrenous bowel intra operatively due to strangulation.

CONTENTS OF THE HERNIAL SAC

CONTENT	Frequency	Percent
OMENTUM	6	12.8
SIGMOID COLON	3	6.3
SMALL BOWEL (V)	35	74.4
SMALL BOWEL + LARGE BOWEL	2	4.3
SMALL BOWEL + OMENTUM (V)	1	2.1
Total	47	100.0



CONTENT :

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

INCIDENCE OF CO MORBIDITIES

Comorbid illness	Frequency	Percent
Nil	33	70.2
CAHD	1	2.1
DM	5	10.6
HT	7	14.9
JDM	1	2.1
Total	47	100.0

In the current study 70.2% of patients has none of the medical illnesses or comorbidities, Remaining 30% has medical illnesses like DM,HT,CAHD,JDM in varying proportions . And there is no relationship between comorbidities and development of hernia.

A total of 47 patients were included in this study. They were divided into two groups, each having 24 and 23 patients in Group A and group B respectively. Group A underwent LMH repair, while Group B underwent Darning repair.

S.NO	POST OPERATIVE COMPLICATIONS	LMH (N = 24)	DR (N= 23)
1	SEROMA	4	7
2	HEMATOMA	2	5
3	WOUND SEPSIS	3	5
4	WOUND GAPING	1	3
5	HYDROCOELE		1
6	HOSPITAL STAY	4 DAYS	7 DAYS
7	RETURN TO WORK	21 DAYS	35 DAYS
8	CHRONIC GROIN PAIN	3	6
9	RECURRENCE	0	0

Seroma was observed in 4 patients in group A and 7 patients in group B. hematoma was observed in 2 patients in group A and 5 patients in group B. Mean time of hospital stay in group A was 4 days, while patients in group B remained hospitalised for more than 7 days due to swelling and infection. 6 patients developed inguinal swelling in group A, while 12 patients developed inguinal swelling in group B. chronic groin pain was seen in 3 patients in group A and 6 patients in group B.

Wound sepsis was observed in 3 patients in group A while it was observed in 5 patients in group B. Wound sepsis leading to removal of skin stitches and therefore wound gaping was seen in 1 patient in group A and 3 patients in group B.

None of the patients from both groups developed recurrence during long term followup. Patients in group A, returned to normal physical activity (walking / stair climbing/ eating, bathing, sitting) in 21 days while group B patients returned to work in 35 days.

STATISTICS

CHI-SQUARE TEST
STATISTICAL INFERENCE OF AGE

Age	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Below 34yrs	1	4.3%	0	.0%	1	2.2%	$X^2=4.544$ Df=4 $.337 > 0.05$ Not Significant
35 to 50	4	17.4%	1	4.3%	5	10.9%	
51 to 60	6	26.1%	6	26.1%	12	26.1%	
61 to 70	7	30.4%	6	26.1%	13	28.3%	
Above 71years	5	21.7%	10	43.5%	15	32.6%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI-SQUARE TEST
STATISTICAL INFERENCE OF SIDE

Diagnosis	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
LIH	7	30.4%	11	47.8%	18	39.1%	$\chi^2=1.460$ Df=1 $.227>0.05$ Not Significant
RIH	16	69.6%	12	52.2%	28	60.9%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI-SQUARE TEST

STATISTICAL INFERENCE OF PRESENTATION

Presentation	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
O	9	39.1%	12	52.2%	21	45.7%	$X^2=0.857$ Df=2 $.651 > 0.05$ Not Significant
IR	12	52.2%	9	39.1%	21	45.7%	
SB	2	8.7%	2	8.7%	4	8.7%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI-SQUARE TEST
STATISTICAL INFERENCE OF DURATION

Duration	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
1HR	8	34.8%	5	21.7%	13	28.3%	$\chi^2=1.561$ Df=3 .668>0.05 Not Significant
2HR	7	30.4%	9	39.1%	16	34.8%	
3HR	6	26.1%	8	34.8%	14	30.4%	
4HR	2	8.7%	1	4.3%	3	6.5%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI-SQUARE TEST
STATISTICAL INFERENCE OF CONTENT

Content	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
O	13	56.5%	4	17.4%	17	37.0%	$X^2=9.336$ Df=2 $.009<0.05$ Significant
SB	9	39.1%	19	82.6%	28	60.9%	
LB +M	1	4.3%	0	.0%	1	2.2%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI SQUARE TEST
STATISTICAL INFERENCE OF COMPLICATION

Seroma	DR		LR		Total		Statistical inference
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	
No	16	69.6%	19	82.6%	35	76.1%	$\chi^2=1.075$ Df=1 $.300 > 0.05$ Not Significant
Yes	7	30.4%	4	17.4%	11	23.9%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI SQUARE TEST
STATISTICAL INFERENCE OF COMPLICATION

Hematoma	DR		LR		Total		Statistical inference
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	
No	18	78.3%	21	91.3%	39	84.8%	$X^2=1.516$ Df=1 .218>0.05 Not Significant
Yes	5	21.7%	2	8.7%	7	15.2%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI SQUARE TEST
STATISTICAL INFERENCE OF COMPLICATION

