“A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA”

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DR. M.G.R. MEDICAL UNIVERSITY

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DECLARATION

I hereby declare that the dissertation entitled "**A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA"** was done by me in the Department of General surgery, Chengalpattu Medical College during the tenure of my course in M.S. General Surgery from march 2018 to march – 2019 under the guidance and supervision of Dr.J. Selvaraj .M.S, Professor, Department of General surgery, Chengalpattu Medical College.

This dissertation is submitted to The Tamilnadu Dr.MGR Medical University, Chennai-32 towards the partial fulfillment of the requirement for the award of M.S. Degree in General Surgery.

I have not submitted this dissertation on any previous occasion to any University for the award of any degree.

Place: Chengalpattu

Date: **Dr. SURESH BABU .C**

CERTIFICATE

This is to certify that the dissertation entitled **"A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA**"is a record of bonafide work done by Dr.Suresh babu C in the Department of General surgery, Chengalpattu Medical College, Chengalpattu during the tenure of his course in M.S. General Surgery from March – 2018 to march – 2019 under the supervision of Dr.J. Selvaraj .M.S., Associate Professor, Department of General surgery and submitted in partial fulfillment of the requirements for the award of M.S. Degree in General Surgery by The Tamilnadu Dr. MGR Medical University, Chennai. This work has not previously formed the basis for the award of a degree or diploma.

Dr.G.Hariharan, M.S., M.Ch.
Dean,
Chengalpattu Medical College,
Chengalpattu.

Dr.J.Selvaraj, M.S.,
Professor and Head,
Department of General Surgery,
Chengalpattu Medical College,
Chengalpattu.

CERTIFICATE FROM THE GUIDE

This is to certify that the dissertation entitled "**A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA**" submitted by the candidate Dr.Suresh babu C in partial fulfillment for the award of the degree of Master of Surgery in General surgery by The Tamilnadu Dr. M.G.R. Medical University, Chennai-32 is a record of original and bonafide work done by him under my guidance and supervision in the Department of General surgery, Chengalpattu Medical College, Chengalpattu during the tenure of his course in M.S. General Surgery from March – 2018 to march – 2019, submitted in partial fulfillment of the requirements for the award of M.S. degree in General surgery by The Tamilnadu Dr. MGR Medical University, Chennai-32.

Place: Chengalpattu

Date:

Dr.J. Selvaraj .M.S,
Professor & HOD
Department of General surgery,
Chengalpattu Medical College,
Chengalpattu.

INSTITUTIONAL ETHICAL COMMITTEE

Reg. No: ECR/774/INST/TN/2015

CHENGALPATTU MEDICAL COLLEGE, CHENGALPATTU

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Department	:	General surgery

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LIST OF ABBREVIATIONS USED

AD	Anna domino : After Christ
BC	Before Christ
Cms	Centimeter
ECG	Electrocardiogram
Gms	Grams
H/O	History of
Hb%	Hemoglobin Percentage
HBsAg	Hepatitis B surface antigen
HIV	Human Immuno Deficiency Virus
Inj IM	Injection , Intramuscular
Ie	That is
IP NO	Inpatient number
Lt	Left
N	Total number
P	Probability (significance of difference)
RBS	Random Blood Sugar
Rt	Right
RCT	Randomised Control Trial
S/O	Suggestive of
USG	Ultrasonogram
Vs	Versus
Yrs	Years

ABSTRACT

Background

Chronic post herniorrhapy groin pain is defined as pain lasting for more than 6 months after surgery. Majority of chronic pain as been attributed to ilioinguinal nerve entrapment. The purpose of current study is to evaluate the effect of routine ilioinguinal nerve excision on chronic groin pain and other sensory symptoms when performing inguinal hernia repair**.**

Objectives of the study:

To evaluate the effect of preservation versus elective division of the ilioinguinal on chronic post herniorrhapy groin pain, hypoesthesia and numbness after inguinal hernia repair using a polypropylene mesh.

Materials and Methods:

Source of data: Study is a prospective type which includes all patients admitted in Chengalpattu Medical College for Uncomplicated Inguinal Hernia Repair.

Method of collection of data (including sampling procedure):

Definition of a study subject: Patients admitted to Department of Surgery, Chengalpattu Medical College for Uncomplicated Inguinal Hernia .

The method of study consists of:

- Detail history taking & clinical examination as per the proforma
- Investigations after taking written informed consent
- Patients will be explained about types of surgeries available
- Intraoperatively careful note will be made about
  - Time latent for the procedure
  - Documentation of any complication encountered during procedure
- Post operative period will be divide into immediate post operative day-1(POD-1) , 1month and 3months following surgery and the following data will be collected
  - Post operative hospital stay
  - Any complication if occurred
- Patients will be followed regularly up to 3 months
- Note will made of any complications, time taken to return to work and patients satisfaction

Inclusion criteria

- ✓ subjects admitted with uncomplicated inguinal hernia(direct and indirect)
- ✓ both sex included
- ✓ above 18 years who can give valid informed consent

Exclusion Criteria

- ✓ subjects with diabetes mellitus
- ✓ subject with recurrent hernias
- ✓ previous surgery in inguinal region
- ✓ mesh allergy and subsequent hernia repair in the observation period
- ✓ previous history of trauma and pain in inguinal region

The following investigations will be done after taking written informed consent-

Routine Investigations for General Surgical Procedure

Blood Investigation and Urine Investigations : Hb%, TC , DC, Peripheral smear, ESR, Renal function tests, Liver function tests, Lipid profile, FBS/PPBS, HIV, HB_sAg, , Urine for albumin, sugars, ketone bodies, microscopy, BT CT , wound site pus c/s ,blood c/s,local parts xray

<u>Other investigations</u>

X-ray of the chest

CONCLUSION

The above study is to evaluate the **"CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA"** in Chengalpattu Medical College Hospital during the period March 2018 to March 2019.

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INTRODUCTION

Hernia is defined as "Protrusion of viscus or part of viscus through an abnormal opening in the walls of its containing cavity".[1]

"A protrusion of any viscus from its proper cavity is denominated a hernia. The protruded parts are contained in a bag by a membrane with which the cavity is naturally invested"

-Sir Astley Cooper (1804).

One of the most common operations performed by a general surgeon is Hernia repair. But none of the surgeons has ideal results following hernia repair due to complications such as nerve injury, infection, post operative pain and recurrence.[2]

Pain lasting for more than 3months after surgery is termed as Chronic post herniorrhaphy groin pain. As per the studies conducted between (1987 – 2000) the overall incidence of chronic post herniorraphy groin pain was around 25% among which 10% of patients had moderate or severe pain.[3] After Lichenstien repair the incidence of long term (≥1 year) post-operative neuralgic pain was 6-29%.[4] Inguinodynia is the recommended generic term for chronic groin pain following hernia repair.[5] In cases that involved workman's compensation issue, treating a post surgical patient is complicated. Most of the legal cases will result in out of court settlement. But still its worth noting that 5-7% of patients with post herniorrhaphy neuralgia will sue their surgeons.[6]

Routine neurectomy in surgery is not an unique feature in the repair of inguinal hernia. It is often performed during axillary dissections and in neck dissections where the intercosto brachial nerve and the greater auricular nerves respectively are usually sacrificed. Routine ilio-inguinal nerve excision has been proposed as a solution to avoid the long term complication of post herniorrhaphy neuralgia[8,9]. Excision of ilioinguinal nerve theoriticaly would eliminate the possibility of inflammation neuralgia arising as a result of neuroma, entrapment and fibrotic reactions. Still this procedure is not widely accepted and controversies persists.

The purpose of current study is to evaluate the effect of routine excision of ilioinguinal nerve in comparison with nerve preservation in reducing the complication of chronic groin pain and other sensory symptoms that can occur as a result of Lichenstein inguinal hernia repair.

AIMS AND OBJECTIVES

To evaluate the effect of preservation versus elective division of the ilioinguinal nerve on chronic post herniorrhaphy groin pain and hypoesthesia after Lichtenstein tension free inguinal hernia repair using a Polypropylene mesh

REVIEW OF LITERATURE

HISTORICAL ASPECTS OF INGUINAL HERNIA

In the entire history of surgery no subject has been Controversial as that of repair of groin herniation - C.B. McVay

Ancient Times[14,15]

In history, hernia is replete with myths and facts, ideas and realities and also a lot of transmutations and Shadows. The term hernia is derived from Greek word "Henios", meaning offshoot, a budding or bulge.[14] Hippocrates has barely mentioned about hernia in his writings (500 BC). Inguinal hernia mostly has been a disease since the beginning of mankind.[12] Vedic period described hernia antra-vriddhi" and was thought to be an incurable one. The evolution of surgical treatment of inguinal hernia will include the trials and errors of many surgeons practicing for these thousands of years. Over the years evidence obtained from historical documents suggest that till the onset of 19 century, the main treatment for hernia was conservative. About 3500 years ago, few Egyptian physicians said that the treatment of inguinal hernia can be conservative that included bandage for reduction and support. In the 3rd century BC, Alexandrian medical scientists advocated surgery as a treatment for hernia. They obtained preoperative sedation with a root of extract of mandrake, while hemostasis achieved with vascular ligatures[13].

Irreducible hernia has been treated by taxis, has been traced back to 2400years. Aulus Celsus, a Greek surgeon had documented the use of transillumination to distinguish hydrocele from hernia and described the technique of taxis for strangulated hernia. Irreducible hernia were treated using trusses and bandages.

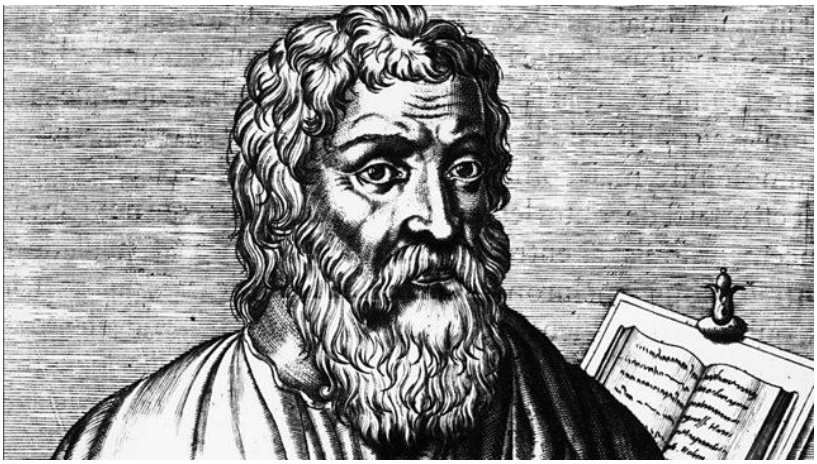


Fig.1 Hippocrates

Fig.2 Aulus Celsus Of Alexandria

Fig.3 Ambrose Pare

Medieval period[17]

During the dark middle ages two main advances were made in hernia management. “Chirurgia Magna” a well known text by Guy de Chauliac, from France differentiated femoral from inguinal hernias. He also developed the treatment of incarcerated hernia by taxis and recommended the head down trendelenberg position. He preferred chemical cauterization and considered surgeries to be doubtful and dangerous. In 1556, Pierre Franco of Switzerland was the first one to device a routine procedure for strangulated hernia by cutting through the constricting ring using a grooved director to protect the bowel which was later replaced by the use of fine linen. According to him, gangrenous intestines were deemed to be fatal[18]. Trendelenberg position in the management of hernias was recommended by Ronald, of Parma in around 1383AD.

Post – Renaissance period[19,20]

After the renaissance, Knowledge about hernias started to bloom in Bologna in the year 1200 AD. In 1700AD, the presence of Meckel's diverticulum was demonstrated in hernia sac by Littre. In 1721 William Cheselden operated on strangulated hernias successfully. In 1724 Heister in his monograph distinguished indirect from direct inguinal hernia. Hunter and Percival Pott of London pointed out the Congenital nature of some of the indirect inguinal hernia. In 1731 Gimbernat described the gimbernat's ligament and advocated its importance in the division of the ligament in case of strangulated femoral hernias instead of an upward incision of the Poupart ligament which caused serious bleeding due to aberrant inferior epigastric artery in certain cases. 'Antonio Scarpal' (1752-1832), in his treatise on hernia was the one to accurately described the sliding hernia based on autopsy studies He described the intimate fusion of intestinal content with the peritoneal lining in a sliding hernia. Astley Patson Cooper first time described the superior pubic ligament (which was later known by his name) and the transversalis fascia, the role these in the pathogenesis of hernias. Frenz Casper Hesselbach contributed towards groin hernias- Hesselbach's triangle and liopubic tract.

Period of Aseptic Surgery/The Listerian Era[15]

In 1867, Joseph Lister first time presented a paper on antiseptic surgery performed under carbolic acid spray for in the history of surgery. In 1871, the first article in United States on Antiseptic herniorrhaphy, was published by marcy where he used carbolised catgut ligature. In 1877, Czerny described excising the sac by pulling down the sac through the superficial ring , thus allowing the ligated part of neck to retract and invert at the level of deep ring. Antisepsis was first introduced in France by. In 1885, Lucas-championniere incised the external oblique aponeurosis, to open the inguinal canal and imbricated the roof during the time of closure. "The Decade of Inguinal Hernia 1880-90", in which significant contributions were made by Lucas championniere, Bassini and Marcy. Marcy, was the first to indicate the importance of the high ligation of the sac and closure of the dilated inguinal ring as one of the most essential step in the inguinal hernia repair. He was also the first to describe, the trans-abdominal approach for inguinal hernia repair. Edoardo Bassini[21] of Italy was the one who revolutionized the treatment of inguinal hernia by the introduction of a novel technique, of reconstructing the inguinal canal. In 1890, he published his epoch making report of 206 cases of hernia operations, with a very low mortality and a low recurrence rates. He also described the use of rectus sheath, transversalis fascia, and interrupted silk sutures in hernial repair. He also did bilateral inguinal hernia repairs and surgery for cryptorchidism in the same sitting. Bassini advocated the physiological reconstruction of inguinal canal and

recreating the internal and external rings with anterior and posterior walls. He sutured the conjoined transversus abdominis and internal oblique to the inguinal ligament with continuous sutures using silk, and the third layer includes transversalis fascia, divided from pubis to an inch beyond the internal ring. He also emphasized closing the floor from below upwards in order to restore the valve mechanism. In 1940, McVay and Anson pointed out that rectus fascia, inserting into the lateral border of rectus muscle, is strong enough to prevent incisional herniation. Shouldice, Obney, Ryan Performed multi- layer repair of the posterior wall of inguinal canal under local anaesthesia, now known as Shouldice technique.

Darn Repair

In 1921 McArthur used the pedicled strips of the external oblique aponeurosis present between the inguinal ligament and the conjoint tendon. Gallie and Lemesurier in 1921, published an article on using fascia lata strips. Ogilvy in 1936, practiced floss silk lattice repairs with non absorbable suture material, was followed by Maingot. Pratt, in 1948, used steel wire and Koontz used tantalum gauze in 1950.

Patch Graft Repair

Hernia recurrence was due to approximation of tissues under tension when the local tissues were weak. Thus the sutures did not hold together. Thus prosthesis with good tensile strength came into existence. To fill the gap in the posterior wall of the canal, patch of biological materials or synthetic sheets were tried. Most of the Silver wire mesh used were fragmented and corroded and was rejected through chronic sinuses and led to higher rates of post operative recurrence. In 1940, Burke introduced tantalum metal sheets which also underwent fragmentation leading to hernia recurrence. Natural tissue flaps from fascia of thigh, Rectus sheath or internal or external oblique aponeurosis were turned downwards and fixed to the inguinal ligament. Skin graft was used by Mayr in the year 1943. In 1958 Uscher introduced the synthetic polyethylene mesh prosthesis to reinforce previously sutured repair. Lichtenstein showed that mesh could be used successfully in 1986. Then in 1989, he Introduced tension-free repair by reconstruction of the floor of inguinal canal with prosthesis. In 1991, Gilbert tried suture less repair i.e, suture less patch placed over the whole of the posterior inguinal wall. In this, a roll of material is placed in the hernial orifice with or without suture to obstruct the passage of hernia to the exterior, popularized by the duo Robbins and Rutkow in the year 1993.

Expanded polytetrafluroethylene (PTFE) was adopted for both open and pre-peritoneal approach, which gave good results. recently, sheaths of monofilament polyamide or monofilament polypropylene are used extensively. Recently, bilayered mesh device for inguinal herniation was introduced, which has three components- underlay patch which provides posterior mesh repair, plug repair and an Calay patch which covers the pterion wall of the internal ring[22].

Fig.4 Francis Usher

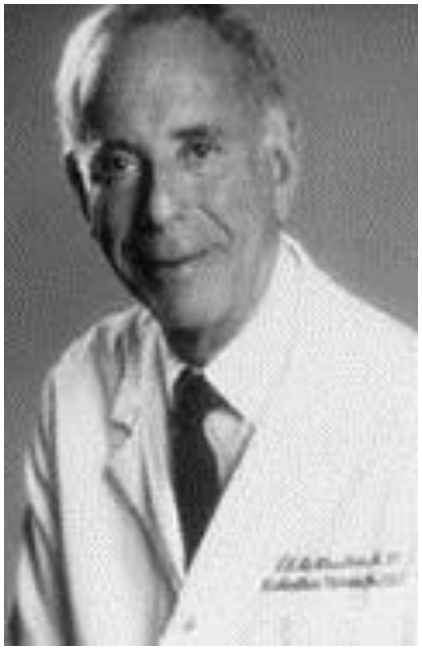


Fig.5 Irving Lichenstein

Preperitoneal Repair

Thomas Annandale of Edinburgh was the first to present the pre peritoneal approach in 1876. In 1883 Lawson Tait of Birmingham, reported about the advantages of medial abdominal section. Bates in 1913, repaired the defect inguinal ligament, from posterior approach. Henry in 1936, suggested that the pre peritoneal approach will facilitate the technical handling of the inguinal

and femoral hernias. This approach was strongly recommended by 'Nyhus in the year 1900. Stoppa, who recommends it in cases were the tissues were scarred and weakened and the normal anatomy was destroyed and in cases in which repeated repairs of have been carried out. In 1984, stoppa also Devised a procedure for reinforcing peritoneum using large unslit prosthesis

Laparoscopic Inguinal Hernia Repair[24,25]

With the advent of computer chip technology, laparoscopic visualisation and treatment of inguinal hernia got introduced in the surgical field[26]. Schultz and co-workers (1990) described plug and patch to close the peritoneal opening of the sac in laparoscopic inguinal herniorrhaphy. Spaw & co-workers in 1991 described the anatomy of laparoscopic approach. Toy Smoot described intra peritoneal on lay patch technique (IPOM) using a synthetic mesh to cover the defective peritoneal wall.

Dion & Morin (1992) described transabdominal preperitoneal patch(TAPP) technique where an intra-peritoneal U-type incision in the peritoneal wall and the mesh is inserted in a preperitoneal position. Mc(1992) described the complete extraperitoneal insertion of the preperitoneal mesh known as totally pre peritoneal patch technique (TEP).

Fig.6 Antonio Scarpa

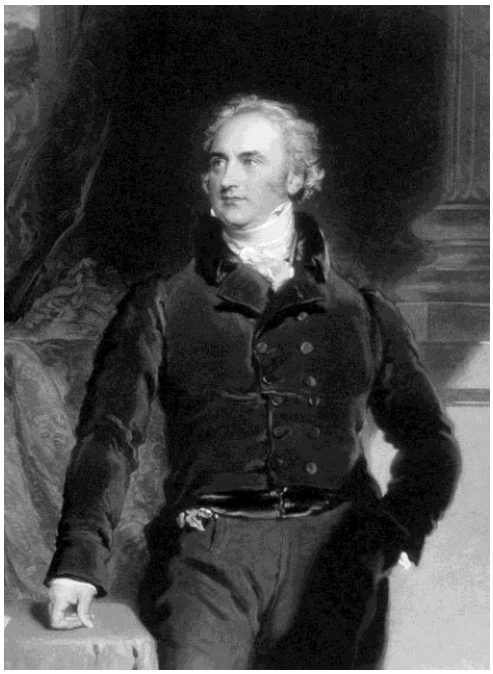


Fig.7 Astley Cooper

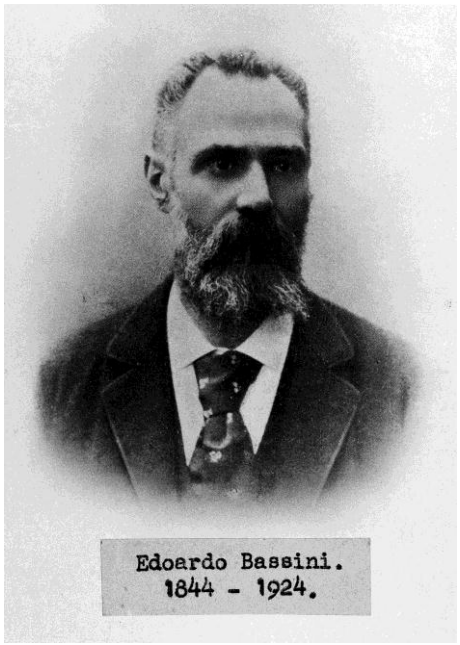


Fig-8 Edoardo Bassini

Fig-9 August Richter

EMBRYOLOGY[21,27]

The skin forms the scrotum in males and Labia in females. The embryological entities between the skin and the peritoneum, permit the processes vaginalis which penetrates the two and forms the inguinal canal. The inguinal canal contains the cord structures in males and the round ligament of the uterus in females[2].

Inguinal Region

The Testis is originally located on the posterior abdominal wall, at the level of the upper lumbar vertebrae. It lies medial to the mesonephros, where it is attached by mesorchium near the lower pole of the mesonephros. The descent of the testis into the scrotal chamber is accomplished by contraction gubernaculum testis, which is attached above to the lower pole of testis and below to the bottom of the scrotum after piercing the abdominal wall, thus forming the inguinal canal. Along with it the processus vaginalis descends into the scrotum, dragging the prolongations of the layers of the abdominal wall with it. Thus, the processus vaginalis receives coverings from the external oblique muscle (external spermatic) internal oblique muscle (cremasteric fascia and muscle) and the transversalis fascia (internal spermatic). the migration of the testis proceeds as the gubernaculum shortens and which eventually atrophies, leaving some trace of the at the bottom of the scrotum below tunica vaginalis, namely the scrotal ligament, fixing the testis to the scrotal pouch.

ANATOMY OF GROIN AND THE INGUINAL CANAL [29,30,31,32]

The groin is the region of the anterior abdominal wall below the anterior superior iliac spines. The medially bound by pubis and superior pubic (Cooper's[28]) ligament Laterally it is bounded by the epigastric vessels and the transversalis fascia condensation at the internal ring. inferiorly lie The anterior femoral sheath, inguinal ligament and iliopubic tract and the transverses abdominis muscle and aponeurosis will arch superiorly.

Skin

Langer's lines are transverse lines in the groin with convexity facing downwards. The anterior superior ileac spine is palpable in the lateral groin and pubic tubercle on the lateral margin of the pubis where the Spermatic cord exits from the external ring. The deep ring is located 2 cm above the skin crease between the abdomen and the thigh and midway between anterior superior iliac spine and pubic symphysis. The nerve supply is by these three main nerves- ilioinguinal, iliohypogastric and genital branch of genitofemoral nerves.

