""COMPARATIVE STUDY BETWEEN TAPP AND OPEN HERNIOPLASTY IN INGUINAL HERNIA REPAIR"

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LIST OF ABBREVIATIONS USED

Cms	**Centimeter**
ECG	**Electrocardiogram**
Gms	**Grams**
H/O	**History of**
Hb%	**Haemoglobin percentage**
HBsAg	**Hepatitis B surface antigen**
HIV	**Human immunodeficiency virus**
Inj IM	**Injection , Intramuscular**
ie	**That is**
IP No	**In patient number**
Lt	**Left**
N	**Total number**
P	**Probability (Significance of difference)**
RBS	**Random blood sugar**
Rt	**Right**
RCT	**Randomized Controlled trial**
S/o	**Suggestive of**
USG	**Ultrasonogram**
Vs	**Versus**
Yrs	**Years**

ABSTRACT

Background: Inguinal hernia repair has evolved over the last few decades, and more research is still being conducted in this area. Laparoscopy has gained widespread acceptance in today's surgical world, but the most scientific way to determine the superiority of one method over another is through evidence-based medicine.

Aims and objectives: To investigate the difference in postoperative stay, intensity of postoperative pain, and complications such as seroma, hematoma, wound infection, neuralgia, numbness, and scrotal swelling between the two techniques.

Methods: From October 2019 to June 2021, a prospective study was conducted at a tertiary care hospital to compare Transabdominal pre-peritoneal (TAPP) mesh repair and Lichtenstein's open mesh repair. The study included 60 subjects with unilateral or bilateral inguinal hernias divided into two groups of 30 patients each. The outcomes and variables were evaluated.

Results: It showed that 30 of the 60 patients had TAPP and 30 had open hernia repair. The average hospital stay in the TAPP group was 2.6 days and 5.87 days in the open group. On postoperative days 1, 3, and 5, the mean pain score for TAPP hernia repair was lower than that of open hernia repair. In the open hernioplasty group, postoperative complications such as wound infection, seroma formation, and neuralgia were more common.

Conclusions: Transabdominal pre-peritoneal mesh repair is superior to Lichtenstein's open hernia mesh repair because it is safer, has a shorter recovery time, fewer post-operative complications, and lower morbidity.

KEYWORDS: INGUINAL HERNIA, LICHTENSTEIN MESH REPAIR, TRANSABDOMINAL PREPERITONEAL MESH REPAIR

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INTRODUCTION

Hernias are defined as an "abnormal protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity." "A hernia is defined as a protrusion of any viscus from its proper cavity." "Generally, the protruded parts are contained in a bag by a membrane with which the cavity is naturally invested"[1] **– Sir Astley Cooper 1804.**

"A great surgeon performs operations using a single method, then compiles a statistical summary of deaths and recoveries and concludes from these statistics that the mortality law for this operation is two out of five." So, according to me, this ratio means nothing scientifically and provides us with no certainty in performing the next operation because we don't know whether the next case will be among the recoveries or among the deaths. Rather than gathering facts indiscriminately, what should be done is to study them more precisely, each in its own unique determinism." [1] - **Bernard, Claude**

These are the words used to describe the importance of surgical research and techniques. In order for patients to be subjected to only the best procedures in the future, every surgical technique must be studied and its benefits and drawbacks evaluated. As a result, research into newer techniques contributes to the reduction of morbidity and mortality associated with older standardized techniques. In order for the patient to benefit the most from our efforts, we as surgeons must constantly reinvent ourselves.

To reach the modern era, inguinal hernia surgery has gone through several stages. It is said that the history of inguinal hernias is the history of surgery itself.[1] Hernia repair is one of the most common general surgical procedures performed

worldwide.[2] Since Bassini described his technique, the search for an ideal inguinal hernia repair has continued. An ideal inguinal hernia repair should be tension-free and tissue-based, with no risk of damage to vital structures, long-term pain or complications, or recurrence.