Wound Sepsis	DR		LR		Total		Statistical inference
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	
No	18	78.3%	20	87.0%	38	82.6%	$\chi^2=0.605$ Df=1 .437>0.05 Not Significant
Yes	5	21.7%	3	13.0%	8	17.4%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI SQUARE TEST
STATISTICAL INFERENCE OF COMPLICATION

Wound Gaping	DR		LR		Total		Statistical inference
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	
No	20	87.0%	22	95.7%	42	91.3%	$\chi^2=1.095$ Df=1 .295>0.05 Not Significant
Yes	3	13.0%	1	4.3%	4	8.7%	
Total	23	100.0%	23	100.0%	46	100.0%	

CHI SQUARE TEST
STATISTICAL INFERENCE OF COMPLICATION

Chronic Groin Pain	DR		LR		Total		Statistical inference
	<i>n</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>n</i>	<i>%</i>	
No	18	78.3%	19	82.6%	37	80.4%	$X^2=0.138$ Df=1 .710>0.05 Not Significant
Yes	5	21.7%	4	17.4%	9	19.6%	
Total	23	100.0%	23	100.0%	46	100.0%	

' T ' TEST**STATISTICAL INFERENCE OF AGE**

Age	n	Mean	S.D	Statistical inference
<i>DR</i>	23	60.74	13.315	t=-1.548 Df=44 .129>0.05 Not Significant
<i>LR</i>	23	66.26	10.737	

‘ T ‘ TEST

STATISTICAL INFERENCE OF HOSPITAL STAY

Hosp Stay	N	Mean	S.D	Statistical inference
<i>DR</i>	23	8.30	1.105	t=13.441 Df=44 .000<0.05 Significant
<i>LR</i>	23	4.22	.951	

‘ T ‘ TEST

STATISTICAL INFERENCE OF RETURN TO WORK

Return to Work	n	Mean	S.D	Statistical inference
<i>DR</i>	23	32.35	3.973	t=13.498 Df=44 .000<0.05 Significant
<i>LR</i>	23	19.26	2.416	

CONCLUSION

The following observation has been made from this study:

- 1) Incidence of acute complication of groin hernia is highest in age group of 51 to 60 yrs.
2. The incidence of acute complication of groin hernia is commoner on the right side than on the left side
3. Majority of them presented with acute symptoms, within 1 year of development of hernia (34%)
4. The most common presentation being groin swelling with symptoms of obstruction
5. The most common content found in the sac is small bowel followed by omentum
6. immediate post operative complications like seroma, hematoma, wound sepsis was observed more in patients who underwent Darning repair technique.
7. Hospital stay was minimal in patients who underwent Litchenstein's hernioplasty when compared to Darning repair technique.
8. Patients who underwent Litchenstein's hernioplasty returned to work earlier than those patients who underwent Darning repair.
9. Chronic groin pain was observed in patients who underwent darnind repair.
10. Recurrence was found to be nil in both the groups.

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PROFORMA

Title : "A study of groin hernias presenting as emergency and its outcome"

QUESTIONNAIRE

Name: Age: Sex: IP No:

Occupation:

ON ADMISSION

Main Complaint :

Groin Swelling :

Laterality :

Duration before Acute Symptoms :

Pain and Incarceration :

Irreducibility :

Obstipation :

Duration of Symptoms :

Time of Hospitalization :

Vomiting :

Abdominal Distention :

Chronic Cough :

Constipation :

Difficulty in micturition :

Lifting Heavy Weight :

Strenuous Work :

Medical Comorbidities :

Past History Of Surgery :

Smoking :

CLINICAL EXAMINATION:

General condition:

Hydration: Temp:

PR : Bp : RS:

CVS: CNS:

P/A:

Examination of Groin:

DRE:

INVESTIGATIONS:

Hemogram: RFT: BT/CT:

CXR : Xray Abdomen Erect: ECG:

Operative Procedure: ASA Grade :

Post Op Period :

OUTCOME :

Early post operative complications :

Delayed post operative complications :

ABBREVIATIONS

1. RIH - Right inguinal hernia
2. LIH - left inguinal hernia
3. TEP - Totally extra peritoneal approach
4. TAPP - Trans abdominal preperitoneal approach
5. MPO - Myopectineal orifice of fruchard
6. DM - Diabetic mellitus
7. HT - hypertension
8. CAHD - Coronary artery heart disease
9. RFH - Right femoral hernia
10. LFH - Left femoral hernia
11. RPH - Right pantaloon hernia
12. RHR - Right Herniorrhaphy
13. LHR - Left herniorrhaphy
14. RL - Right lotheissen repair
15. LL - Left lotheissen repair
16. HS - Hospital stay
17. JDM - Juvenile diabetic mellitus
18. O 1 - Obstruction <24hrs
19. O 2 - Obstruction (24 -36)hrs
20. O 3 - Obstruction >36 hrs
21. IR 1 - Irreducibility <24 hrs
22. IR 2 - Irreducibility (24-36)hrs
23. IR 3 - Irreducibility >36 hrs
24. FV - Femoral vein
25. FA - Femoral artery
26. FN - Femoral Nerve