The subcutaneous tissue is divided into two strata - superficial fatty layer called as Camper's fascia and a deeper membranous layer called the Scarpa's fascia, which continues as the Colles fascia in the perineum.

External Oblique Muscle and Aponeurosis

It takes its origin from the lower 8 ribs, and is directed downwards, forwards, and medially. From the anterior superior iliac spine to the pubic tubercle, it forms a free border known as the inguinal ligament or poupart's ligament. The muscle becomes completely aponeurotic in the groin. It forms the outer layer of the anterior rectus sheath and inserts on the pubis[2]. The lacunar ligament is the fan-shaped medial expansion of the inguinal ligament which also inserts into the pubis. The superficial ring is a triangule shaped opening in the external oblique aponeurosis, 1 to 1.5 cm just lateral to pubic tubercle, by the splitting of external oblique. The spermatic cord exits the inguinal canal through this superficial inguinal ring. [2]

Internal Oblique Muscle and Aponeurosis

The internal oblique muscle lies between the external oblique and the transversus abdominis muscles. It forms the middle layer of the aponeurotic complex. It originates from the lateral half of the inguinal ligament, the intermediate line on the bone of iliac crests and the posterior lamella of lumbodorsal fascia through which it is attached to the lumbar spine. The anterior lamella joins the external oblique aponeurosis to form the anterior rectus sheath. The posterior lamella joins the aponeurosis of the transversus abdominis to form the posterior rectus sheath. They insert conjointly with the transversus abdominis

into the crest of the pubis. This fusion of the tendinous portion of the internal oblique and transverses muscles is known as the conjoined tendon[33].

Transversus abdominis

This muscle is the most internal muscle of the three flat muscles of the abdominal wall. It is oriented almost horizontally throughout most of its area. It is a key layer, because of its role in hernia repair. This muscle arises from three structures- iliac fascia along the iliac crest and the inguinal ligament and from the lower six costal cartilages and ribs. The lateral part is muscular and the aponeurosis (medial part) is towards the linea alba, where it forms the anterior rectus sheath just below the semicircular line of Douglas. In the groin it is divided into continuous and discontinuous portions

A. The continuous portion is the extension of the main muscle and aponeurosis, who's lower border arches above and medial to cord structures and are called the Transversus abdominis arch, and is inserted into the pubic tubercle and the crest is known as falx inguinalis. In 3% of cases it receives contribution from the internal oblique aponeurosis, thus forming the conjoined Tendon

B. The discontinuous portion below the transverses arch, forms the posterior wall of the inguinal canal, medial to the internal ring. One fourth of these fibers are most often deficient, represented only by the transversalis fascia also known as endo-abdominal fascia, thereby forming a weak spot

in the posterior wall of the inguinal canal. The inferior boeder of this layer is formed by the aponeurotic fascia- "iliopubic tract".

Transversalis Fascia

This is the portion of the endo-abdominal fascia that encloses the abdominal cavity and the peritoneum. It continues as the lumbar, iliac, psoas, obturator and the rectus fascia. It is adherent to the transverses muscle and the aponeurosis due to the numerous slips of fibrous tissue that traverse the muscle and attach to the deep interpareital fascia. Hence, it forms a part of the transverses muscle aponeurosis fascia complex. At the deep ring its tubular projection (internal spermatic fascia) extends outwards in a funnel like manner to cover the ductus deferens and the spermatic vessels. However, the funnel is not perfectly conical and is skewed and thus the axis of the funnel is less oblique than that of the vessels. Most often, the posterior inguinal wall is represented only by this fascia and leads to weak spot in the inguinal region.

Rectus Sheath

The aponeurosis of all the three flat muscles of abdomen contribute to the anterior sheath. The component layers of rectus sheath vary according to the level of examination. The section of the sheath immediately inferior to the umbilicus is composed of external oblique aponeurosis, only the anterior leaf of the internal oblique aponeurosis and transversus abdominis aponeurosis[33].

Peritoneum

The peritoneum is a thin elastic membrane that serves to provide a lubricating surface for the contained viscera. Because of its elastic nature, it has no role in the prevention of herniation.

The Conjoint Tendon (Falx Inguinalis)

Falx inguinalis is derived from the latin word meaning “the inguinal sickle". The aponeurosis of the transversus abdominis and the internal oblique aponeurosis fuse for some distance just lateral to the rectus sheath to form the conjoined tendon. The conjoint tendon lies lateral to the rectus muscle and immediately deep to superficial ring. It passes down to its insertion site deep to the inguinal ligament and the lacunar ligament. The spermatic cord or round ligament of uterus are the anterior relations. The conjoint tendon is a very variable structure and in 20% of the individuals it may be absent or slightly developed or replaced by the lateral extension of the tendon or original ring that no interval is present inbetween the lower border of transverses abdominis and inguinal ligament.

Cooper's Ligament

Cooper's ligament is constant in both form and extent. It represents the strongly reinforced periosteum of superior pubic ramus. immediately internal to the pectineal the periosteum is supplemented by considerable amount of dense fibrous tissue that it usually becomes 2 cm or even 3 cm. Laterally, it continues along the brim of the true pelvis, becoming progressively thinner until it can no longer be distinguished from the periosteum of the ileum. Cooper's ligament is important in surgical correction of femoral and large direct inguinal hernia, because it is a solid anchor along the inferior or posterior aspect of these hernial defects through which sutures may be placed with confidence.

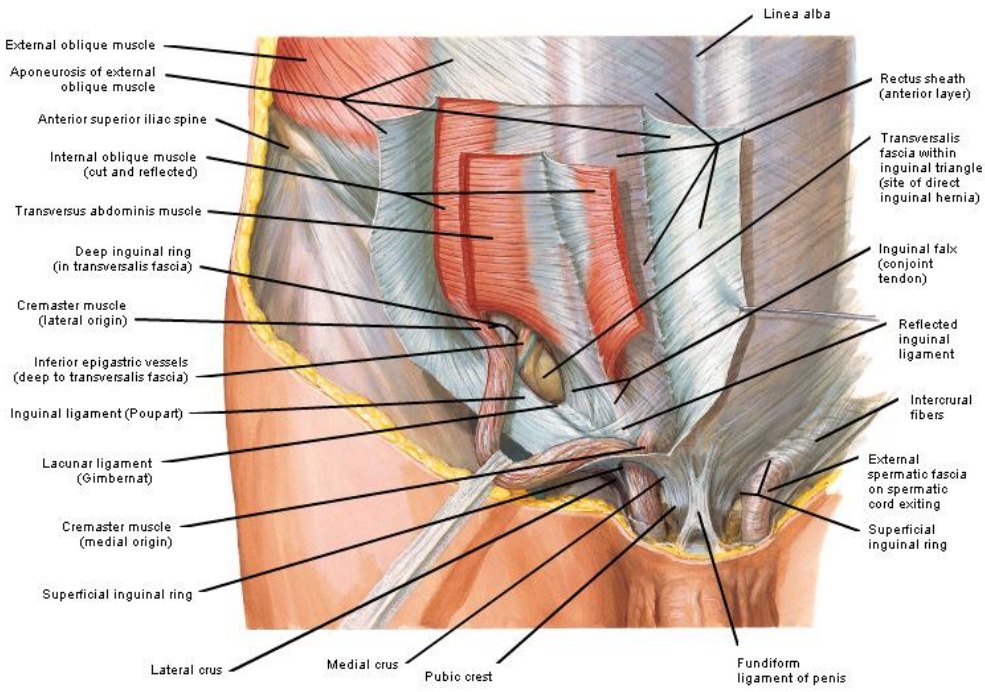
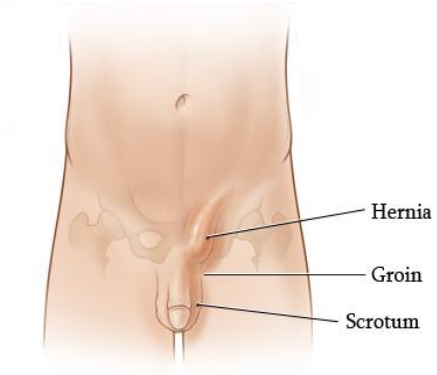


Fig.10 Deep And Superficial Ring



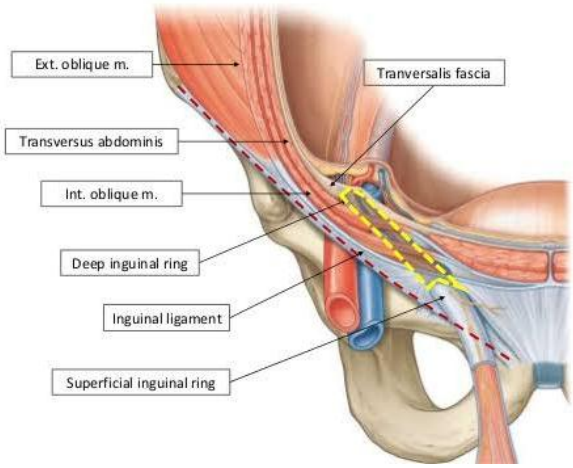


Fig.11 The Groin **Fig.12 Inguinal Canal**

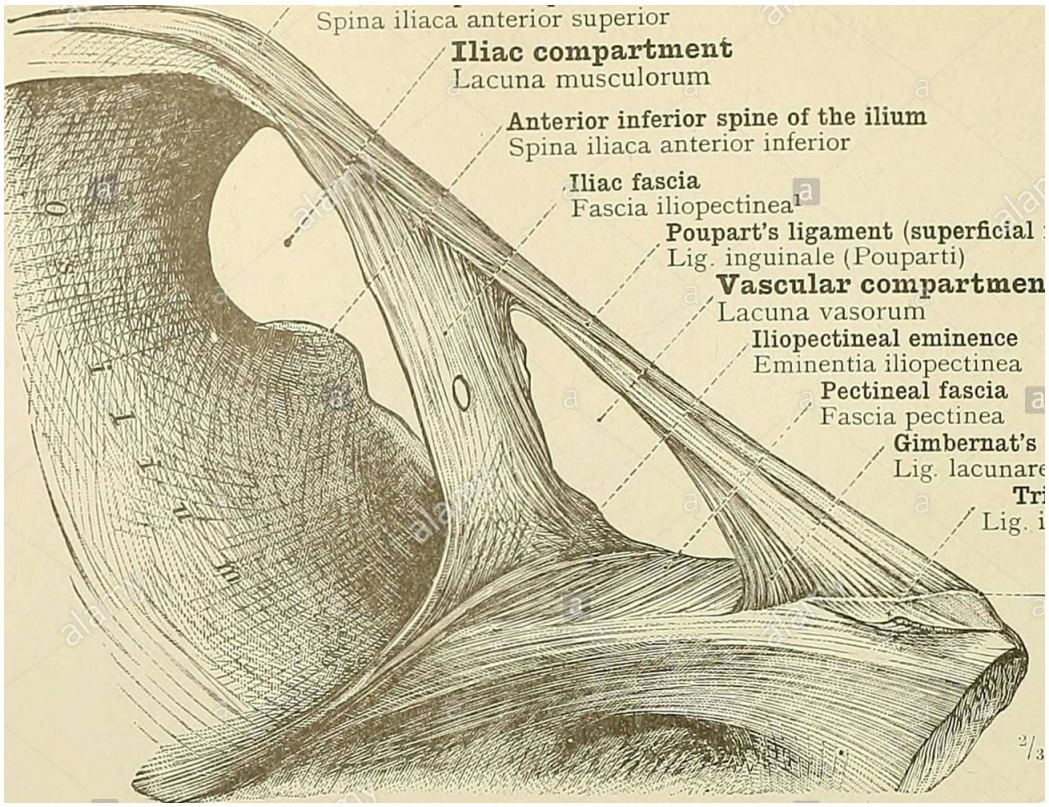


Fig.13 Ligaments of The Inguinal Region

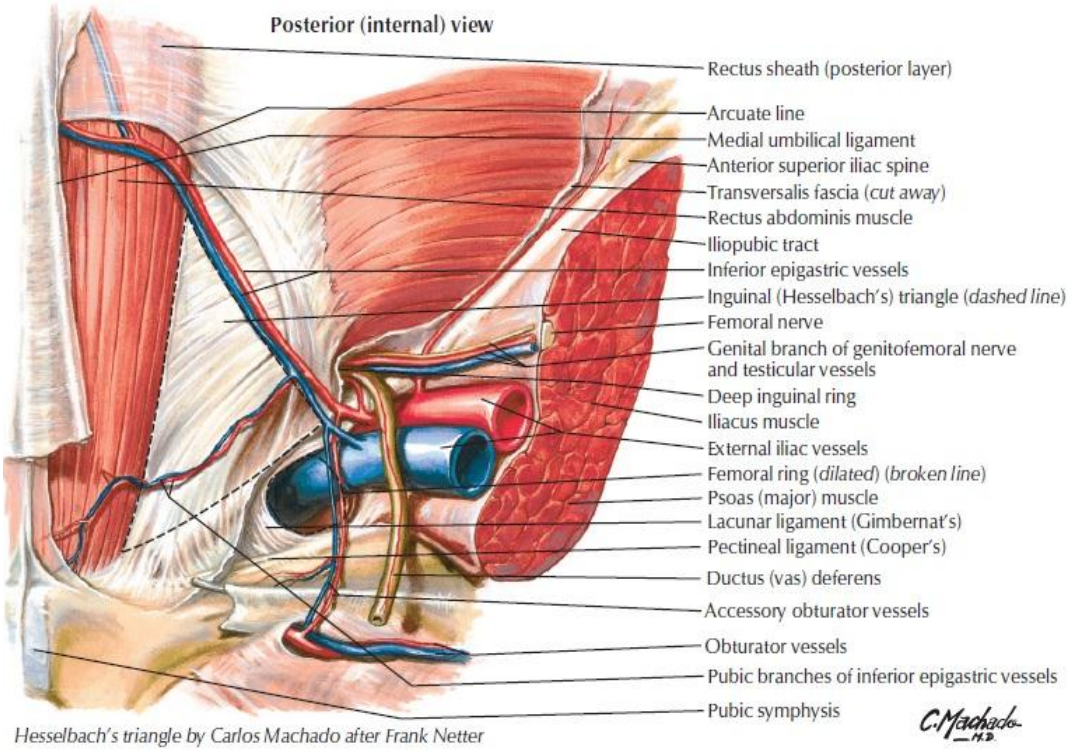


Fig.14 Hesselbach's Triangle

Inguinal Ligament (Ligament of Poupart)

It is the lower free edge and the thickened portion of external oblique aponeurosis. It extends from anterior superior iliac spine to pubic tubercle medially. And the edges are rolled inwards to form a gutter. It forms a bridge over the iliopsoas muscle and also the neural and vascular structures as they pass out of the pelvis. The lower edge of the inguinal ligament is loosely bound to the fascia lata by the Innominate fascia. The inguinal ligament medially gets inserted to the pubic tubercle to form a fan shaped structure downwards to the superior pubic ramus known as the lacunar ligament.

Lacunar Ligament of Gimbernatt

The ligament of Gimbernatt is a triangular fascial extension of inguinal ligament, before its insertion onto the pubic tubercle. It is inserted at pecten pubis and meets proximal end the Cooper's ligament laterally. By fanning , it broadens the attachment area for the inguinal ligament.

The Cremaster Muscle

The cremaster muscle consists of loosely arranged muscle fascicles along the spermatic cord structures which are united by the areolar tissue to form a sac like cremasteric fascia around spermatic cord and the testis, below the external spermatic fascia. The lateral part of muscle has been described as the continuity of the medial edge of internal oblique. These fibres passes along the lateral aspect of spermatic cord through the superficial inguinal ring and spreads out into fascicles, of increasing length along the anterolateral aspect.

Inguinal Canal

It starts at the emergence of spermatic cord through the deep ring and ends at the pubic tubercle in male, whereas in females the inguinal canal envelops the round ligament. It is an oblique structure of 3.75 cm long, slanting downwards and medially, parallel to and above the inguinal ligament. It is bounded anteriorly by the skin, superficial fascia, external oblique aponeurosis. It is bounded laterally by the lateral one third by the muscular fibres of the internal oblique. Posterior border by the transversalis fascia, reinforced by the conjoint

tendon medially. Superior border formed by the arched fibers of internal oblique and the transverses aponeurosis. Inferiorly the inguinal ligament and lacunar ligament forms the boundary.

Hesselbsach's Triangle

It is a weak area through which direct inguinal herniation occurs. It is bounded medially by lateral border of the rectus sheath and falx inguinalis. Lateral border is formed by the inferior epigastric vessels and inferior by the inguinal ligament.

Spermatic cord

a. Arteries: Testicular artery, cremasteric artery and artery to vas deferens

b. Veins: Corresponding veins(pampiniform plexus)

C. Nerve: the Genital branch of genitofemoral nerve, cremasteric nerve, Sympathetic plexus from the Para aortic and pelvic plexus

d. Lymphatic system of the testes.

e. Vas deferens and areolar connective tissue.

Coverings of the spermatic-cord from within outside: processus vaginalis internal spermatic fascia, cremasteric fascia and external spermatic fascia.

Blood Vessels and Nerves

The external iliac artery gives two major branches beneath inguinal ligament. These tributaries are- deep circumflex iliac and inferior epigastric vesselss. The latter is the medial border of the deep ring, or the lateral border of the direct triangle. The epigastric artery gives two branches, namely the cremasteric and the pubic arteries. The testicular artery is the direct branch the aorta that supply the testis. The spermatic cord contains one small vessel (umbilical artery) that supplies the ductus deferens.

[34]The nerves of the groin are the iliohypogastric, the ilioinguinal, and the genitofemoral nerve. The genitofemoral nerve arising form L1 and L2 supplies the cremaster muscle, the skin of the scrotum and the medial aspect of the thigh and In females it also supply the mons pubis and labia majus. Its is essential to the cremaster reflex. The ilioinguinal and iliohypogastric nerves arise primarily from L1 medial to the anterior superior spine and these nerves traverse the internal oblique muscle to lie beneath the external oblique aponeurosis. Ilioinguinal nerve traverses the inguinal canal and emerges through the superficial ring. It supplies sensation to the proximal part and medial part of the thigh, root of the penis and upper scrotum. The hypogastric branch of the iliohypogastric is mainly motor and supplies the abdominal muscles. It exits through the external oblique aponeurosis above the superficial ring. Care is necessary to avoid injury to the nerve while performing a relaxing incision.