Other tissue repairs, including the modified Bassini, Iliotibial tract repair, Shouldice, Nylon darn, Halsted-Taner, McVay, and many others, require extensive surgical experience or are tension repairs with recurrences.

Shouldice repair, which is similar to mesh repair, is rarely used, most likely due to the complexity of tissue dissection and repair. Recurrences vary from surgeon to surgeon and from centre to centre due to the complexity of the procedures.[5]

Although Lichtenstein prosthetic repair with prolene mesh has recently gained popularity, it is not a tissue-based repair and thus is not ideal. Although this hernia repair method is simple and safe, the slightest separation of the mesh from the sutured area is the leading cause of mesh repair failure in inguinal hernias. The prosthetic mesh itself acts as a mechanical barrier.

The longevity of the operation, the absence of complications, the lowest possible cost, and the earliest possible return to normal activities all contribute to the success of groin hernia surgery. A comparison to open mesh (Lichtenstein) in these outcomes is required to validate the use of the laparoscopic technique in general. With a limited study of long-term outcomes, the goal of this study is to see how this new technique affects early clinical outcomes of inguinal hernia repair. If it is shown to be effective, it will lay the groundwork for global adoption.

AIMS &OBJECTIVES:

To study the short term outcome with respect to :

- The difference in postoperative stay
- The intensity of postoperative pain between the two techniques
- Cost factor
- Complications: seroma, hematoma, wound infection, neuralgia, numbness, scrotal swelling

REVIEW OF LITERATURE

HISTORY OF INGUINAL HERNIA

No subject in the history of surgery has been as contentious as groin hernia repair.

McVay, C.B.

'Abnormal protrusion of a viscous or a part of a viscous through the wall of the cavity containing it,' says the definition.

"Area of body wall fibromuscular tissue weakness or disruption"

Ancient Times [14,15]

Hernia history is rife with myths and facts, ideas and realities, as well as a plethora of transmutations and shadows. Hernias have been around since the beginning of time. The ancient Greeks first recorded inguinal hernias around 1500 BC. Hernia is a Greek word that means "offshoot, budding, or bulge."[14]

Hippocrates made little mention of hernias in his writings (500 BC). Inguinal hernia has existed since the beginning of time.[12] Hernia is derived from the Greek word "Hernios," which means "Nad" or "Shoot." Shushruta described hernia as "Antra-vriddi" in the Vedic period, and it was thought to be an incurable disease. For thousands of years, the trials and errors of surgeons practising inguinal hernia surgery have contributed to the evolution of surgical treatment. The majority of the evidence obtained from historical documents suggests that until the beginning of the nineteenth century, the mainstay of hernia treatment was conservative. Around 3500 years ago, a few Egyptian physicians reported that inguinal hernias could be treated conservatively bandage for compression and support. Alexandrian medical scientists

pioneered surgery as a treatment option for hernias around the third century BC. They used a sedative to achieve preoperative sedation with a mandrake root extract and haemostasis with vascular ligatures. [13]

Figure-1. Hippocrates (460-377 B C)

Figure-2. Aulus Celsus of Alexandria(50 AD)

Figure-3. Middle Dark Ages (476-15th Century)

Figure-4. Ambrose Pare

Taxis have been used to treat irreducible hernias for over 2400 years. The earliest mention of inguinal hernia was found in "Eber's papyrus" (1500BC), where pre-Homeric physicians used conservative techniques to treat the condition.

Aulus Celsus, a Greek encyclopedist and surgeon, documented the use of transillumination technique to differentiate between hydrocoeles and hernias (50 AD) and described taxis for strangulation. Trusses and bandages were used to treat reducible hernias. Around 700AD, "Paul of Aegina" distinguished between incomplete (Bubonocele) and complete (Scrotal) inguinal hernias.