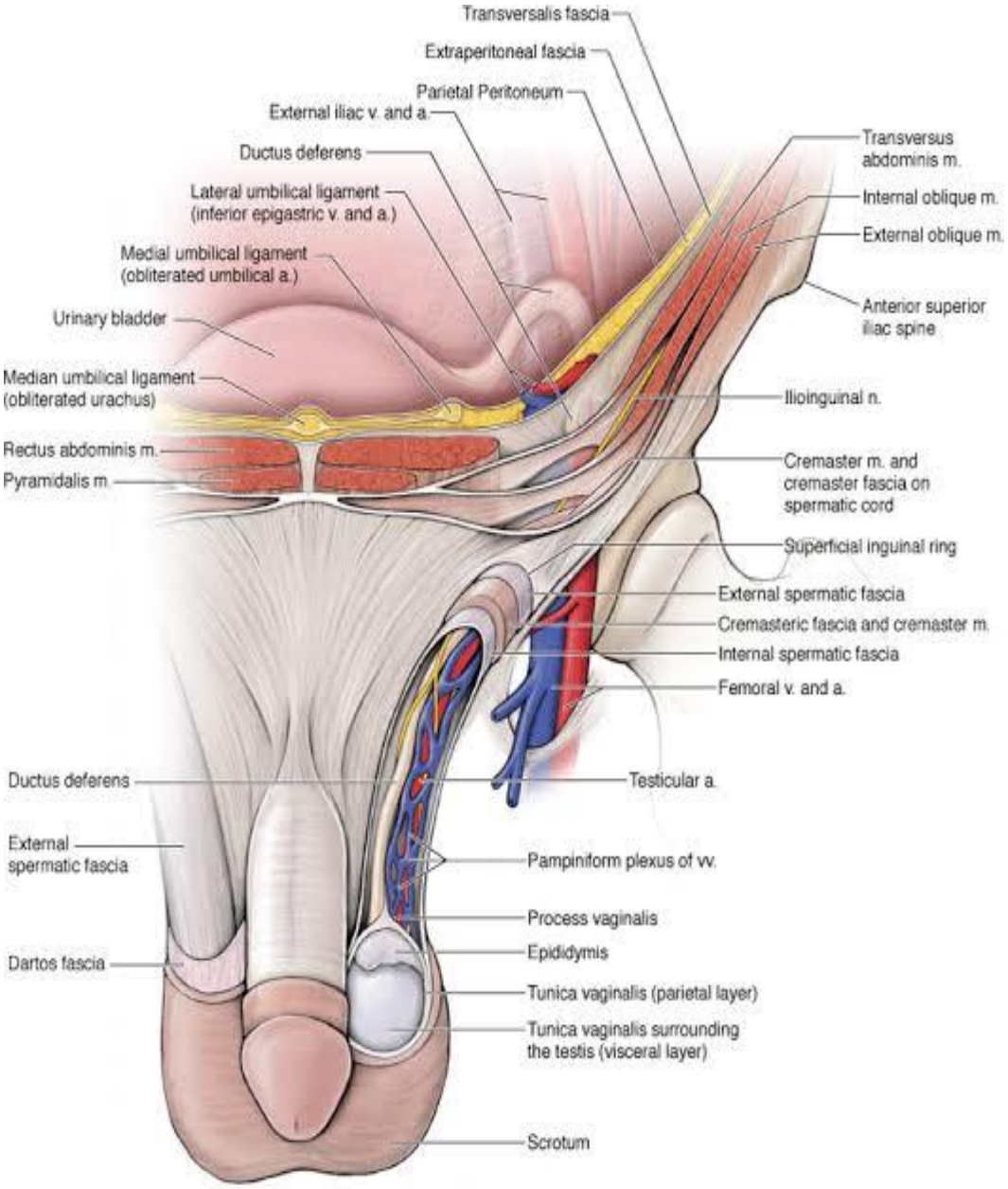


Fig.15 Layers of abdominal wall forming the inguinal canal and its contents

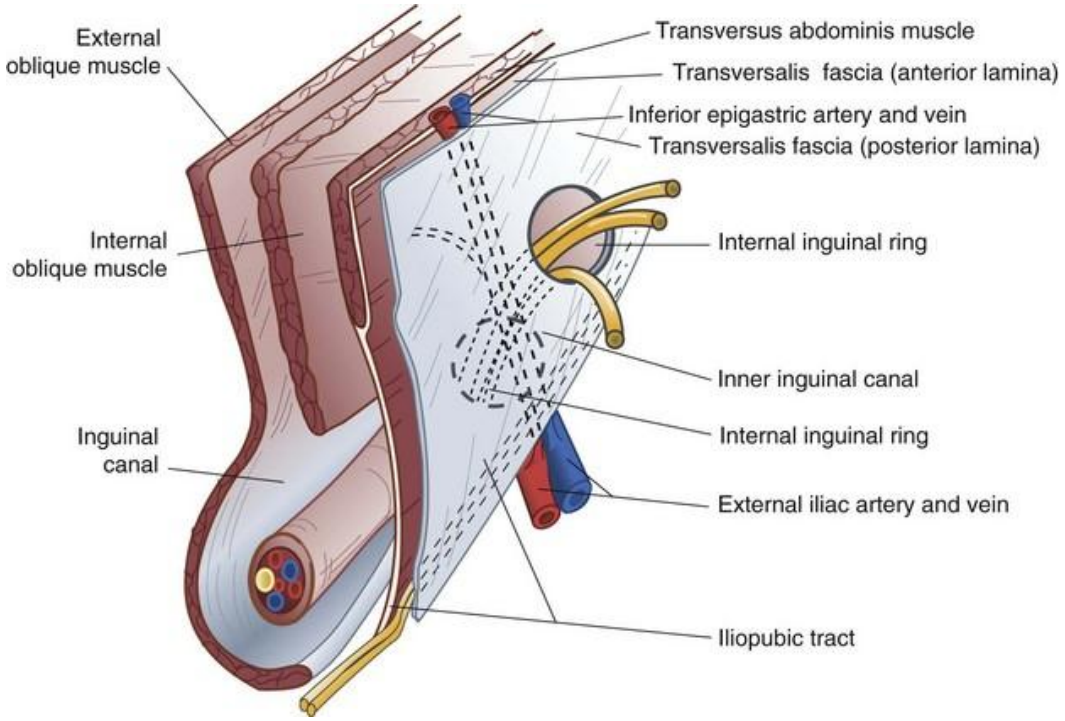


Fig.16 Inguinal canal and its contents

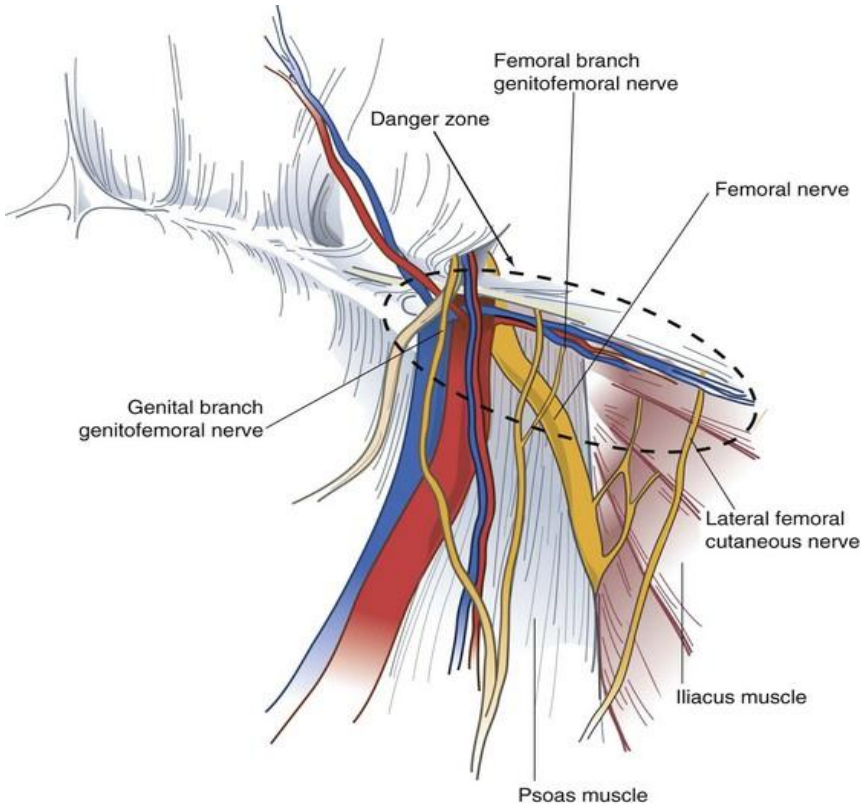


Fig.17 Nerves and blood vessels at groin

EPIDEMIOLOGY, ETIOLOGY AND PATHOPHYSIOLOGY[35,36,37,38].

75% of all abdominal hernias are found in the groin; Of all groin hernias,95% are inguinal hernia and the rest are femoral hernias. Inguinal hernias are more common in men than in women (9:1). Still inguinal hernia is the most common hernia in women The overall lifetime risk of developing a groin hernia is 15% in males and <5% in females. Studies shows that there is an association between age and hernia diagnosis. The complications of hernia (incarceration, strangulation, bowel obstruction) are found most commonly oldage. The cause of hernia is multifactorial. The following factors are mainly involved

1. Evolution

The absence of posterior part of rectus sheath below the arcuate line and only substantial part of transversalis fascia unsupported by the muscles or aponeurosis resisting the intra-abdominal pressure and holding the defect between the abdomen and thigh. It is compounded by human beings having adopted an upright posture and the change to bipedal from quadrupedal locomotion. In man, upright posture causes gravitational stress to lower abdominal wall, which structurally is not designed for it and also doesn't has the evolution suited for it.

2. Congenital and Anatomical Factors

a. Patent Processes Vaginalis is the foremost important cause for indirect inguinal hernia in infants and in children. The development, migration and

obliteration of the processus vaginalis are closely linked to the descent of testis from the abdomen to scrotum. Upto 20% of adults presenting with patent processes vaginalis wont develop hernia during their life.

b. Subtle varieties in attachment and arrangement of abdominal muscles.

c. Females are free of direct inguinal hernia due to the narrowness of interval between the transversus arch and inguinal ligament because of the hermetical attachment of external oblique aponeurosis. They play a role in protecting women against the direct hernia. On the other hand, woman develop femoral hernia frequently due to musculo aponeurotic attachments. the number of aponeurotic fibers in the transversus aponeurosis determine the intrinsic strength of abdominal wall layer.

d. During sudden exertion, there is increase in intraperitoneal pressure, and due to obliquity of inguinal canal, pressure compresses anterior and posterior walls of the canal and occludes the canal.

3. Shutter Mechanism

When the abdominal muscles contract, it raises the intra abdominal pressure. The internal oblique and transverse abdominis contracts and thus lower fibers forming the musculo aponeurotic conjoined tendon that arches over the spermatic cord also contracts and the arch straightens out and descends to lie next to or on the inguinal ligament covering the fascia transversalis. The shutter also passes in front of the deep inguinal ring and counteracts the intra abdominal

pressure on the ring. Contraction of the transversus abdominis muscle pulls and tenses the deep ring causing the ring to close like a sphincter around the cord.

4. Integrity of the Fascia Transversalis[37]

The ability of the fascia transversalis to withstand the elevation in intra abdominal pressure is determined by the state of collagen fibers present in these tissues and give them strength. The factor that determine normal production of collagen or causing its increased destruction or abnormal production will decrease the strength of transversalis fascia. These include congenital connective tissue disorders like Marfan's , Ehlers-Danlos, Hurler-Hunter syndromes and metabolic defects. It is found that cigarette smoke inactivates anti-proteases collapsing the protease/antiprotease system thus responsible for the destruction of elastin and collagen of the rectus sheath and fascia transversalis, predisposing to herniation in smokers.

5. General Contributing Factors

Muscle wasting due to advancing age, lack of physical exercise, obesity and multiple pregnancies. Pulmonary diseases like COPD and emphysema. Chronic constipation, prostatomegaly, genitourinary causes like cystocele, cystitis and urethrocele contributes to groin hernia. Other causes Loss of weight and body fitness due to illness, operation or prolonged bed rest, unduly long transverse abdominal incisions for gynecological, urological and appendicectomy incision.

Components of Inguinal Hernia[28]

1. The sac consists of

Mouth: between the sac interior and abdominal cavity.

Neck: narrowest section- between the mouth and the body of sac.

Body: inbetween the neck and the fundus.

Fundus: blind end of the distal part of the sac

2. Contents of Hernia

The commonest are:

Fluid - in congenital hernias.

Omentocele (Synonym-Epiplocele)

Enterocele (Intestinal loops).

A part of circumference of the intestine- Richter's hernia

A part of the urinary bladder wall or its diverticulum

Ovary with or without Fallopian tube.

Meckel's diverticulum known as Littre's Hernia.

Two loops of intestine forming a W - Maydl's hernia.

Rarely stomach, spleen or caecum may be found.

Sliding Hernia (Contents - Caecum. Urinary bladder).

Dual hernia (saddle or pantaloon).

3. Coverings[32]

Coverings in an indirect inguinal hernia from inside out is as follows:

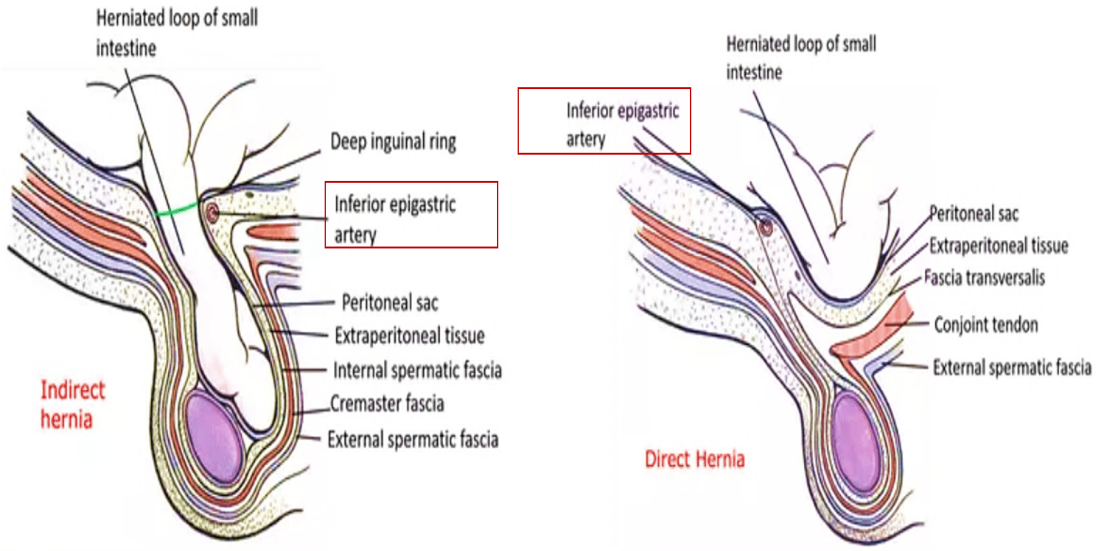


Fig-18. Coverings of inguinal hernia - indirect and direct

CLASSIFICATION OF INGUINAL HERNIAS[34,39]

Clinical Classification

BASED ON THE CLINICAL PRESENTATION OF HERNIA

Reducible hernia

Irreducible hernia

Inflamed hernia

Obstructed hernia (Incarcerated hernia)

Strangulated hernia

Gilbert's Classification (Addition by Rutkow and Robbins)

BASED ON ANATOMICAL AND FUNCTIONAL DEFECTS

Established intraoperatively and is categorized into 7 types.

Type, 2 and 3 were indirect hernias whereas type 4 and 5 are direct hernias

Indirect Hernia

Type 1: Snug deep inguinal ring, intact canal floor

Type II : One finger breadth deep inguinal ring with intact canal floor.

Type III: Two-finger breadth deep inguinal ring with defective Canal floor (Scrotal and sliding hernias)

Direct Hernia

Type IV: the Entire canal floor is defective, with no peritoneal sac found anteriorly and deep inguinal ring is intact

Type V : Diverticular defect, admit not more than one finger. deep inguinal ring is intact

Type VI : Consists of both indirect and direct components

Type VII: femoral hernia.

Nyhus Classification of Groin Hernias

BASED ON ANATOMICAL CRITERIA

(focus on functional state of posterior wall and the deep inguinal ring)

Type I: Indirect inguinal hernia with a normal deep inguinal ring (Congenital hernia)

Type II: Indirect inguinal hernia with dilated deep inguinal ring. posterior wall intact, inferior epigastric vessels not displaced.

Type III: Posterior wall defects

A .Direct inguinal hernia.

B. Indirect inguinal hernia - dilated deep inguinal ring, medially encroaching the transversalis fascia at the Hesselbach's triangle. (eg massive scrotal, Sliding or Pantaloon hernias)

C. Femoral hernia.

Type IV: Recurrent hernias

Classification based on Patency of Processes Vaginalis

Vaginal hernia

Funicular hernia

Infantile hernia

RINA DAVID TDS CLASSIFICATION

Type

Anteromedial (direct)

Anterolateral (indirect)

Posteromedial (femoral)

Posterolateral (perivascular)

Anatomical Classification

a. direct inguinal hernia

b. Indirect inguinal hernia

c. Femoral inguinal hernia

Classification based on the Descent of the hernial Sac

A. Complete

B. Funicular

C. Bubonocele

CLINICAL FEATURES OF INGUINAL HERNIA[40,41]

History

Age: Inguinal hernias present at any age. They may be present at birth or may appear suddenly at 80year old. Peak times of presentation are in the late teens and early 20's and between 10years and 60 years. Young individuals usually present with indirect inguinal hernias but direct are seen in elderly. Males are more affected than females (20:1). Occupation involving Heavy work, weight lifting, etc increase the risk of herniation as they causes strain on the abdominal musculature. If there is an underlying weakness pre-existing, then the appearance of a hernia may coincide with the strenuous physical effort, and sportspersons are more prone. Mostly, hernia is due to diseases that cause weakness of the anterior abdominal wall musculature (example obesity, ascites, previous lower abdominal operations and Malgaigne's bulges). Certain diseases increase the intraabdominal pressure such as prostatomegaly, chronic cough, respiratory diseases, and stricture urethra.

Local symptoms

The commonest symptoms along with pain are discomfort and heaviness in the initial stages. The patient complains of dragging pain or aching sensation in the inguinal region, that worsens as the day pass by.

Lump

Lump in the groin is the second most common complaint. This may be small or huge going downwards. Patient feels that it is relieved on lying down and aggravates on straining or standing.

Systemic symptoms

In obstructed hernias, the patient complaints of cardinal symptoms of intestinal obstruction like: colicky abdominal pain, vomiting, abdominal distension and obstipation. In late cases of strangulation, where gangrene has set in, patient may present with peritonitis, more often if perforation has occurred.

Signs

Inspection:

In standing position, a bulge or swelling is seen in the groin. This may disappear on lying down. if the hernia is spontaneously reducible then cough Impulse is present. In large inguino-scrotal hernias loss of rugosities of scrotal skin is seen. Visible peristalsis is seen in enterocele. Malgaigne's bulges are observed in patients with a lax abdominal wall. An indirect hernia is in the shape of sausage or pear and lies parallel to inguinal ligament. It is more laterally placed and runs down to the scrotum. A direct hernia is usually round and medially placed, bulges forward and not rech the scrotum. After reduction it reappears in the same forward direction

Palpation

Reducing and manipulating the hernia is known as taxis. This is performed in the lying down position. As the hernia is being reduced the following features are noted:

a. Gurgling sound is felt in the enterocele

b. The enterocele (first part) takes longer to reduce than the omentocele (later part)

c. Expansile cough Impulse is felt.

Internal Ring Occlusion Test

Deep ring is occluded and the patient is asked to cough, a bulge appears medial to the occluding finger. This is a direct inguinal hernia. Viceversa is an indirect hernia. Ring Occlusion Test: After taxis the deep ring is occluded with the finger and patient is asked to stand up gently. The reducible inguinoscrotal welling will not descent as it is prevented by occluding finger, whereas in a scrotal swelling, fills gradually from below (varicocele and lymph varix).

Finger Invagination Test

After reduction of hernia, the skin is invaginated from bottom of the scrotum using the little finger, which is pushed upwards to palpate the pubic tubercle and pushed further into the superficial inguinal ring. Normal ring admits only the tip of a finger. When the finger enters the ring, it goes directly

backwards in direct hernia and it goes upwards, backwards and outwards in indirect hernia. The finger is again rotated so that the pulp faces back and The patient is asked to cough. The impulse is felt on the pulp of the finger if the hernia is direct. The impulse is felt on the tip, if it is a indirect hernia.

Percussion

Percussion on the swelling if tympanic, then it is an enterocele. If percussion is impaired or a dull note in case of omentocele

Auscultation

Bowel sounds are heard in enterocele

Always examine

1. External Genitalia

- Scrotum- look for thickened spermatic cord,
- Epididymis and Testes
- Prepuce for phimosis and External urethral meatus for pinhole meatus

2. Per Rectal examination

3. Per Abdomen Examination: To rule out any presence of abdominal mass, ascites and Divarication of recti

4. Respiratory System: To watch out for COPD

Differential Diagnosis of Inguinal Hernia

I. Incomplete swelling - inguinal or a groin swelling

a. Femoral hernia.

b. Enlarged Inguinal Lymph Nodes.

c. Femoral Aneurysm.

d. Saphena Varix or Lymph Varix

e. Encysted Hydrocele of the Cord

f. Lipoma of the Cord

g. Undescended Testis or Ectopic testis

h. Malgaigne Bulge

i. Spermatocele

j. Psoas Abscess

2. Complete swelling - inguino-scrotal swelling.

a. Infantile Hydrocele

b. Congenital Hydrocele.

c. Encysted Hydrocele of the Cord.

d Varicocele

COMPLICATIONS OF GROIN HERNIA[42]

a. Irreducible hernias

b. Incarceration

c. Reduction-en-masse

d. Strangulation

e. Gangrene

f. Peritonitis -perforation of the intestinal wall

g. Malignant mesothelioma (rarely).

INVESTIGATIONS[43,44,45]

Laboratory and radiological tests are of limited use in diagnosing a inguinal hernias. Routine laboratory investigations like blood Hemogram, urine routine, blood urea and serum Creatinine are done before taking the patient for Surgery. X-ray abdomen (Plain X-ray erect abdomen) may reveal the patterns characteristic of intestinal obstruction (air-fluid filled loops of intestine). Other investigations such as Ultrasound abdomen show any obstructive urinary outflow diseases and Chest x-ray to rule out pulmonary pathology before surgery.

Herniography

It is used in patients with unexplained groin pain, nonpalpable swellings with symptoms of hernia, and in recurrence. Technique is described by Gullmo.

With a 20 to 22 gauge Veress needle a puncture is made in the midline below the umbilicus. The catheter is guided through this into the lesser pelvis and 50 to 80 ml of contrast is injected via this. As the patients turns from side to side, the contrast pools in the inguinal region. With the current techniques now available, there is no indication for herniography, even if the complication rate is low.

TREATMENT OF INGUINAL HERNIAS[46,47,48]

Aim of treatment of inguinal hernia is to expose the defective site, correct the anatomical defect, strengthen or reinforce the defect in the posterior wall of the inguinal canal. Treatment is essentially surgical, exceptionally conservative, where efforts are made to keep the hernia in reduced state clinically, till the time patient becomes fit for surgery .

TYPES OF SURGICAL TREATMENT FOR INGUINAL HERNIA

Herniotomy: This is the basic operation and it deals with dissecting out and opening the hernial sac, reducing the contents and transfixing the neck of the sac and removing the remainder. It is is the first step in herniorrhaphy or hernioplasty. Herniotomy is sufficient for the treatment of congenital hernias in infants and adolescents. In High herniotomy, the sac is removed at the level of deep inguinal ring.

Hernioraphy: refers to the strengthening or reconstruction of the posterior wall of the inguinal canal.

Hernioplasty: is the addition of grafts or prosthetics to herniorrhaphy (Reinforcement)

Bassini's Repair : This classical operation was first described by Bassini in 1888

Indications

1 Indirect inguinal hernia in healthy young adults with good musculature, in whom the deep ring is not stretched and Adults in whom the internal ring is stretched

2. Suitable for large indirect inguinal hernia in which the internal ring is stretched and posterior inguinal wall is distorted

Aim of the operation is to narrow the deep ring and to reinforce the posterior wall of the inguinal canal with conjoint tendon

Technique: Simple herniotomy is done. The lower part of the conjoint tendon and upper surface of the inguinal ligament are carefully cleared off soft tissue. The muscle and tendon are lifted and 4 to 5 stitches are made at about one centimeter interval between conjoint tendon and the inguinal ligament at medial end of the canal (site of maximum recurrence). To make sure of closing the medial gap the first bite is taken through the periosteum of the pubic bone. The stitches should be introduced at different depths into the inguinal games in order to avoid splitting of the inguinal ligament along the suture line. Care should be

taken not to injure the Iliac vessels, that lie immediately deep to the inguinal ligament. Prolene is usually used. It is particularly important that the stitches are not too tight and to avoid the iliohypogastric nerve. The conjoint muscle should lie around the deep ring. Care should be taken not to tie the suture under tension. The cord is placed over the strengthened posterior wall and external oblique aponeurosis is closed with interrupted or continuous suture. The skin wound is sutured

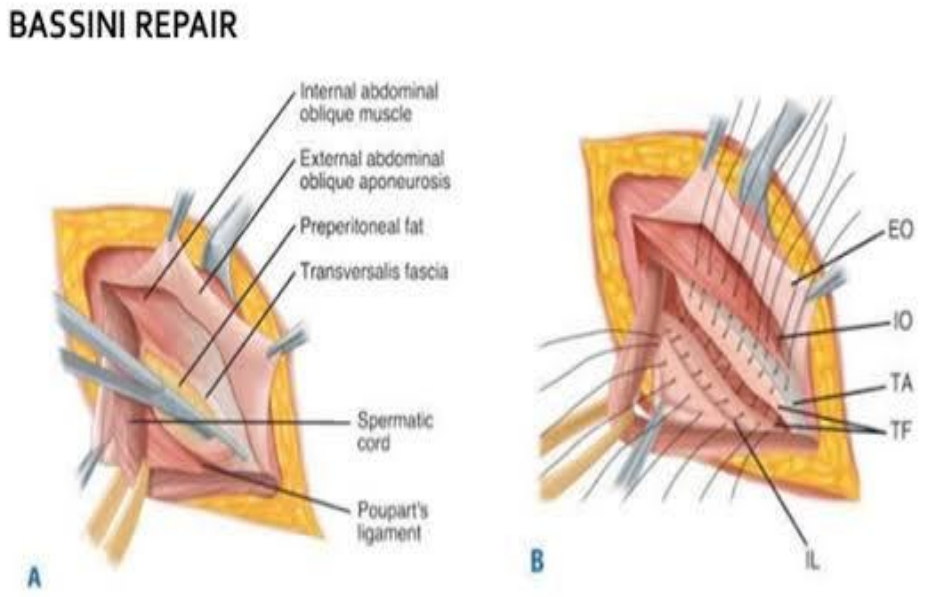


Fig.19 Bassinis repair

The dawn Shane and Ryan working with Shouldice at his hernia clinic, developed a hernioplasty identical to Bassini procedure. In this, the transversalis fascia is not incised, but is imbricated with a continuous sutures of at least two layers, approximating identical aponeurotic layers between conjoint tendon and

the inguinal ligament. The darning is conducted from pubic tubercle up to and above the deep ring and back to the starting point. It is kept fairly loose in such a way that it forms a lattice onto which fibrous tissue is laid down. It does not draw tissues together and there is no tension in the stitches.

Shouldice operation [42,49,50]

The Shouldice method of hernia repair was described by Shouldice of Toronto. It is the most popular of all techniques that use the local tissues. It is basically a multilayered Bassini's operation. In Shouldice hospital all repairs are done under local anesthesia. After herniotomy is done, the posterior wall repair done by four layers using non absorbable 2-0 prolene. The first line of the repair is started from pubic tubercle just medial to the deep ring, approximating the upper and lower flap of transversalis fascia. The second line of repair is in the reverse direction. The third line of the repair is commenced just medial to the deep ring. Above, it is internal oblique muscle and below, the undersurface of the external oblique aponeurosis close to the inguinal ligament. The fourth line of the repair: Returning from the pubic bone, this one is the structures of third line of repair to one another by taking down as much of the lower flap as desired over the aponeurotic and muscle surface above. Followed by Closure of External oblique aponeurosis. The new external ring is higher and further lateral. The subcutaneous tissue and skin is closed separately.

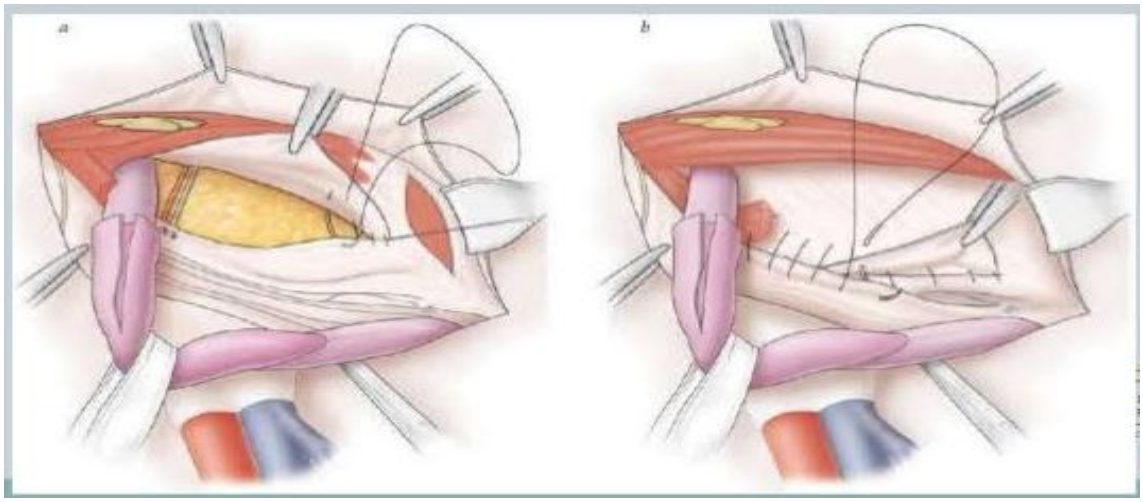


Fig. 20 Shouldice repair (a and b)

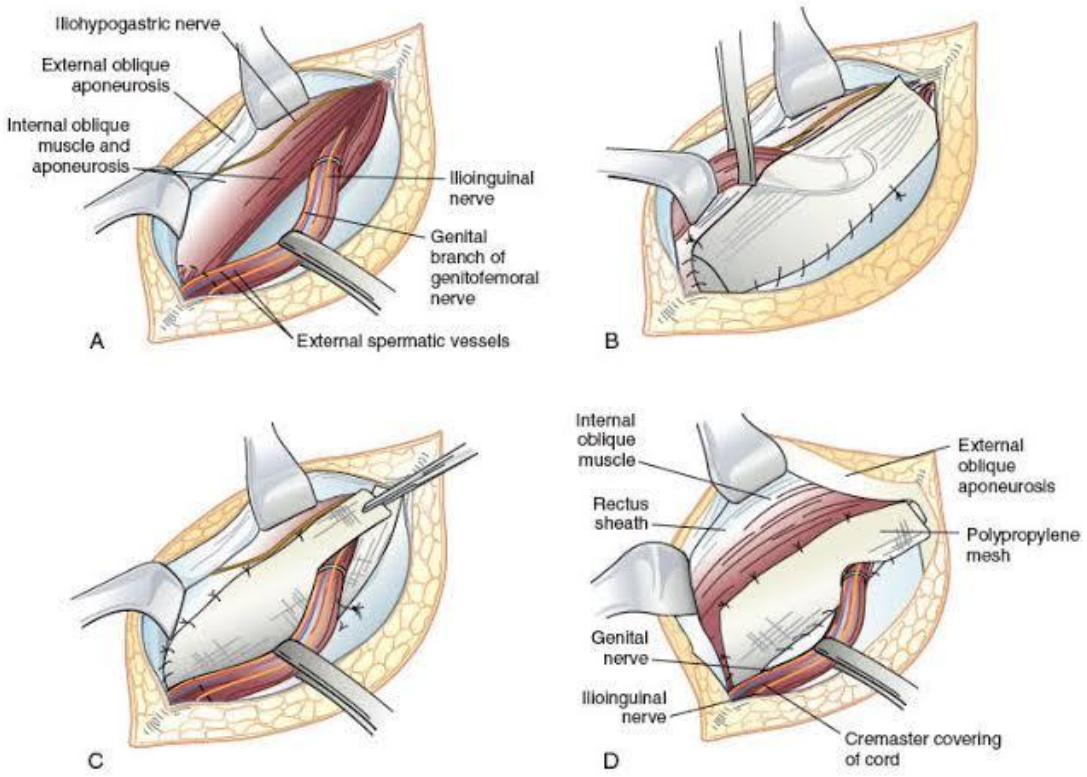


Fig.21 Lichtenstein tension free mesh repair

Fig.22 Polypropylene mesh

In 1984, Lichtenstein described a "tension free" onlay mesh repair for inguinal hernias. In Lichtenstein repair all primary direct and indirect hernia without the closure of defect. Operative technique: A transverse skin incision is made and deepened down to the external oblique aponeurosis. The spermatic cord is mobilized as usual. Direct sacs are reduced and imbricated using a non absorbable suture to flatten the posterior wall bulge. Indirect sacs are dissected from the cord sructures till the pre peritoneal pad of fat and then either excised or reduced. High dissection, rather than high ligation, is the most important feature of this repair. If deep ring is widened, a cone of mesh is inserted and anchored, usually in the superolaterally direction and sometimes in the inferior direction to the inguinal ligament by two to three non absorbable sutures. Inguino Scrotal sacs are transected in the inguinal canal and the proximal portion is closed and dealt separately, while the mouth of distal portion is left undissected, but is wide open.

Onlay mesh:[52,53]

A polypropylene mesh is anchored along its lower border to the pubic tubercle, lacunar and inguinal ligament to beyond the deep ring with continuous sutures (monofilament 3-0 polypropylene). The medial border is anchored to the rectus sheath,. The superior border is tacked to the internal oblique aponeurosis or muscle with few interrupted sutures, while care is taken to avoid injuring or entrapment of the iliohypogastric nerve. A slit is made at the lateral end thus creating two fish tails, 2/3rd above and1/3rd below. The lower border of the two tails encircle the cord and are fixed to the shelvingin of inguinal ligament. This creates a new deep inguinal ring made of mesh. The patch on the lateral side is trimmed such that approximately 3-4 cm of mesh is left beyond the internal ring. The wound is closed in a routine manner with absorbable material and subcuticular sutures.

Gilbert's sutureless Repair.[54]

Arthur L. Gilbert (1992) described suture less repairs of small and medium sized indirect herniations. The repair was performed by creating one swatch of the polypropylene mesh into an umbrella plug, which is placed through and immediately deep to deep ring. The second swatch is placed as an overlay graft covering the canals posterior wall with a slit in the upper part, under and around the spermatic cord

The Mesh Plug Hernioplasty [55](Robbins and Rutkow Repair)

This method was used to treat all groin hernias, both primary and recurrent. In indirect inguinal hernia, after high dissection of the sac is done, the sac is simply placed back through the deep ring into the abdominal cavity. A mesh plug is inserted with the tapered end first through the internal ring and placed into the correct position just beneath the crurae. The plug is fixed in place by interrupted 3-0 vicryl.

Giant prosthetic reinforcement of visceral sac (GPRVS or Stoppa)

Stoppa's original description of this technique was applied to a single groin hernia under local anaesthesia. The essential features of GPRVS is to reinforce the transversalis fascia in the groin by using a large prosthesis that extends far beyond the myopectineal orifice of Fruchaud. The prosthesis envelopes the visceral sac, held in place the by intra-abdominal pressure and later by the connective tissue that grow. The mesh adheres to the peritoneum and makes it inextensible thus it cant protrude through the parietal defect. GPRVS is also a suture less and tension-free technique.

GPRVS directly provides access to the pre-peritoneal space via a transabdominal incision and provides access to the parietal defect of hernia without dissecting the inguinal canal, spermatic cord, and sensory nerves of the groin.The recurrent rate of primary inguinal hernia repair is 0.7% and for recurrent inguinal hernia repair is 0.8%

Laparoscopic Inguinal Hernia Surgery[9,10,43]

Though the laparoscopic approach is not minimally invasive, it has several advantages. reduced postoperative pain and disability are some of those. The femoral and inguinal areas can be inspected and repaired bilaterally in a single sitting. In patients with recurrent hernias It avoids previous operative site, thus decreasing the risk for nerve injury or ischemic orchitis. The disadvantages are the violation of the peritoneal cavity, general anaesthesia and the cost. In some patients general anaesthesia is contraindicated. For others, it is too invasive a procedure (laparoscopic procedure). Although many different techniques of laparoscopic hernia repair are available, only two types of laparoscopic inguinal herniorrhaphy are used in common. These are:

1. Transabdominal pre peritoneal (TAPP)

Presently, this is the most frequently used technique. Diagnostic laparoscopy is done prior to detect the presence of any hernia. Peritoneum is incised transversely just above the hernial defect and a using instruments placed intra abdominally via accessory ports, a complete dissection of pre-peritoneal space is accomplished. During the course of this pre peritoneal dissection, direct sacs are reduced and indirect sacs are either dissected from the cord structures or reduced or divided circumferentially at the deep inguinal ring, leaving the distal sac in its place. Prosthetic mesh required for TAPP. A large piece of polypropylene mesh measuring 16x12cm is usually used to cover the

myopectineal orifices that includes all three spaces- direct, indirect and femoral hernia spaces.The prosthesis is either simply placed over the cord or slot to accommodate the cord structure or according to surgeon's preference. Finally mesh is stapled in position using the following landmarks

a. Medially pubic Symphysis

b, Transversalis fascia Superiorly

c, An arbitrary point approximately 1 cm medial to ASIS Laterally

d. Cooper's ligament Inferomedially

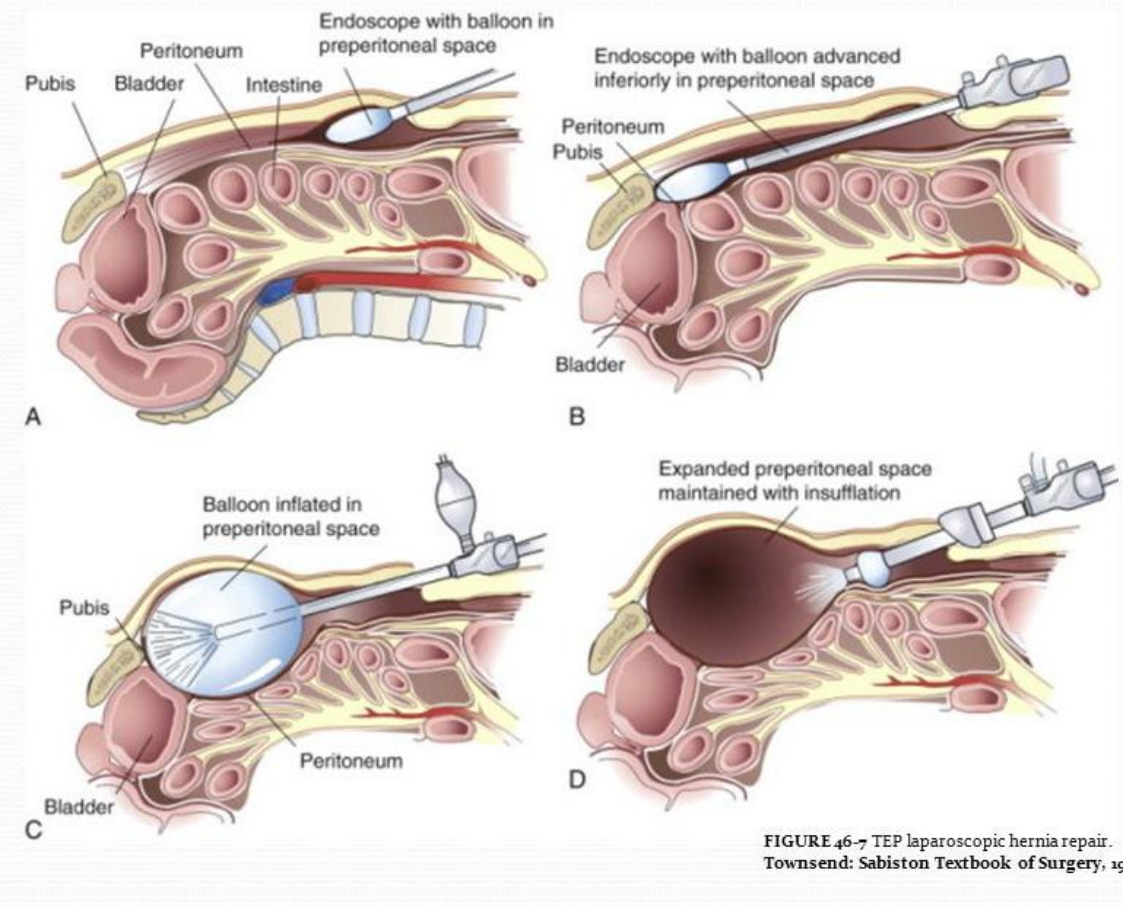
e. Iliopubic tract Inferolaterally

It is the preferred technique, in patients with lower abdominal wall incision, that may result in peritoneal adherence.

2. Totally Extra Peritoneal Herniorrhaphy (TEP)

This Approach is totally extra-peritoneal, that avoids bowel and vascular injuries and peritoneal adhesions. A 1.5 cm infra-umbilical incision is made and advanced until the rectus muscles are exposed. A tunnel is made between rectus muscles and the underlying pre peritoneal pad of fat by using retractors or by using balloon dissection device. The peritoneum is dissected of the posterior aspect of the rectus muscle and the symphysis pubis is exposed. Dissection is continued up till the iliac crest and the cord structures are inspected. If the indirect sac is present, then it is reduced. Polypropylene mesh is placed such that

it covers all three hernia orifices (direct, indirect, femoral and obturator). Two mirror image pieces of polypropylene mesh are prepared In case of bilateral hernia.



Fig,23 Laparoscopic hernia repair (TEP)

COMPLICATIONS OF INGUINAL HERNIA SURGERY[59,60]

The complications cannot be eliminated completely. They can be minimized by meticulous and precise surgical techniques.

INTRAOPERATIVE COMPLICATIONS

1. Haemorrhage
2. loss of sensations.
3. Nerve-entrapment by sutures
4. loss of testicular blood supply
5. injury to vas deferens
6. Damage to intestinal loops
7. Injury to urinary bladder
8. Transection of spermatic cord

Post operative complications[60]

GENERAL COMPLICATIONS

Systemic complication occur at rates comparable with that of complications that occur after other surgical procedures of the same magnitude. Atelectasis and pneumonitis were the most frequent ones, followed by thrombophlebitis and urinary infection.

Others

1. Scrotal Edema.
2. Swollen Testis.
3. testicular atrophy and Ischemic orchitis
4. Hydrocoele
5. Wound infection
6. Recurrence[49,61]- A weakness in the operation area necessitating further operation.

Both thorough anatomical knowledge and skilled technique are necessary for the successful hernial repair. Absence of tension in hernia repair is the most essential step in the success of repair. Recurrence, after 6 months are mostly due to factors other than technical error or selection of inferior procedure. Recurrence may also be due to decreased collagen synthesis. By supplementing the basic repair with additional support by prosthetic mesh, Prevention of recurrence is acheived. The overall recurrence reported is 10% for primary hernial repair and 25% for recurrent inguinal hernial repair.

Others: include urinary retention, Neuroma, Haematoma, Seroma, Sinus formation, sexual dysfunction, Numbness, paresthesiapersistent postoperative pain Groin pain The common causes of groin pain are neuroma, nerve entrapment and periostitis.

PHYSIOLOGY AND ANATOMY OF CHRONIC GROIN PAIN AFTER INGUINAL HERNIORRHAPHY

Pain is defined as "an unpleasant sensory and emotional experience with actual or potential tissue damage or described in terms of such damage by the International Association for the Study of pain.[58] chronic groin pain is defined as pain lasting for more than 3 months.Chronic groin pain can be Nociceptive or Neuropathic

Nociceptive pain: Nociceptive pain is a dull, burning or digging type of pain which is brought on by lifting or stretching. It is akin to ligament or tendon injury. It can be somatic or visceral in origin,and the nervous conducting system is intact A lot of these ents have nociceptive pain from sutures or staples in ligamentous structures 54

Neuropathic pain: Neuropathic pain presents as a jabbing, electrical, or brief, sharp pain may be provoked by movement or it may occur spontaneously. There is an wality in conduction. Neuropathic pain is subdivided into three sub groups:

- Peripherally generated
- Centrally generated
- Sympathetically maintained.

Classic causes of chronic pain are osteitis pubis and ilioinguinal nerve entrapment. The majority of chronic pain has been attributed to ilioinguinal nerve entrapment.

Postoperative pain is assessed using a 4- point verbal scale (none, mild, moderate severe) assigning numerical values of 0 to 3 Mild pain was defined as an occasional disturbance that did not limit normal routine activities of the patient.

Moderate pain- as pain that interfered with normal-day to day activities.

Severe pain- as pain that rendered the patient unable to perform normal activities.[11]

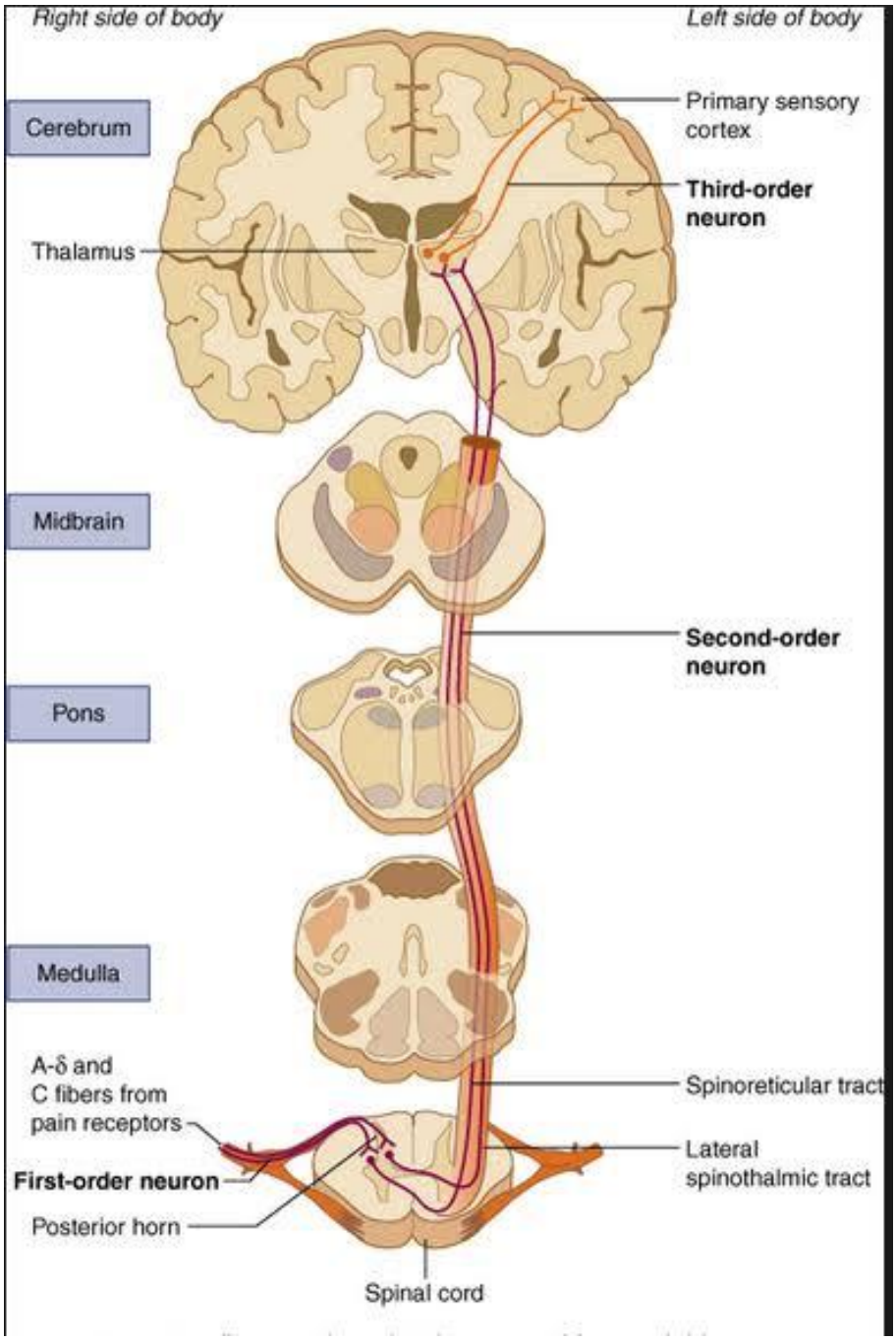


Fig-24 Physiology of Pain

Anatomic considerations

When the groin is explored via the anterior approach, one may encounter the ilioinguinal nerve, Genital branch of genitofemoral nerve, and Iliohypogastric nerve.

1. Ilioinguinal nerve(T12-L1)[61]

Emerges from behind the psoas muscle along with or just inferior to the iliohypogastric nerve. It passes obliquely across the quadratus lumborum muscle. perforate the transversus abdominis muscle near the anterior end of the iliac crest and then pierces the internal oblique muscle to run along the inguinal canal until it leaves by the external ring or by piercing the fascia just adjacent to the ring

Function: It provides motor function to the internal oblique and sensory innervation to upper medial thigh, upper scrotum and root of the penis in males, mons pubis and labia majora in females -It is the nerve that is classically described as the primary cause of chronic pain

2. Genitofemoral nerve (L1-L2)

Passes obliquely through the psoas muscle, exciting on the medial border of the L-4 spinous process It then passing behind the ureter and dividing superior to the inguinal ligament. The genital branch follows the external iliac artery, passes through the internal ning into the inguinal canal and innervates the cremasteric muscle and scrotal skin or labia majora and mons pubis.Lateral

femoral branch innervated anterolateral part of thigh iliohypogastric nerve (T12-LI) It emerges lateral to the psoas muscle and runs in front of quadratus lumborum muscle. the iliac crest it perforates and innervates the transversus abdominis muscle.

Anterior cutaneous branch runs between the transversus abdominis muscle and internal oblique muscle until about 2 cm medial to the anterior superior iliac spine, where it through the internal oblique muscle Jt then proceeds medially and pierces the external oblique aponeurosis above the external ring It innervates to suprapubic skin and gives branches to ilioinguinal nerve

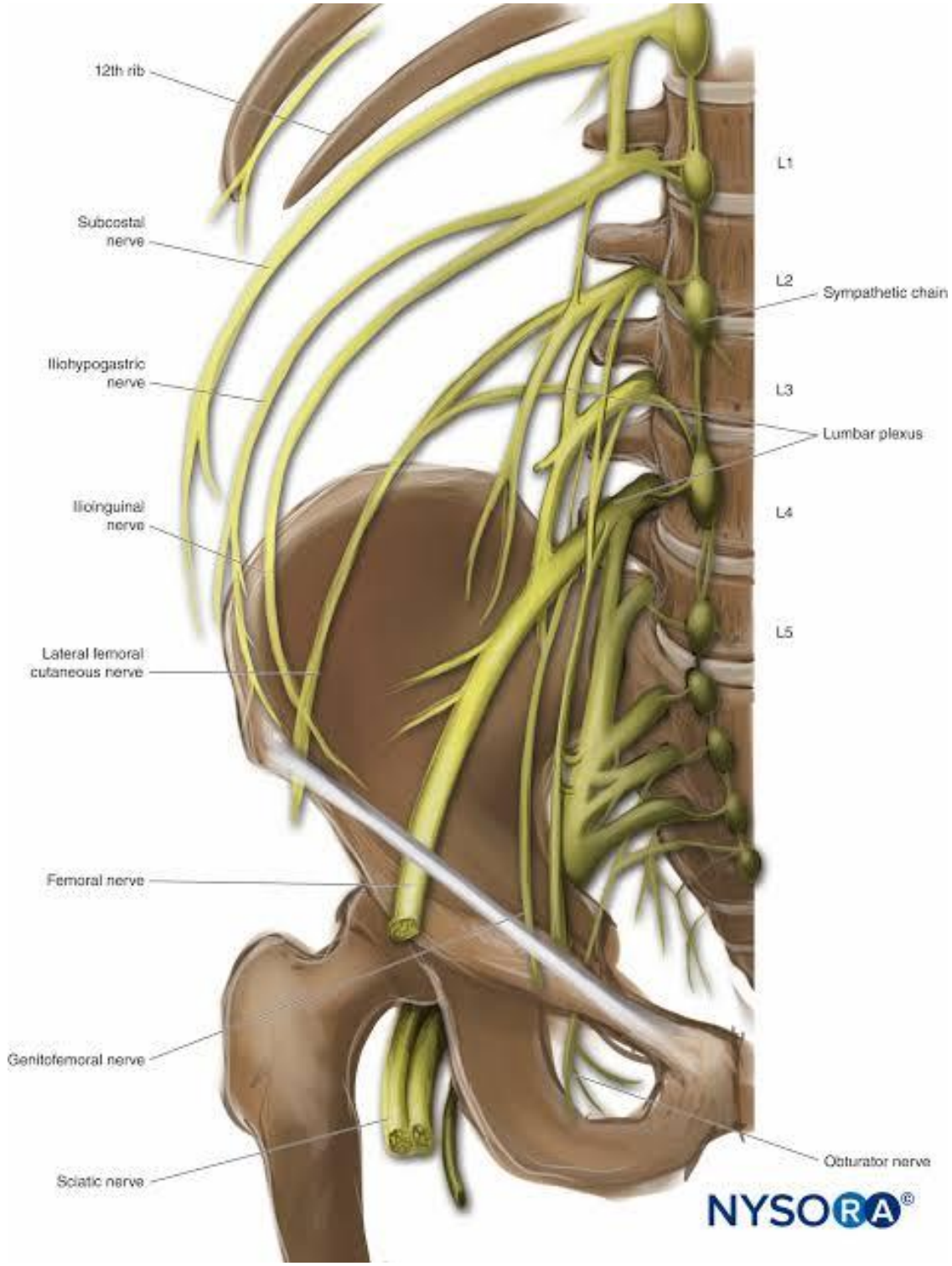


Fig.25 Lumbar Plexus

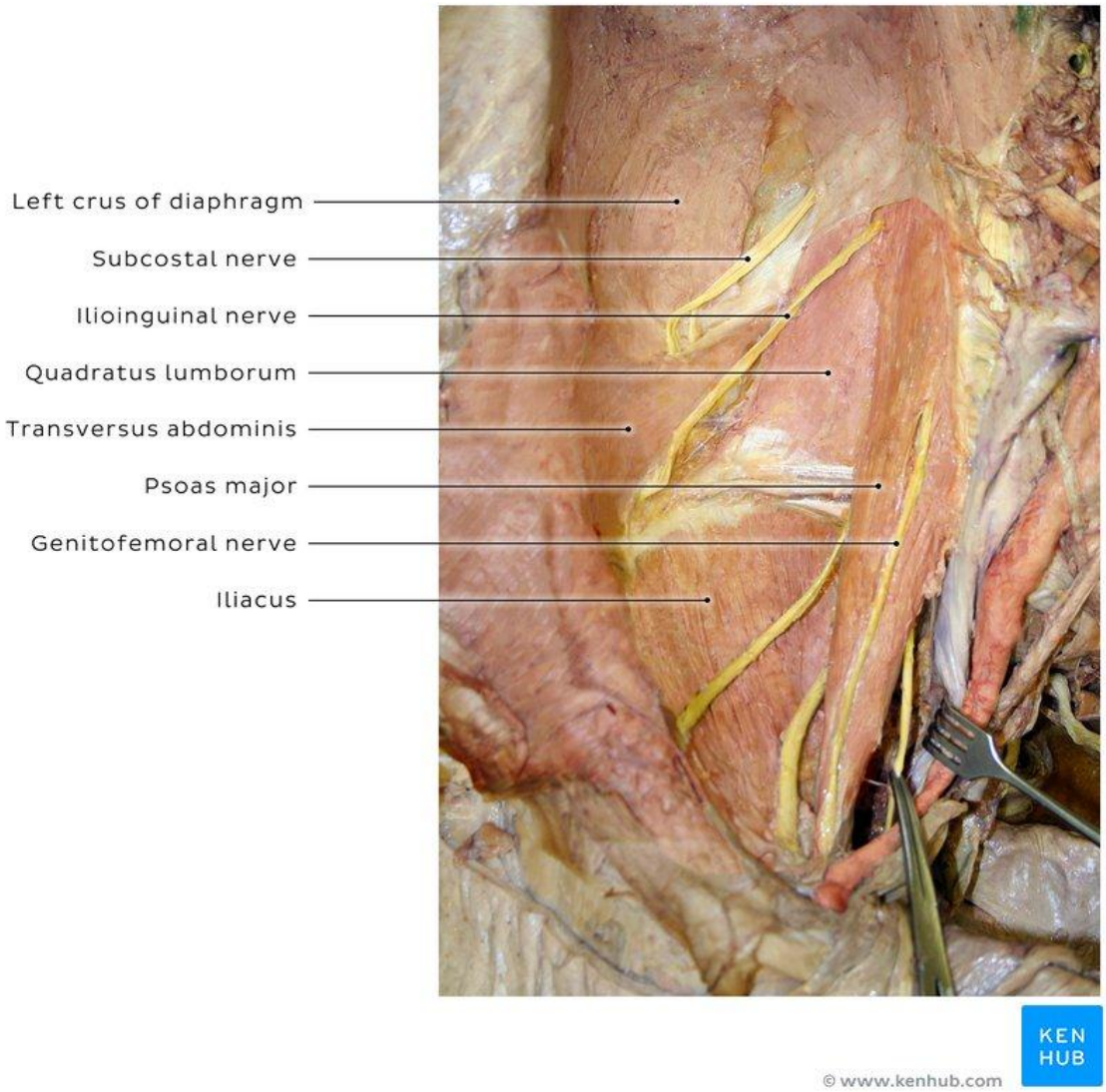


Fig.26 Ilioinguinal Nerve

Risk factors for chronic pain following herniorrhaphy.[34,64]

Preoperative pain may indicate complicated disease pathology prior to surgical intervention resulting in stretching, entrapment, or inflammation of inguinal nerves. It may also be due to psychological predisposition and lowered pain threshold among these patients, increasing potential for postoperative pain. Direct injury to nerves that results in either partial or complete transection can

lead to neuroma formation and contusion, crushing, cautery damage, suture compression can cause the subsequent development of chronic pain. The role of mesh has been implicated as well It has been demonstrated experimentally that when peripheral nerve tissue comes in contact with polypropylene mesh, myelin degeneration, edema, and fibrosis result and can lead to neuralgia and peripheral neuropathy[65]. The implantation of mesh, which induces scar formation through inflammation, also causes pain.

Avoiding chronic pain following inguinal herniorrhaphy[34,66,67]

Judicious clinical judgment advocate early intervention thereby minimizing this tential debilitating morbidity. Care must be taken to avoid placement of sutures at the medial insertion of the inguinal ligament so as to avoid excessive tightness of the inguinal ligament at pubic tubercle. Other measures include avoiding indiscriminate division of subcutaneous tissues, removal of the cremastic muscle fibres nor placement of sutures in the lower edge of the internal oblique muscle. It can also be prevented by avoiding making the external ring too tight. A study performed by Lichtenstein that investigated prevention of post herniorrhaphy neuralgia proposed that transection of ilioinguinal and genitofemoral nerve prove to be a useful solution. A double blinded RCT trial to investigate the effects prophylactic ilioinguinal neurectomy following tension free mesh repair of inguinal hernia was conducted with 100 male patients. They were randomized into two groups: Prophylactic ilioinguinal neurectomy of ilioinguinal nerve preservation. The findings demonstrated that

the incidence of chronic pain at 6 months was significantly lower compared with the nerve preservation group (8% versus 28.6% P-0008) And no significant difference was found in the incidence of neurosensory complaints, including groin numbness and sensory loss. However, it has been postulated that the sensory loss that may result following prophylactic neurectomy might be compensated for by cross innervation provided by cutaneous nerves from the contralateral side and, therefore the morbidity following neurectomy would be negligible[67]

Evaluating and treating the chronic pain[65-73]

Causes of chronic pain following inguinal herniorrhaphy can be divided into Neuropathic and Non neuropathic etiologies. The most common non neuropathic causes include excessive scar formation, hernia recurrence, and pressure from the bulk of the mesh. The neuropathic etiologies of chronic pain include nerve entrapment by sutures or staples and Neuroma formation with partial and complete transaction of the Neuropathic pain related to the genitofemoral nerve may result in testicular pain and labial pain in women in these patients thorough urological evaluation aimed at identification underlying testicular or epididymal pathology in men and careful gynecological examination in women also necessary Ultrasound is another potential diagnostic modality to help determine occult recurrence[70]. MRI also been used to detect recurrence, delineate mesh position, and demonstrate non hernia related causes of pain. By physical examination one can specifically elicit ilioinguinal nerve entrapment by

having the patient hyperextended and twist the trunk of the body opposite side of hernia repair[72].

Treatment modalities

1. Oral analgesics

2. Regional nerve blocks

3. Re-operation with mesh extraction, and Surgical neurectomy: The best surgical option to date may in fact be exploration with neurectomy and possible mesh removal.

On a reported series of 54 patients who underwent groin exploration with triple Neurectomy that included the ilioinguinal, iliohypogastric, genitofemoral nerves, 68% 62 were relieved of pain. This was confirmed in another study which demonstrated that triple neurectomy resulted in a 72% complete pain relief and 25% had partial relief. [72]

Fig.27 Right Inguinal Hernia

Fig.28 Bilateral Direct Inguinal Hernia

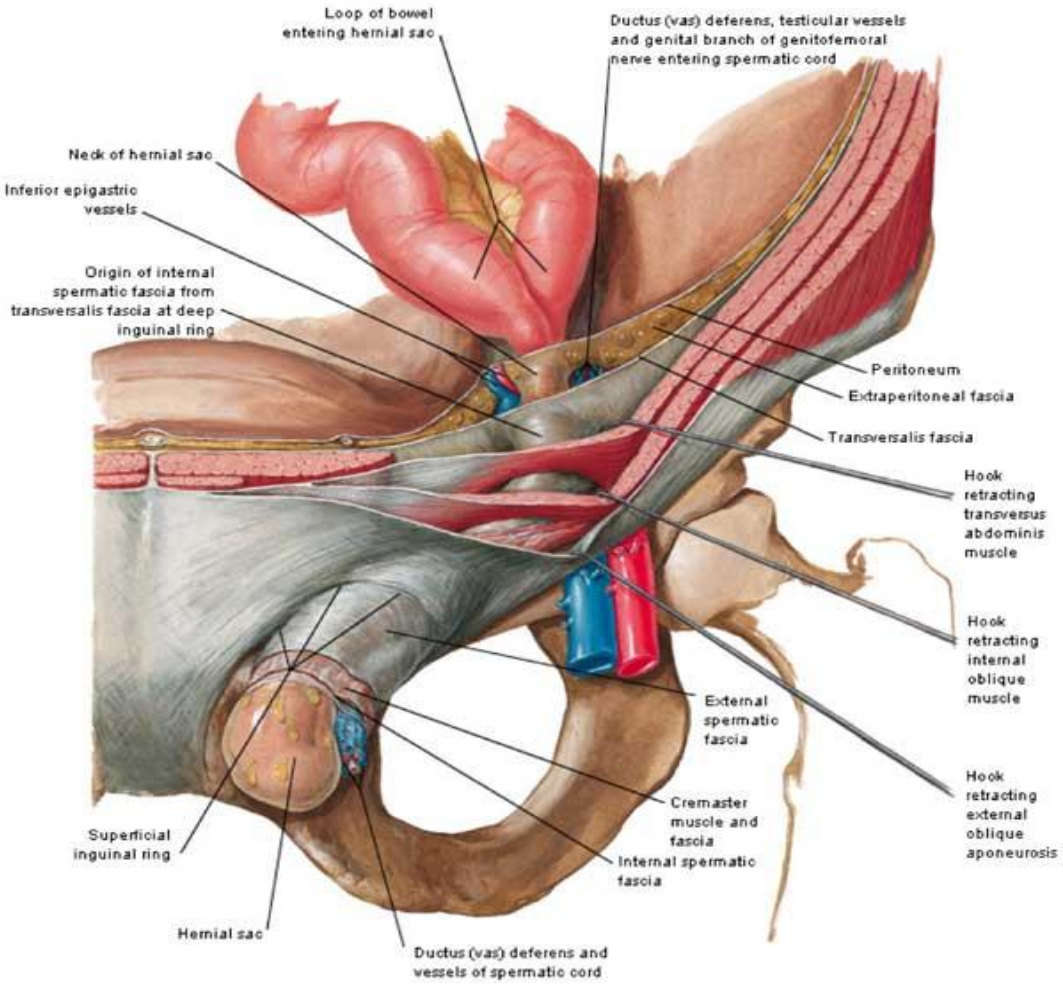


Fig.29 Hernial Sac With Indirect Component

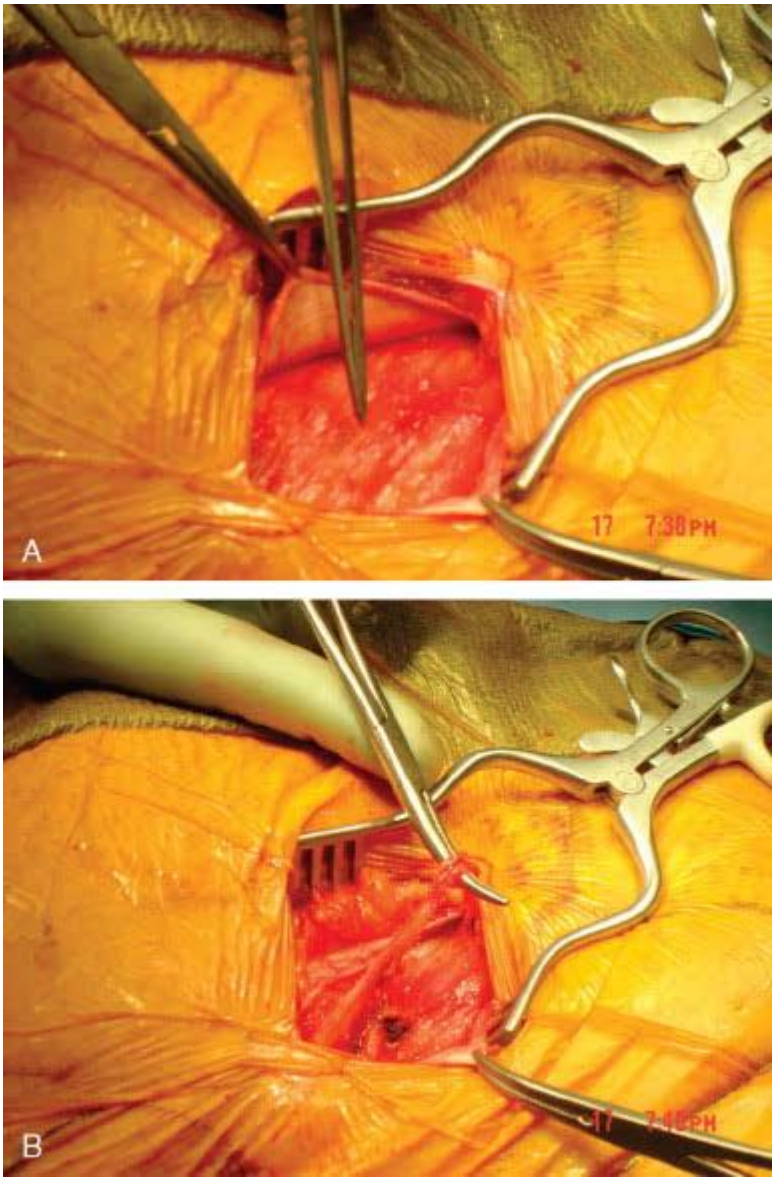


Fig.30 Ilioinguinal Nerve During Operation (A and B)

METHODOLOGY

Study design

Prospective comparative study

Study place

Chengalpattu medical college and hospital, Chengalpattu

Duration of the study

1 year (march 2018 to March 2019)

Study population

Patients admitted with uncomplicated inguinal hernia was taken as clinical material (both sexes) in the Department of General Surgery at Chengalpattu medical college and hospital, Chengalpattu.

Sample size: 46

Inclusion criteria

- ✓ Subjects admitted with uncomplicated inguinal hernia (Direct & Indirect).
- ✓ Both males and female patients included
- ✓ Above 18 years who can give valid informed consent

Exclusion Criteria

- ✓ Patients having Diabetes Mellitus
- ✓ Patients presenting with Recurrent Hernias
- ✓ Any Previous surgery in the inguinal region.
- ✓ Mesh allergy or Subsequent Hernia repair in the follow up period
- ✓ Any Previous history of trauma or pain in the inguinal region.

The data was collected in the prescribed "proforma" which contains the particulars of the patient, presenting history, clinical examination, diagnosis, relevant investigations and details of the surgery performed.

Sampling method

Systematic random sampling

FOLLOW-UP

Patients was being asked to review in surgery ward 1month and 3months after surgery and the study parameters was assessed.

PARAMETERS USED FOR COMPARISON

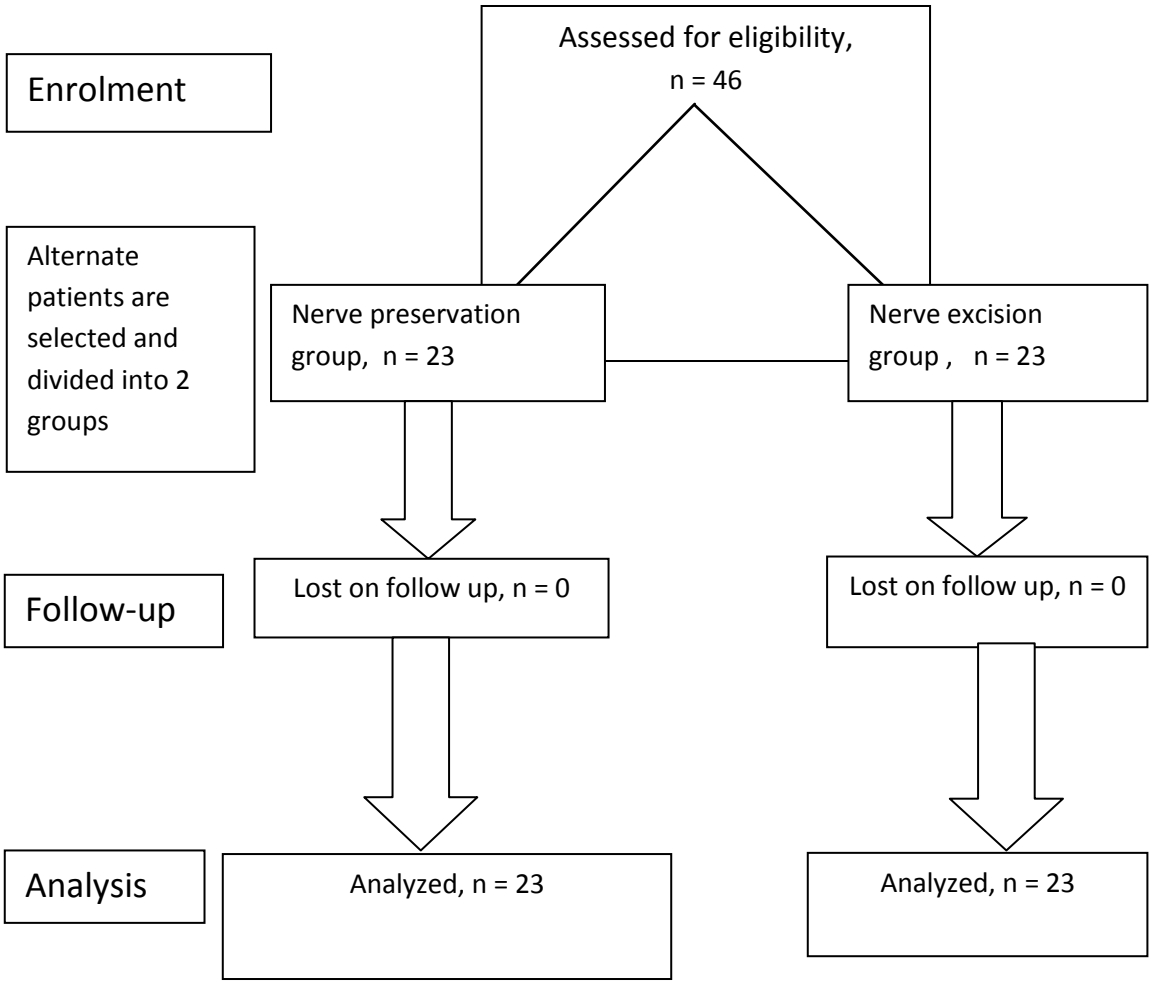
- ✓ Pain (by using the 4 point Likert scale).
- ✓ Hypoesthesia
- ✓ Numbness

Ethical clearance was obtained from the ethical committee, Chengalpattu medical college and hospital, Chengalpattu , prior to the conduction of this study.

STATISTICAL ANALYSIS

In this study the results of the two groups was compared and analyzed by using SPSS software version 15.

CONSORT DIAGRAM



RESULTS AND OBSERVATIONS

The Study on clinical outcome in preservation and elective division of ilioinguinal nerve on post operative groin pain, in open mesh repair of inguinal hernia" was conducted in Department of General Surgery at Chengalpattu Medical College and Hospital, Chengalpattu From march 2018 to March 2019

A total of 46 patients of uncomplicated inguinal hernia who underwent Lichtenstein mesh Hernioplasty included for this Prospective comparative study. group A -23 patients with nerve preservation and group B 23 -patients with nerve division were considered for this study

PATIENTS DEMOGRAPHY

Table - 1 Age at presentation

Age group (in years)	No of patients	Percentage (%)	Group A n = 23(%)		Group B n = 23(%)	
≤ 20	0	0	0	0	0	0
21 – 30	2	4.34	1	4.35	1	4.35
31 – 40	12	26.08	6	26.08	6	26.08
41 – 50	7	15.21	1	4.35	6	26.08
51 – 60	12	26.08	8	34.79	4	17.39
61 – 70	8	17.39	5	21.74	3	13.04
71 – 80	5	10.86	2	8.70	3	13.04

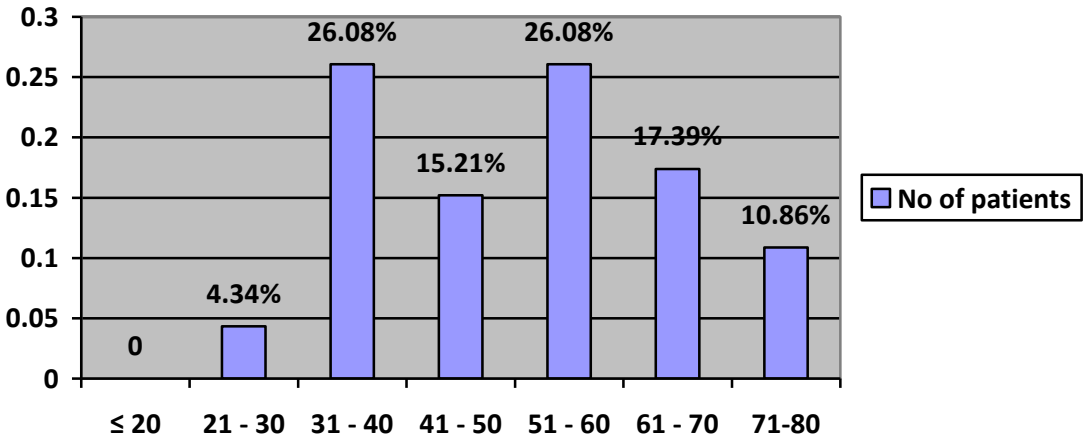


Fig.31 Age at presentation

In this study the age of the patients ranged between 23 years to 80 years. The youngest patient included in this study series was 23 years, and eldest was 80 years old. Almost 70% of the patients were in 41-80 age group. This includes 35% in group A and 30.4% in group B.

SEX DISTRIBUTION

Table - 2 (Sex distribution)

Sex	No. Of patients	Percentage
1. MALE	46	100
2. FEMALE	0	0

In this study we have no female patients.

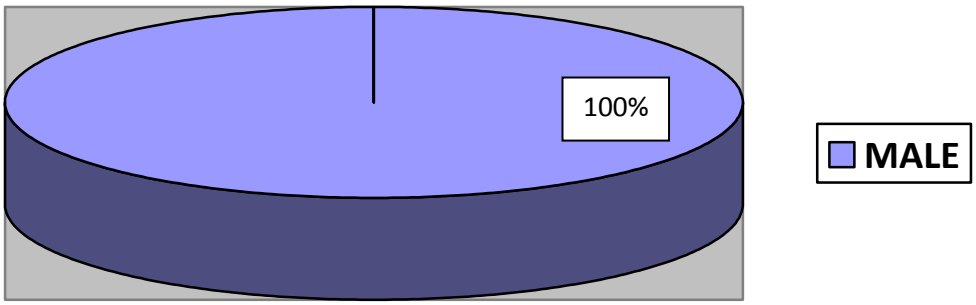


Fig-32 sex distribution.

MODE OF PRESENTATION

Table 3 - Mode Of Presentation

MOP	No. Of patients	Percentage
SWELLING ONLY	29	63.04
SWELLING WITH PAIN	17	36.9

Without exception all patients presented with swelling, of these 63.04% of presented with swelling only, while 36.9% of patients presented with swelling and Pain

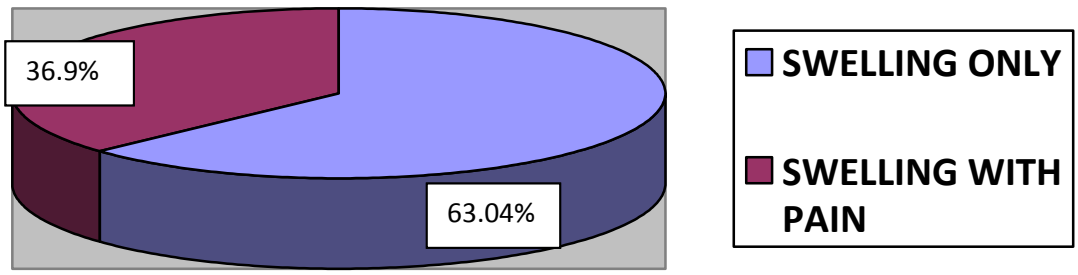


Fig-33 Mode of Presentation.

DURATION OF ILLNESS

Table 4 - Duration of Illness

Duration	No. Of patients	Percentage
1. < 6 MONTHS	6	13.04
2. 6 – 12 MONTHS	20	43.47
3. > 1 YEAR	20	43.47

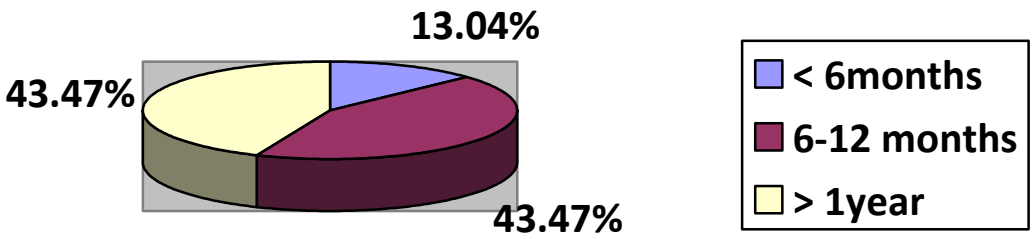


Fig. 34 Duration Of Illness

RELATION WITH OCCUPATION

Table 5 - Relation With Occupation

Occupation	No. Of patients	Percentage
1. HEAVY WORK	26	56.52
2. MODERATE WORK	5	10.86
3. LIGHT WORK	15	32.60

The present study shows that 56.52% patients were involved in heavy and strenuous work like Agricultural labor, Coolie & manual labor. 10.86% were involved in moderate work like teacher, driver & clerk. 32.60% of patients involved in light work.

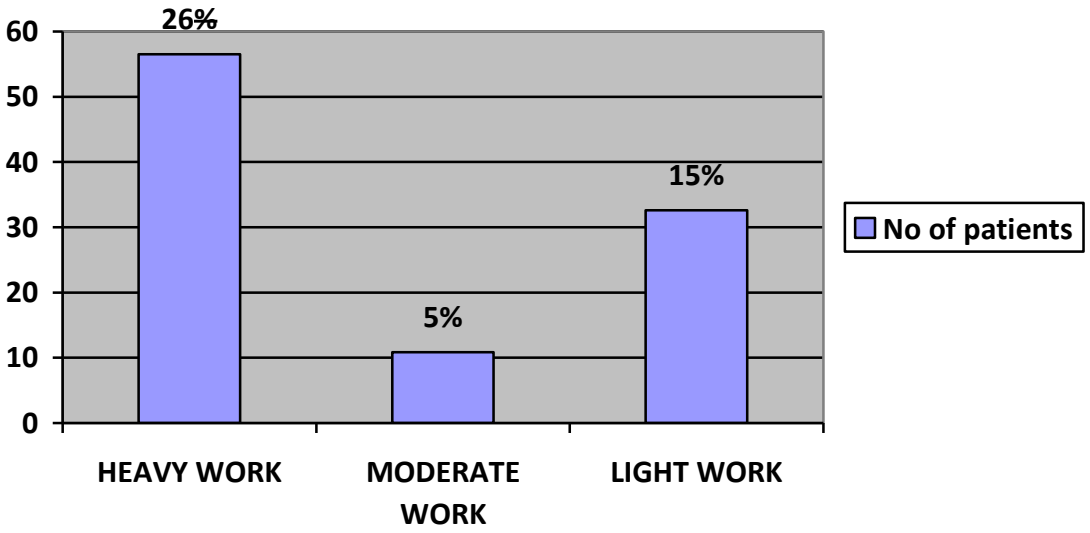


Fig.35 Relation With Occupation

PRE DISPOSING FACTORS (PDF)

Table 6 - Pre Disposing Factors

Factors	No. of patients	Percentage
BLADDER OUTLET OBSTRUCTION	9	19.56
CONSTIPATION	8	17.39
CHRONIC COUGH	7	15.21
SMOKING	17	36.95

In this study 19.56% of patients had bladder outlet obstruction, 17.39% had constipation, 15.21% suffered from chronic cough and 36.95% were smokers.

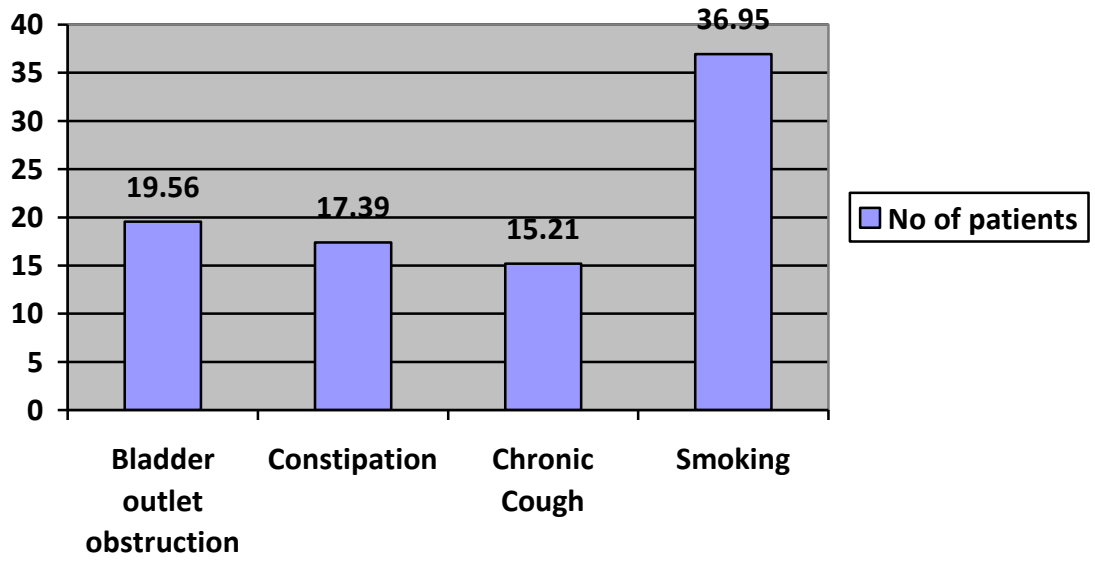


Fig.36 Pre Disposing Factors

LOCATION OF HERNIA

Table 7 - Location Of Hernia

Side	No. of patients	Percentage(%)
1. RIGHT	22	47.82
2. LEFT	21	45.65
3. BILATERAL	3	6.52

The present study showed that hernia was most common on right side in about 47.85%. hernia was left sided in 45.65% and bilateral in 6.52% of patients

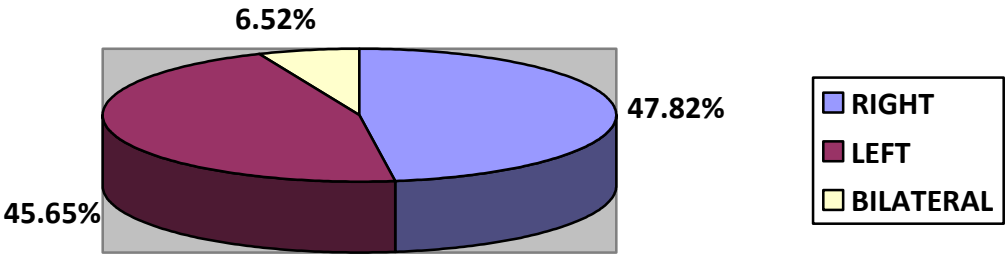


Fig-37-Location Of Hernia

TYPE OF HERNIA

Table 8 - Type Of Hernia

Type	No. Of patients	Percentage(%)
1. DIRECT	11	23.91
2. INDIRECT	35	76.08

In this study 35 cases were indirect inguinal hernia which contributed 76.08% . and 11 cases were direct hernia which contributed 23.91%

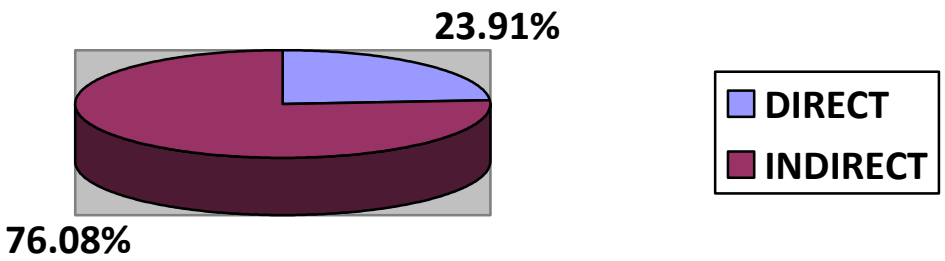


Fig.38 Type Of Hernia

Comparison of study groups

Table 9 - Comparison of study groups

	COMPARISON OF	NERVE PRESERVATION	NERVE DIVISION
1	**DEMOGRAPHY**		
	MALE	23	23
	FEMALE	-	-
	MEAN AGE	53.26±15.36	50.91±15.01
2	**MODEOF PRESENTATION**		
	ONLY SWELLING	13	16
	SWELLING + PAIN	6	11
3	**PRE DISPOSING FACTORS**		
	BOO	5	4
	CONSTIPATION	5	3
	CHRONIC COUGH	3	4
	SMOKING	10	7
4	**LOCATION OF HERNIA**		
	RIGHT	11	11
	LEFT	10	11
	BILATERAL	2	1
5	**TYPE OF HERNIA**		
	DIRECT	5	6
	INDIRECT	18	17

Nerve preservation group:

In the present study Preservation of ilioinguinal nerve during Lichenstein inguinal hernia repair was performed in 23 patients out of 46 patients with an mean age of 53.26±15.36 years which consisted only of male patients.

Out of the 23 patients, 13(56.52%) patients presented with only swelling in the groin, whereas 6(26.09%) patients presented with swelling with pain.

Of the 23 male patients, 5(21.74%) showed features of bladder outlet obstruction, 5(21.74%) had constipation, 3(13.04%) had chronic cough and 10(43.48%) were regular smokers.

Regarding the side, 11(47.85%) patients had a right sided inguinal hernia, 10(43.48%) had a left side inguinal hernia and 2(8.70%) presented bilateral hernias.

Of the 23patients, 5(21.74%) were direct inguinal hernia and 18(78.26%) cases were indirect inguinal hernia.

Nerve excision group

Routine excision of ilioinguinal nerve during Lichtenstein hernia repair was performed in 23 patients.

Of the 23 patients 16(69.57%) patients presented with only swelling in the groin, whereas 11(47.85%) presented with swelling with pain.

4 (17.39%) patients had bladder outlet obstruction, 3 (13.04%) patients had constipation, 4(17.39%) suffered from chronic cough and 7(30.43%) were smokers.

Of the 23 patients, 11(47.85%) had left sided inguinal hernia, 11(47.85%) had right sided inguinal hernia and 1(4.34%) had bilateral presentation.

6(26.09%) were direct hernia and 17(73.91%) patients had indirect inguinal hernia.

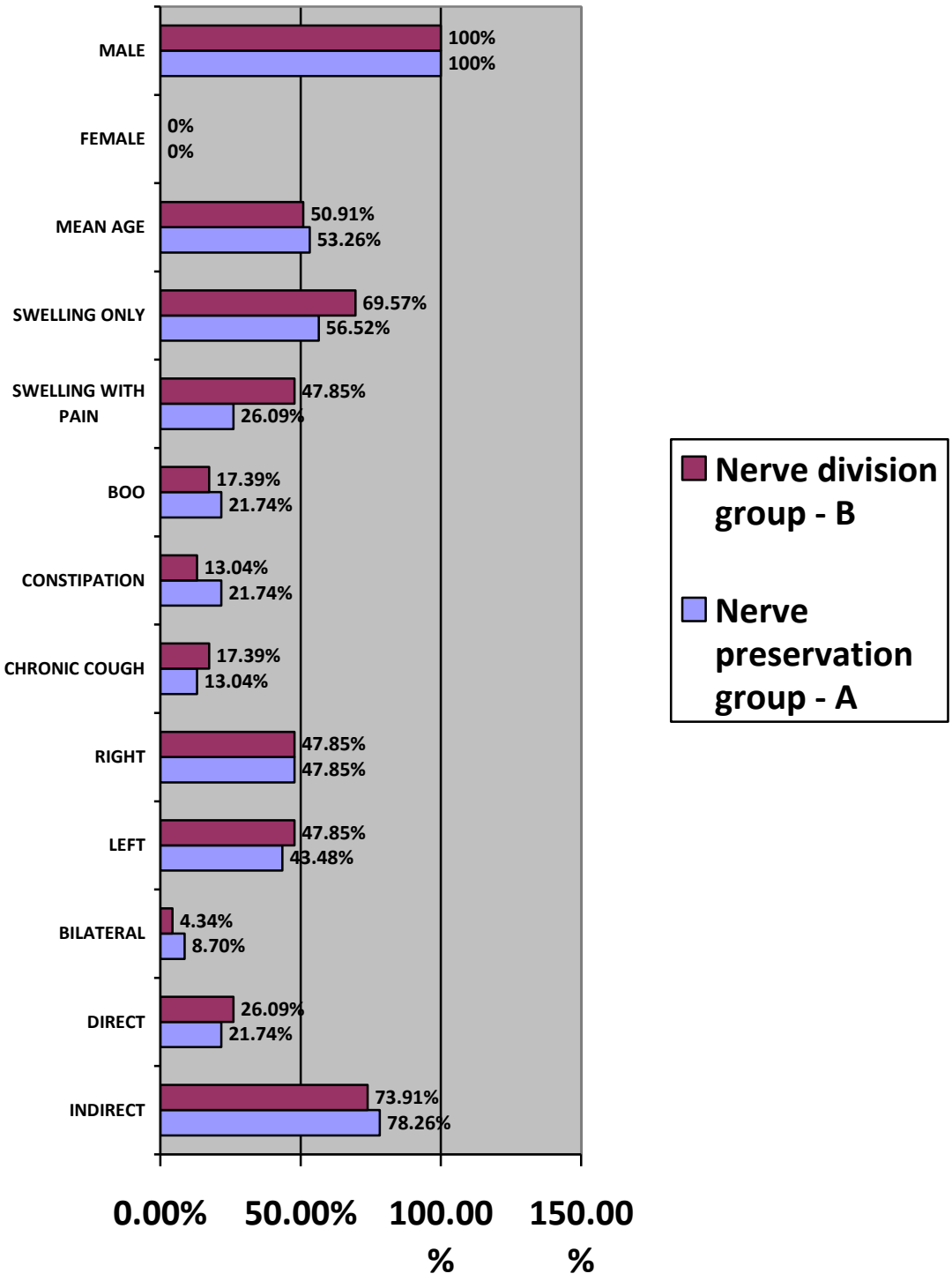


Fig.39 Comparison Of Study Groups

FOLLOW-UP

Post operative chronic groin pain, hypoesthesia and numbness has been analysed in two groups (A & B). At POD – 1 , at 1 month , at 3 months and results are compared with p value.

Table 10 - Incidence of post operative neuralgia

Follow-up at	Nerve preservation		Nerve excision		P value
	n=23	(%)	n=23	(%)	
POD -1	13	56.5	23	100	0.000
1MONTH	15	65.2	16	70	0.797
3MONTH	17	74	4	17.4	0.000

In the present study in 46 patients, the incidence of post operative neuralgia in group A with 23patients (ilioinguinal nerve preservation) was compared with group B with 23 patients (ilioinguinal nerve excised) during Lichenstein hernioplasty.

The results of follow up visits at POD – 1 are 56.5% vs 100% ($p = 0.000$); at 1 month 65.2% vs 70% ($p > 0.05$) and at 3 months 74% vs 17.4% ($p = 0.000$) in group A and B respectively. Statistiscally significant results were observed in 3months after surgery which indicates the decrease in incidence of post operative neuralgia in Group B(17.4% in Nerve excision) when compared to Group A(74% in Nerve Preservation).

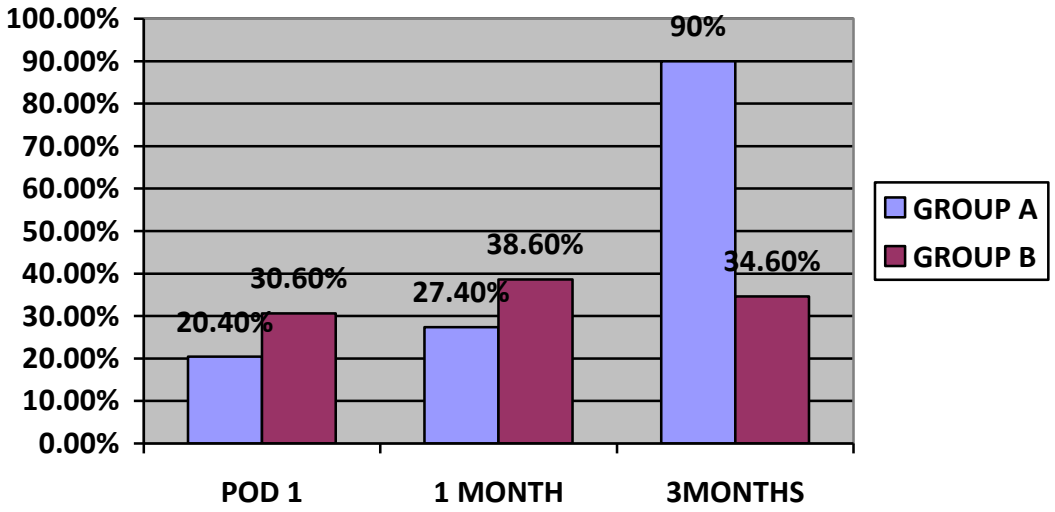


Fig.40 Incidence Of Post Operative Neuralgia (%)

Table 11 - Mean Severity Score

Follow up	Group – a					Group – b				
Severity	**(0)**	**(1)**	**(2)**	**(3)**	**Mean**	**(0)**	**(1)**	**(2)**	**(3)**	**Mean**
POD – 1	10	6	7	0	0.87±0.87	0	7	8	8	2.04±0.83
1 MONTH	8	10	5	0	0.87±0.76	7	9	7	0	1.00±0.80
3 MONTHS	6	5	6	6	1.52±1.16	19	4	0	0	0.17±0.39

In the present study severity of pain was compared between group A and group B , by using 4- point Likert scale.

The pain was absent at POD – 1 in 43.5% vs 0% , Mild in 26.1% vs 30.4% , Moderate in 30.4% vs 34.8% and Severe in 0% vs 34.8%; Absent at 1month in 34.8% vs 30.4% , Mild in 43.5% vs 39.1% , Moderate in 21.7% vs 30.4% and Severe in 0% vs 0% ; Absent at 3months in 26.1% vs 82.6% , Mild in

21.7% vs 17.4% , Moderate in 26.1% vs 0% and Severe in 26.1% vs 0% in group A and group B respectively.

The mean severity score by using 4 point verbal scale in patients who reported post operative neuralgia was 0.87±0.87 vs 2.04±0.83 at POD -1 ; 0.87±0.76 vs 1.00±0.80 at 1 month and 1.52±1.16 vs 0.17±0.39 at 3months in group A and group B respectively.

There was statistically significant difference of post operative neuralgia ($p < 0.05$) at 3 months follow up visit even though absent in other two visits on POD -1 and 1 month.

Table 12 - Incidence of post operative hypoesthesia

Hypoesthesia	**Nerve preservation N=23(%)**		**Nerve excision N=23(%)**		**p value**
FOLLOW UP AT					
POD -1	6	26.1	8	35	0.359
1MONTH	9	39.1	10	43.5	0.234
3MONTH	4	17.4	8	35	0.234

In the present study the incidence of post operative groin hypoesthesia was compared between group A and group B . The results of the follow up visits at POD – 1 are 26.1% vs 35% ($p>0.05$); at 1month 39.1% vs 43.5% ($p>0.05$); at 3months 17.4% vs 35% ($p>0.05$) in group A and group B respectively. Here the p value was found to be insignificant($p>0.05$)

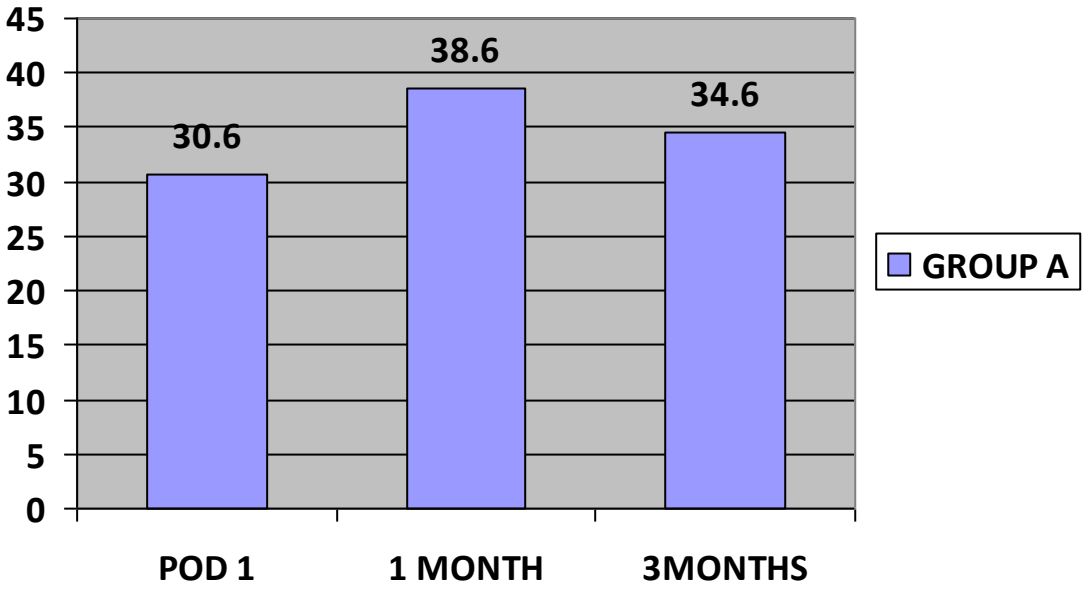


Fig.41. Incidence of post operative hypoesthesia (in %)

Table 13 - Incidence of post operative numbness

Numbness	**Group A (n=23)**		**Group B (n=23)**		**p value**
FOLLOW UP AT					
POD -1	13	56.5	16	70	0.522
1MONTH	8	35	12	52	0.765
3MONTH	8	35	12	52	0.179

In the present study the incidence of post operative numbness was compared between group A and B and the results of the follow up visits at POD – 1 are 56.5% vs 70% (p>0.05); at 1month 35% vs 52% (p>0.05); at 3months 35% vs 52% (p>0.05). The difference was insignificant (p-value >0.05).

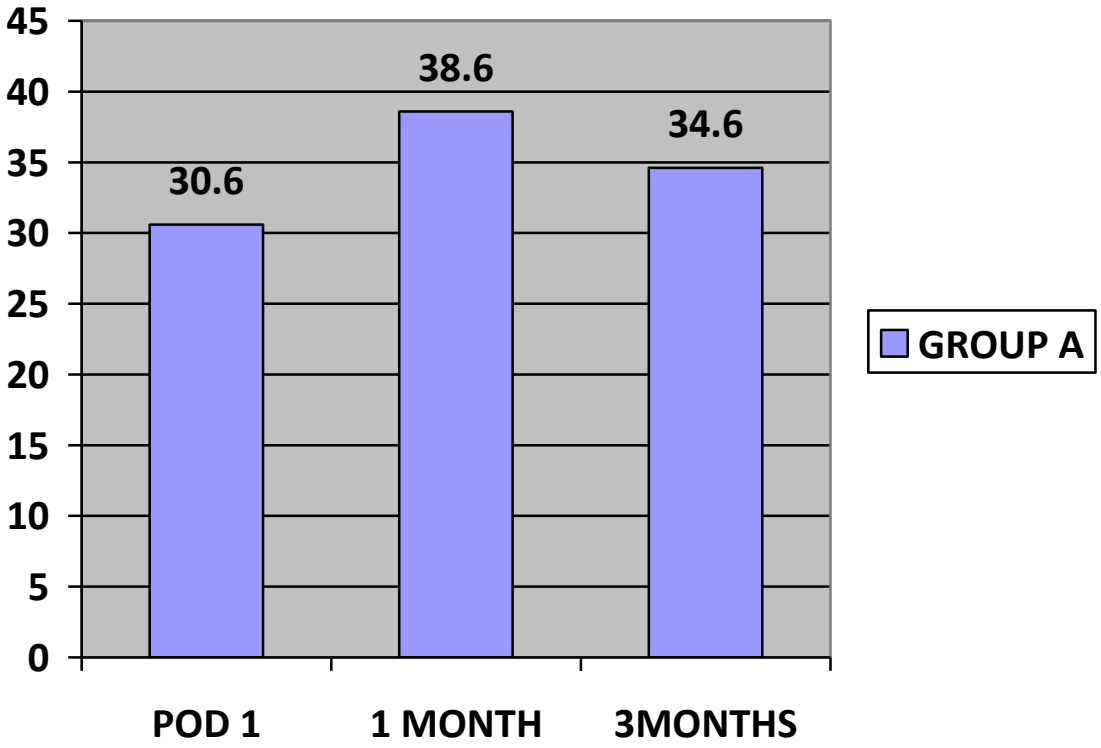


Fig.42 Incidence of post operative numbness (in %)

DISCUSSION

Chronic groin pain is a significant problem following open hernia repair with pain being often mild in nature, the quality of life studies has shown that chronic pain can significantly interfere with normal daily activity[74]irrespective of severity.

Routine excision of ilioinguinal nerve in an attempt to decrease the incidence of inguinodynia has been proposed by many studies. Yet, controversies do persist. Thus the present study was done to evaluate the effect of ilioinguinal nerve excision on post operative groin pain, hypoesthesia and numbness when compared with the preservation of ilioguinal nerve during the hernia mesh repair surgery.

In the present study number of patients evaluated for pain, hypoesthesia and numbness are 46,in two study groups patients(group A – 23patients and group B - 23patients)

In group A ilioinguinal nerve was carefully protected throughout the operation and also extreme care was taken during surgery to avoid inclusion of nerve during suturing and mesh placement.

In group B the ilioinguinal nerve was excised lateral to the deep inguinal ring.

The patients were followed up for assessment of pain, hypoesthesia and numbness at POD – 1 , 1 month and 3 months following surgery.

RESULTS ARE COMPARED WITH OTHER STUDIES

INCIDENCE OF CHRONIC GROIN PAIN

Table-14 Comparison of incidence of groin pain with other studies

Studies	**Dittric M.D et al**		**Mui et al**		**Fatemeh et al**		**Present study**	
Group	NP n=24 (%)	NE n=66 (%)	NP n = 50 (%)	NE n = 50 (%)	NP n = 50 (%)	NE n=50 (%)	NP n = 23 (%)	NE n = 23 (%)
POD – 1	0	0	0	0	0	0	13(56.5)	23(100)
At 1 month	5(21)	3(5)	37(78)	37(78)	0	0	15(65.2)	16(70)
At 3 month	0	0	0	0	10(21)	3(6)	17(74)	4(17.4)

The above table clearly shows the number of patients and percentage of incidence of post operative chronic groin pain in three previous studies and the present study .

The incidence of post operative groin pain in the present study (comparison between ilioinguinal preservation versus routine excision of ilioinguinal nerve) showing the results at POD-1 56.5% vs 100%; at 1 month 65.2% vs 70% comparable with study conducted by Dittrich (Dittrich M.D et al, 2004). and at 3 months 74% vs 17.4% correlates very well with the study conducted by fatemeh (Fatemeh M.D et al, 2008). Here the incidence at POD-1 is not considered for post operative chronic groin pain.

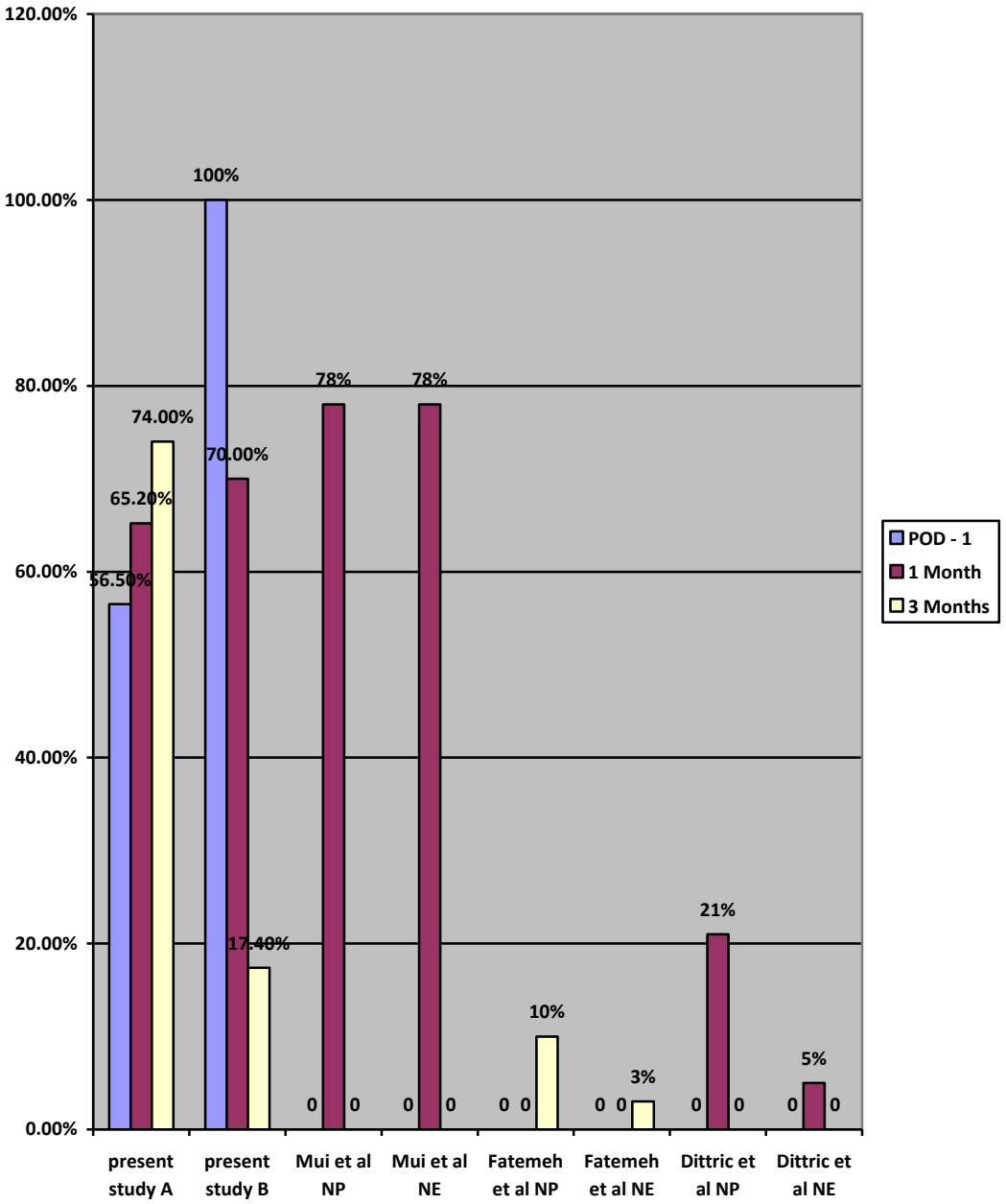


Fig.43 Comparison of incidence of groin pain(%)

INCIDENCE OF HYPOESTHESIA

Table 15 - Comparison of incidence of hypoesthesia

Studies	Mui et al 2006		Fatemeh et al 2008		Present study	
Group	NP n=50 (%)	NE n = 50 (%)	NP n = 50 (%)	NE N = 50 (%)	NP n = 23 (%)	NE n = 23 (%)
POD – 1	0	0	45(90)	39(78)	6(26.1)	8(35)
At 1 month	31(66)	26(55)	12(24)	9(18)	9(39.1)	10(43.5)
At 3 month	0	0	0	0	4(17.4)	8(35)

The incidence of hypoesthesia in the present study compared with two other studies is shown in the above table.

In the present study the incidence of post operative hypoesthesia at groin between ilioinguinal nerve preservation and routine nerve excision during surgery, The results obtained at POD-1 are 26.1% vs 35%: at 1 month 39.1% vs 43.5% and at 3 months 17.4% vs 35% are compared with studies conducted by Fatemeh (Fatemeh M.D et al, 2008). and Miu (Miu M.B et al, 2006). [74]

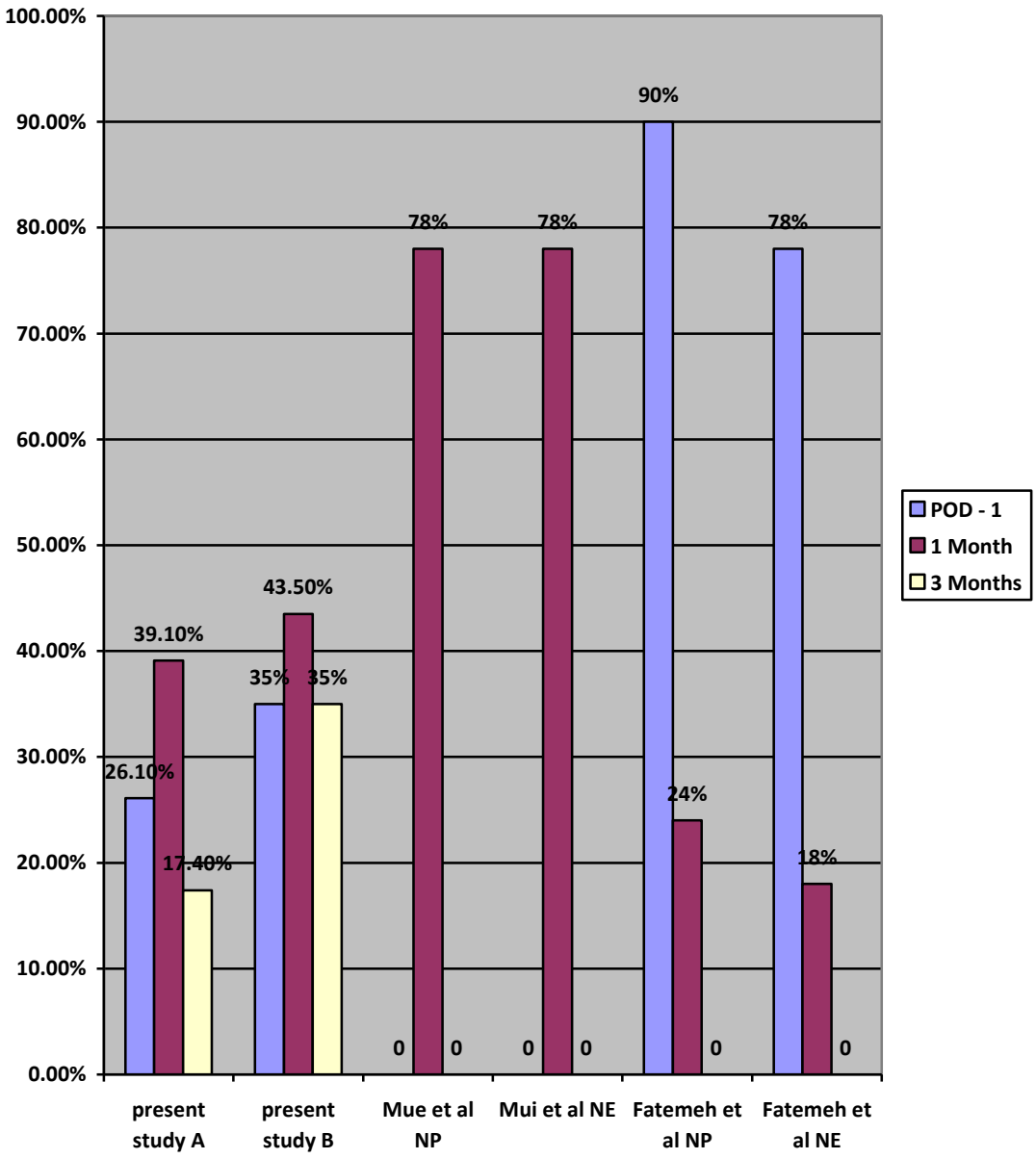


Fig.44 Comparison of incidence of hypoesthesia(in %)

INCIDENCE OF NUMBNESS

Table 16 - Comparison of incidence of numbness

Studies	**Mui et al 2006**		**Picchio et al. 2004**		**Present study**	
Group	NP n = 50 (%)	NE n = 50 (%)	NP n =391 (%)	NE n= 380(%)	NP n = 23 (%)	NE n = 23 (%)
POD – 1	-	-	-	-	13(56.5)	16(70)
At 1 month	16(34)	9(19.1)	46(12)	54(14)	8(35)	12(52)
At 3 month	-	-	-	-	8(35)	12(52)

The present study shows the incidence of post operative numbness comparing ilioinguinal nerve preservation vs nerve excision, results showing 35% vs 52% at 1 months comparable with results of studies conducted by Picchio (Picchio et al, 2004)[10] and mui (Mui MB et al, 2006)[74]

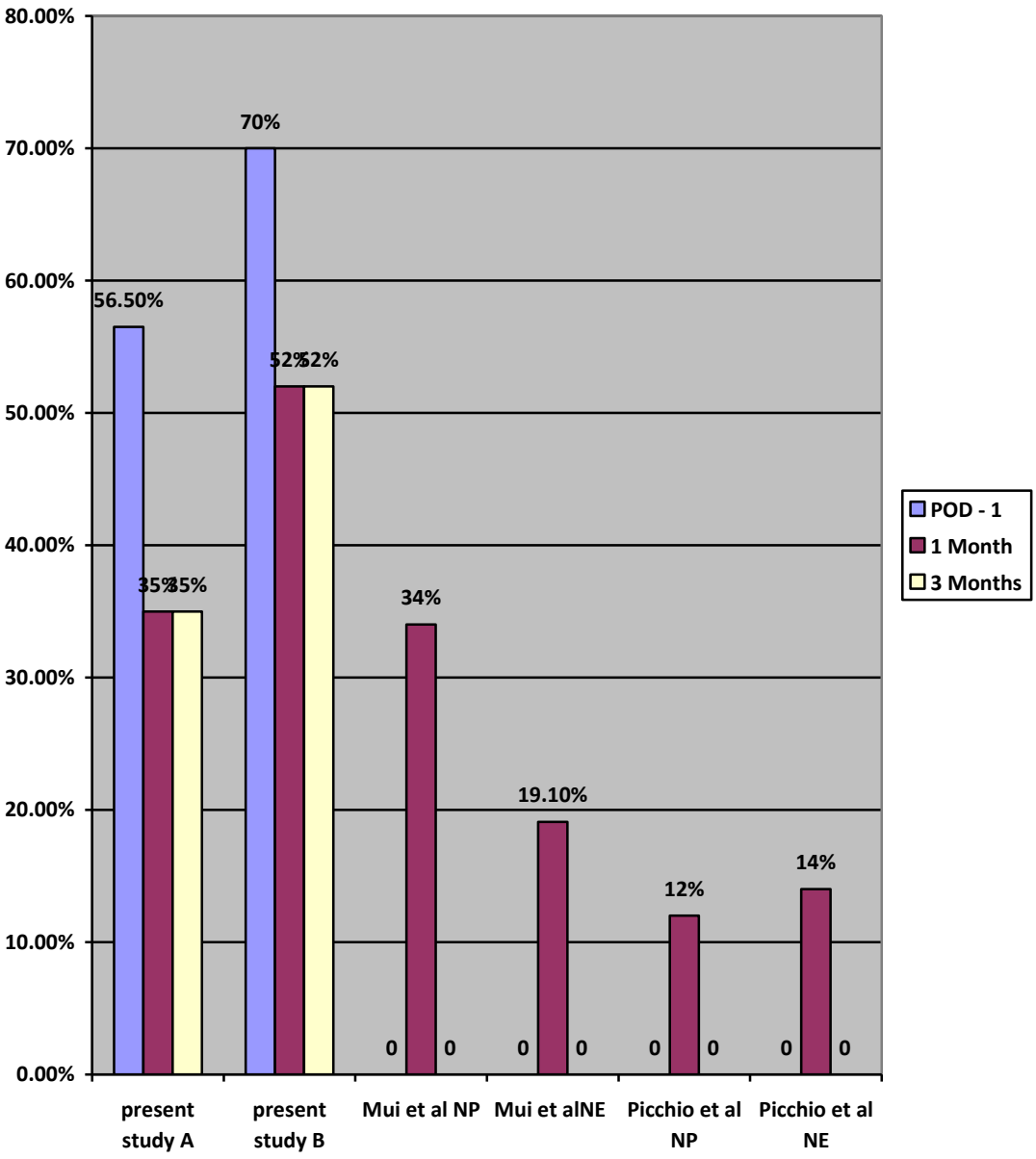


Fig. 45 Comparison of incidence of numbness (in %)

COMMENTS

After the publication several prospective and retrospective studies show the incidence 6%- 29% for post inguinal herniorrhaphy chronic pain syndrome. Many pioneers started to establish algorithm management for these chronic pain syndrome, others tried definite methods to prevent complications rather than to treat by proposed mechanism development. chronic groin pain, and inflammation induce fibrosis in close proximity to the ilioinguinal nerve[75,76]. in addition unintentional injury, strangulation of the nerve during suturing may also contribute. There increasing evidence suggest that prophylactic excision ilioinguinal nerve during open hernia repair potentially decreases the incidence of chronic groin pain following operation. Some studies have failed show relationship between the division preservation ilioinguinal nerve developing chronic groin pain."[11]

Ravichandran et al (2000)[9]

a pilot study conducted by Ravichandran et al at 2000 was One of the early studies in the fields of elective neurectomy in inguinal hernia repair, in which 20 patients with bilateral inguinal hernia underwent a surgery with the ilioinguinal nerve being preserved on oneside and divided on the opposite side, all of the differences were insignificant in the post surgical pain and numbness between the two sides.

Dittrick et al (2004)[8]

Retrospective study performed by Dittrick et al 2004 , on 90 patients who underwent Lichtenstein inguinal hernia repair, the ilioinguinal nerve was excised in 66 patients and preserved in the other 24 patients. These investigators concluded that the incidence of neuralgia was lower in the neurectomy group vs the nerve preservation group (3% vs 26% p value <0.001).difference was significant.

At one year post operatively the neurectomy patient continued to have a significantly lower incidence of neuralgia (3% vs 25% p value=0.003) The incidence of paresthesia was not significantly higher in the neurectomy group (13% vs 5% p value =0.32) at one year.

Mui M.D. et al (2006)[67,74]

A double blinded randomized controlled trial conducted by mui to investigate the short term to mid-terrm neurosensory effect of prophylactic ilioinguinal neurectomy during Lichtenstein repair of inguinal hernia. 100 male patients were randomized into two Ilioinguinal neurectomy (group A). ilioinguinal nerve preserved (group B) during operation. Results concluded that at 6 months the incidence of chronic groin pain was significantly lower in the group A than in group B. (8 vs 28.6%) p= 0.008 . No significant inter group differences were found regarding the incidence of groin numbness, post operative sensory loss or changes at the groin region. And they postulated that

the sensory loss caused by the neurectomy might be compensated by cross innervations from the collateral cutaneous nerves.

Fatemeh malekpour et al 2008[75]

A Double blinded randomized control clinical trial performed on 121 patients undergoing open mesh repair of inguinal hernia.

Out of 121 patients , 61 were nerve excision group and 60 were belonging to nerve preserving group. The chronic post surgical inguinodynia was seen in 6% in nerve excision group 21% in nerve preserved group (p 0.033). Results were concluded that the neurectomy decreases the post surgical pain after elective inguinal hernia repair.

Picchio Marcello M.D et al, 2004[11]

A double blinded randomized controlled trial conducted on 813 patients by picchio, at 1 year post surgery ,pain was absent in 231 (76.5) of nerve preserved and 213 (73%) of nerve transected patients. (difference 3.30%: 95% confidence interval 3.68% to 10.28%), mild pain in 55(18%) and moderate in 11 (4%) and 9(3%), and severe in 5(2%) and 9(3%) respectively p=55.

They suggested that post surgical pain after hernia repair is not affected by elective inguinal nerve division, yet sensory disturbances in the area are significantly increased.

These controversial result as well an article by Madura et al[72] reporting the effectiveness of inguinal neurectomy for ilioinguinal nerve entrapment to relieve pain in post surgical patients motivated us to study the comparison between elective ilioinguinal nerve excision versus preservation on chronic groin pain and other symptoms.

The present study-Results

A prospective comparative study conducted at Department of General Surgery at Chengalpattu Government Medical College and Hospital, Chengalpattu from March 2018 to March 2019 with 3 months follow up. 46 patients who completed the study protocol fully,which includes 23 of 46 patients in group A(ilioinguinal nerve preservation) and 23 of 46 patients in group B (ilioinguinal nerve divided).

The results showed the incidence of postoperative chronic groin pain 56.5% vs 100% (p 0.000), 65.2% Vs 70% (p >0.05) and 74% vs 17.4% (p 0.000) at POD-1, 1 month and 3 months after surgery in group A and B respectively with mean severity Score of 0.87±0.87 vs 2.04±0.83 ; 0.87±0.76 vs 1.00±0.80 and 1.52±1.16 vs 0.17±0.39 respectively

The incidence of paresthesia was 26.1 % Vs 35 % (p >0.05): 39.1% vs 43.5% (p >0.05) and 17.4% vs 35% (p >0.05) in POD-1, 1 month and 3 months in group A and group B respectively.

The incidence of numbness was 56.5% vs 70%; 35% vs 52% and 35 % vs 52% at POD-1,1 month and 3 months in group A and B respectively ,($p>0.05$).This showed the incidence of chronic groin pain is lower in ilioinguinal nerve excision (group B) compared to nerve preservation (group A) which was statistically significant ($p<0.05$) at 3 months follow up visit. No significant difference noted in neurosensory disturbances in either group

CONCLUSION

In the present study 46 have completed the study protocol fully, this includes 23 patients in group A (ilioinguinal nerve preservation) and 23 patients in group B (iloinguinal nerve divided) who underwent Lichtenstein mesh hernioplasty at Chengalpattu Medical College and hospital, Chengalpattu.

After analyzing the data and observations.

The present prospective comparative study have clearly demonstrated that the prophylactic excision of ilioinguinal nerve decreases the incidence of chronic groin pain following Lichtenstein mesh hernia repair surgery. And also, the procedure is not significantly associated with additional morbidity in terms of local cutaneous neurosensory disturbances .

However the follow up period and sample size the in the present study is relatively short. A longer follow-up and larger study sample may be needed before any further conclusion can be made.Though the follow period and study sample is short in this present study than reported by many previous studies it is still wise to recommend ilioinguinal neurectomy in patients undergoing anterior inguinal hernia mesh repair. So, Routine ilioinguinal neurectomy is a reasonable option while performing Lichtenstein inguinal hernia repair,

SUMMARY

A study on clinical outcome in preservation and elective division of the nerve in open mesh repair of of inguinal hernia Conducted in Department of General Surgery at Government Medical College

Chengalpattu government medical college and Hospital, chengalpattu from March 2018 to March 2019.

Data collected in a prescribed proforma analyzed Pain and evaluated for the presence of hypoaesthesia and numbness at POD-1, 1 month and 3 months after surgery

Sample size was 46 patients in two groups, group A - 23(ilioinguinal nerve preserved) and group B - 23(ilioinguinal nerve divided) . All patients completed the study protocol with 3 months follow-up

Of the 46 Patients, 23 patients (all were men) with mean age of 53.26±15.36 Years belongs to group A, and 23 patients (all were men) with mean age of 50.91±15.01 years belongs to group B

56.52% in the group A and 69.57% in the group B presented with only swelling in the groin, rest associated with pain

21.74% in group A showed bladder outlet obstruction compared to 17.39.% in group B, and also 21.74% in group A had constipation compared to

13.04% in group B, and 13.04%(group A) compared to 17.39%(group B) had chronic cough.

47.85% in the group A compared to 47.85% in group B had right sided inguinal hernia, rest had left sided hernia while bilateral presentation is seen in 8.70% in group A and 4.34% in group B.

78.26% in the group A compared to 73.91% in group B had indirect inguinal hernia.

21.74% in the group A compared to 26.09% in group B had direct inguinal hernia.

The incidence of post operative chronic pain at POD – 1 56.5% vs 100% ($p = 0.000$); at 1 month 65.2% vs 70% ($p > 0.05$) and at 3 months 74% vs 17.4% ($p = 0.000$) in group A and B respectively.

The incidence of post operative groin hypoesthesia was 26.1% vs 35% ($p>0.05$) at POD – 1 ; 39.1% vs 43.5% ($p>0.05$) at 1month; 17.4% vs 35% ($p>0.05$) at 3months in group A and group B respectively.

The incidence of post operative numbness was 56.5% vs 70% ($p>0.05$) at POD – 1 ; 35% vs 52% ($p>0.05$) at 1month; 35% vs 52% ($p>0.05$) at 3months in group A and group B respectively.

Thus showed the incidence of chronic groin pain is lower in ilioinguinal nerve excision (group B) compared to nerve preservation (group A) which was

statistically significant at 3 months follow up visit. And no significant difference noted in neurosensory disturbances in either group.

However the sample size and the follow up period in the current study is relatively short. A larger study sample and longer followup may be needed before any further conclusion is made.

ANNEXURES

PROFORMA

Name: IP No:

Age/Sex: Date of Admission:

Occupation: Date of Operation:

Address: Date of Discharge:

CHIEF COMPLAINTS

HISTORY OF PRESENT ILLNESS

1.**Swelling in the groin**

a. Duration

b. site

c. Mode of onset

d. Swelling appears first at

e. Progress

f. Extension

g. Size on stand up training

h. Size on lying down

2. Pain :Present / Absent

a) Site

b) Onset

c) Radiation

d) Character

e) Severity

f) Pain on standing

g) Pain on lying down

3. Vomiting : Present / Absent

Nature of vomitus

No of bouts

4**.Distension of abdomen :** Present / Absent

5.Other straining factors

a) Cough/Breathlessness / Asthma

b) Constipation/Straining at stools

c) Urgency / Frequency / Hesitancy

6. Any treatment before admitting to the hospital : Yes/No

If Yes:

PAST HISTORY

History of similar illness in the past

History of Diabetes, Hypertension Asthma

Epilepsy or Tuberculosis

TREATMENT HISTORY

Medical:

Surgical:

PERSONAL HISTORY

MENSTRUAL HISTORY (If Female)

FAMILY HISTORY

GENERAL PHYSICAL EXAMINATION

Built :

Nourishment:

Mental state:

Pallor :

Clubbing:

Icterus:

Edema:

Cyanosis:

Lymphadenopathy:

VITALS

Pulse: Respiratory rate:

Blood pressure: Temperature:

LOCAL EXAMINATION

A. Inspection:

a) Site: Rt groin/Left groin/Bilateral

b) Extent

c) Size :Measuring about

d) Shape :Pyriform/Globular

e) Surface :Smooth/Irregular

f) Margin :Well defined / ILL defined

g) Skin over the swelling :Stretched/Inflamed/Normal

h) Impulse on cough: Present / Absent

l) Visible peristalsis over swelling :Present or Absent

j) Position of Penis

B. Palpation

a) Temperature	:	Normal/Raised / Decreased
b) Tenderness	:	Present / Absent
c) To get above the swelling	:	Possible/Not possible
d) Position and extent	:	Rt groin/Lt groin/ Bilateral
e) Size		
f) Shape	:	Pyriform/Globular
g) Surface	:	Smooth / Irregular
h) Consistency	:	Soft & elasti/Doughy& Granular
i) Reducibility	:	Spontaneous / by Manipulation
j) Deep ring occlusion test	:	Positive/Negative

k) Invagination test

l) Zieman's test

Can testis be felt separately from the swelling

C. Percussion

Over the swelling : Resonant/ Dull note

D. Auscultation

Bowel sounds heard over the swelling? - Yes/No

E. Examination of abdominal muscle tone

On head raising test malgaigne's bulgings : Present Absent

SYSTEMIC EXAMINATION

A. Per Abdomen

a) Shape

b) Umbilicus

c) Tenderness

d) Organomegaly

e) Other findings

Per Rectal examination

Per vaginal examination (If female):

B. Respiratory system

C. Cardiovascular system

D. Nervous system

CLINICAL DIAGNOSIS

INVESTIGATIONS

A. Routine blood

HB %

Blood urea

Serum Creatinine

RBS

Blood group HIV HbsAG

B. Routine urine

Albumin, Sugar

M/S

C. Others / Special

ECG

Chest X-ray

X ray Abdomen

Serum electrolytes

USG:

TREATMENT

Type of Anaesthesia:

Type of operation :

Findings:

Contents of sac

Sac fluid

Ilio-inguinal nerve - Identified and preserved

FOLLOW-UP

POST OPERATIVE PAIN (USING 4 POINT LIKERT SCALE)

POD-1

Pain	:	None/Mild/Moderate /Severe
Hypoesthesia	:	Present / Absent
Numbness	:	Present / Absent

AT ONE MONTH

Pain	:	None / Mild / Moderate / Severe
Hypoesthesia	:	Present / Absent
Numbness	:	Present / Absent

AT THREE MONTHS

Pain	:	None/Mild / Moderate / Severe
Hypoesthesia	:	Present / Absent
Numbness	:	Present / Absent

PATIENT CONSENT FORM

STUDY DETAIL:: **A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA**

STUDY CENTER:

CHENGALPATTU MEDICAL COLLEGE & HOSPITAL, CHENGALPATTU

PATIENT NAME: PATIENT AGE:

IDENTIFICATION NUMBER:

I confirm that I have understood the purpose of procedure for the above study.

I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without giving any reasons, without my legal rights being affected.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if withdraw from the study, I understand that my identity will

not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperative with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or wellbeing or any unexpected or unusual symptoms.

I hereby give consent to participate in this study.

I hereby give permission to undergo complete clinical examination and diagnostic test.

Signature/Thumb impression: Place: Date:

Patient name and address:

Signature of the investigator: Place:

Date:

Study investigator's name:

சுயஒப்புதல்படிவம்

ஆய்வுசெய்யப்படும் தலைப்பு : "**: A STUDY ON CLINICAL OUTCOME IN PRESERVATION VERSUS ELECTIVE DIVISION OF ILIOINGUINAL NERVE IN OPEN MESH REPAIR OF INGUINAL HERNIA**

ஆய்வுசெய்யப்படும் இடம்:

பங்குபெறுபவரின் பெயர்:

பங்குபெறுபவரின் வயது:

பங்குபெறுபவரின் எண் :

மேலேகுறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கபட்டுள்ளது. நான் இவ்வாய்வில் தன்னிச்சையாக பங்கேற்கின்றேன். எந்தகாரணத்தினாலோ, எந்த சட்டசிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகிக்கொள்ளலாம் என்றும் அறிந்துகொண்டேன்.

இந்த ஆய்வுசம்பந்தமாகவோ, இதைசார்ந்து மேலும் ஆய்வுமேற்கொள்ளும்போதும் இந்த ஆய்வில்பங்கு பெறும்

மருத்துவர், என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதிதேவைஇல்லை என அறிந்துகொள்கிறேன். இந்த ஆய்வின் மூலம்கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக்கொள்ள மறுக்க மாட்டேன்.இந்த ஆய்வில் பங்குகொள்ள ஒப்புக்கொள்கிறேன். இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன்.

பங்கேற்பவரின்கையொப்பம்:

சாட்சியாளரின்கையொப்பம்:

இடம்: இடம்:

தேதி: தேதி :

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்:

ஆய்வாளரின் கையொப்பம்:

இடம்: தேதி:

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																	PAIN			NUMBNESS			HYPOESTHESIA		
S.No.	NAME	AGE	SEX	IP.No.	DUR	SIDE	BOO	SS	CC	Sm	REDU	EXTENT	TYPE	OCCU	SURGERY	STUDY	POD-1	1MO	3MO	POD-1	1MO	3MO	POD-1	1MO	3Mo
1	ALAGUMANI	69	M	9974	24	L	2	2	1	1	R	I	1	Ag	L	A	1	1	2	1	2	1	2	2	1
2	MOHAN	50	M	9937	9	L	1	1	1	1	R	C	2	Ag	L	B	1	0	1	2	1	2	2	2	1
3	THIRUNAAVUKARASU	36	M	10591	5	R	1	1	1	2	R	C	2	B	L	A	0	2	2	2	2	2	2	2	2
4	SHANMUGAM	48	M	9988	10	R	1	1	1	2	R	C	2	C	L	B	2	1	0	1	1	1	2	2	2
5	HARI	67	M	9978	18	R	2	1	1	1	R	I	1	Ag	L	A	2	1	0	1	2	1	2	1	1
6	RANGANATHAN	70	M	8297	19	R	2	1	1	1	R	I	1	Ag	L	B	1	0	0	2	2	2	2	2	1
7	KUSAL DAS	60	M	12079	12	L	1	1	2	2	R	C	2	C	L	A	0	0	1	1	2	1	2	1	2
8	JAYARAMAN	75	M	13737	17	R	1	1	1	1	R	C	1	Ag	L	B	2	2	1	1	1	1	2	2	1
9	ELUMALAI	67	M	12457	12	L	1	2	1	1	R	I	2	CK	L	A	2	0	0	1	1	1	1	1	1
10	RAJU	54	M	16398	11	L	1	1	2	2	R	C	2	D	L	B	2	1	0	1	2	2	2	2	2
11	LASAR	38	M	17410	3	R	1	1	1	2	R	I	2	M	L	A	1	1	2	1	1	1	1	1	1
12	ARJUNAN	70	M	18764	12	B/L	2	1	1	1	R	I	1	Ag	L	B	3	2	0	1	1	1	2	2	2
13	MAASILAMANI	57	M	23754	10	L	1	1	1	1	R	C	2	B	L	A	1	1	0	1	1	1	1	2	2
14	KUMAR	34	M	24712	4	L	1	1	1	1	R	C	2	B	L	B	3	1	1	2	1	1	1	1	2
15	CHANDRASEKAR	32	M	28438	26	R	1	1	1	2	R	I	2	B	L	A	2	0	3	1	2	1	2	1	2
16	KANNIYAPAN	40	M	27058	28	R	1	1	1	1	R	C	2	CK	L	B	2	1	0	2	1	1	1	1	1
17	SRINIVASAN	75	M	27037	30	L	2	1	1	1	R	C	2	Ag	L	A	0	0	3	1	1	1	2	2	1
18	SAGADHEVAN	45	M	27024	8	L	1	1	1	1	R	C	2	M	L	B	1	2	1	1	1	1	2	2	2
19	DINESHKUMAR	28	M	31043	36	R	1	1	1	2	R	I	2	M	L	B	3	1	0	1	2	2	1	1	1
20	RAMESH	39	M	32354	9	R	1	1	1	2	R	C	2	C1	L	B	1	0	0	1	2	2	2	2	1
21	SHANMUGAM	75	M	33679	7	R	1	2	2	1	R	C	2	Ag	L	B	2	0	0	2	1	1	2	1	2
22	VENKATESAN	23	M	36220	5	L	1	1	2	1	R	I	2	S	L	A	2	0	3	2	2	1	1	2	2
23	KANNIYAPAN	52	M	36226	8	L	1	1	2	2	R	I	2	Ag	L	B	3	2	0	1	1	1	2	2	1
24	SELVAMANI	38	M	34099	14	L	1	1	1	1	R	I	2	D	L	B	3	2	0	1	2	1	1	2	2
25	PERUMAL	38	M	39062	6	R	1	1	1	2	R	C	2	B	L	A	0	0	1	2	1	1	2	1	1

26	PACHAIYAPPAN	56	M	39095	17	L	1	1	1	2	R	C	2	Ag	L	A	0	1	1	1	1	1	1	1	1
27	VEDHACHALAM	69	M	39539	9	R	2	2	1	1	R	I	1	Ag	L	A	2	2	0	1	1	1	1	1	1
28	PRBHAKARAN	38	M	43289	16	B/L	1	1	1	2	R	C	2	M	L	A	1	2	3	1	1	1	1	1	1
29	SUBRAMANI	42	M	48354	7	L	1	1	1	1	R	C	2	CK	L	B	1	1	0	1	1	1	1	2	1
30	GOTHANDAPANI	45	M	51350	8	R	1	1	1	1	R	I	2	C	L	B	3	2	0	1	2	1	1	1	1
31	MURUGAIYAN	52	M	51662	10	L	1	1	1	1	R	C	2	C	L	A	2	1	0	1	2	2	1	2	2
32	PRABHU	31	M	56333	13	R	1	1	1	2	R	I	1	C	L	B	2	1	0	1	2	2	2	1	2
33	VARADHARAJAN	55	M	56362	14	L	1	1	1	1	R	C	2	C	L	A	0	1	1	2	1	2	2	1	1
34	KALIYAPERUMAL	70	M	56320	16	L	2	2	2	1	R	I	1	Ag	L	B	1	0	0	2	2	2	2	1	2
35	NAGAPPAN	58	M	54907	18	R	1	1	1	1	R	C	2	C	L	A	0	1	2	2	2	1	2	1	1
36	PARAMASIVAM	56	M	59426	8	R	1	1	1	2	R	C	2	C	L	A	2	0	1	2	1	1	2	2	2
37	ELUMALAI	60	M	59437	9	R	1	1	1	2	R	I	2	C	L	B	3	0	0	1	1	1	2	1	1
38	NAGAPPAN	31	M	62566	24	R	1	1	1	1	R	C	2	M	L	A	0	1	3	1	1	2	2	1	1
39	NARAYANASHARMA	43	M	63600	10	L	1	1	1	1	R	I	2	M	L	B	2	2	0	1	2	1	1	2	2
40	MAHESWARAN	34	M	63619	4	R	1	1	1	1	R	C	2	M	L	B	2	1	0	2	2	1	2	1	1
41	DHARMALINGAM	65	M	2137	16	R	1	1	1	2	R	I	1	Ag	L	A	0	2	2	1	1	1	2	1	2
42	MADHURAI	56	M	4372	18	L	1	1	1	1	R	C	2	Ag	L	B	3	1	0	2	1	2	2	1	2
43	KATTIYAPAN	72	M	5635	20	L	2	2	1	1	R	I	1	Ag	L	B	1	0	0	1	1	1	2	1	2
44	SANKAR	48	M	7109	11	L	1	1	1	2	R	C	2	M	L	A	1	1	2	1	2	1	2	1	1
45	SEKAR	55	M	7077	12	B/L	1	1	1	1	R	C	2	Ag	L	A	0	0	0	1	1	1	1	2	1
46	USMAN BASHA	80	M	10077	18	R	2	2	1	1	R	I	1	Ag	L	A	1	2	3	1	1	1	1	1	1

KEY TO MASTER CHART

SL no. – Serial number

IP no. – Inpatient number

Occupation:

A-Agriculture T-Teacher B-Business S-Student D-Driver Ck-Cook Cl-clerk M-Mannual labour C-Coolie

Duration: d-days m-months y-years

Side: Rt-right Lt: left B/L: bilateral

Mode of presentation: 1:swelling only 2:swelling with pain

Straining factors: CC: Chronic cough SS:Straining of stools

BOO: Bladder outlet obstruction Sm: Smoking 2: Present 1: absent

Clinical presentation: C:complete I:Incomplete

Reducibility: R:Reducible I: Irreducible

Type: 1:Direct 2:Indirect

Surgery: L: lichenstein's mesh hernioplasty

Study group: A- Nerve preservation B-Nerve excision

Follow up:

4 Point Linkert Scale

0-No pain 1-Mild pain 2-Moderate pain 3-Severe pain

H-hypoaesthesia/N-numbness 2-Present/1-absent

POD-1 : post operative day 1

1 M – At one month

3 M – At 3 month