Medieval Period [17]

Religious prejudice against human body mutilation caused a regression in surgical technique after the fall of Rome. Two significant advances in herniology were made during the dark Middle Ages. Guy de Chauliac's well-known text "Chirurgia Magna" (1363 AD) distinguished femoral hernias from inguinal hernias. He developed taxis for the treatment of incarcerated hernias and advocated for the Trendelenberg position with the head down. He considered operations to be risky and untrustworthy, and he preferred chemical cauterization to burning skin, fascia, and pubic bone. In 1556, Swiss surgeon Pierre Franco was the first to perform routine surgery on strangulated hernia cases.

The constriction ring was cut in the early stages of strangulation, and a grooved director was used to protect the bowel, which was then replaced in the abdomen with fine linen.

In around 1383AD, Ronald of Parma recommended the Trendelenberg position in the management of hernias using fine linen.

Post- Renaissance Period [19, 20]

Autopsy and anatomic dissection techniques were widely used throughout Europe after the Renaissance. Herniation became known in Bologna around 1200 AD.

In 1700AD, Littre described Meckel's diverticulum in the hernial sac for the first time. In 1721, William Cheselden performed a successful operation on strangulated hernias. Heister (1724) distinguished between direct and indirect inguinal hernias in his monograph. Hunter and Percival Pott of London discovered that some indirect inguinal hernias are congenital. Gimbernat described the ligament that bears his name in 1731 and advocated for its division rather than an upward incision of the Poupart ligament in cases of strangulated femoral hernias, which occasionally resulted in serious bleeding from an abnormal inferior epigastric artery. In his hernia treatise, 'Antonio Scarpa'1 (1752-1832) 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[1] (1768-1841) described for the first time the superior pubic ligament, which was later known by his name and transversalis fascia, with full recognition of its role in the pathogenesis of hernias. Frenz Casper Hesselbach (1759-1816) made anatomic contributions to groin hernia, including the Hesselbach's triangle and the iliopubic tract. 345 were dissected and sketched by Jules German Cloquet.

Period of Aseptic Surgery/ The Listerian Era[15]

In 1867, Joseph Lister, Professor of Orthopedic Surgery at Glasgow Infirmary, presented the first paper in the history of surgery on antiseptic surgery using carbolic acid spray. Prior to Lister, all hernia repairs were done through external ring incisions, with no use of fascial planes to avoid infection and its potentially fatal

consequences. Marcy published the first article on antiseptic herniorrhaphy in the United States in 1871, in which he used carbolised catgut ligature. Czerny demonstrated the hernial sac being pulled and excised through the superficial ring, causing the ligated neck to retract and return to the deep ring[82]. Lucas-championniere was a pioneer in the use of antisepsis in France. He incised the external oblique aponeurosis, opened the inguinal canal, and imbricated the roof during the closure in 1885. The years 1880-1890 have been dubbed "The Decade of Inguinal Hernia" because of the significant contributions made to hernia surgery by Lucas championniere, Marcy, and Bassini.

Marcy of the United States is credited with developing modern herniology. Marcy (1837-1924) was the first to emphasise the significance of hernial sac high ligation and closure.

He was also the first to describe the trans-abdominal approach to inguinal hernia treatment. **Edoardo Bassini**[21] of Pavia, Italy, revolutionised the treatment of inguinal hernia by introducing a novel technique designed to restore normal conditions in the area of the hernial orifice. He thought the recurrence was due to the inadequacy of simply ligating the sac without reconstructing the inguinal canal. He published an epochal report on 206 hernia operations in 1890, with extremely low mortality and recurrence rates.

He pioneered the use of rectus sheath sutures, transversalis fascia sutures, and interrupted silk sutures. He used to perform both bilateral hernia repairs and cryptorchidism surgery in the same session. Rather than obliterating the inguinal canal through deep suturing of the rings, Bassini advocated physiological

reconstruction, recreating the internal and external openings with anterior and posterior walls.

To connect the transverse abdominis and internal oblique to the inguinal ligament, he used continuous silk sutures. In his triple layer, the transversalis fascia was divided from the pubis to an inch beyond the internal ring[82]. He emphasised the significance of closing the floor from the bottom up to restore the valve-like mechanism. In 1940, McVay and Anson discovered that the rectus fascia, which is a portion of the transversalis fascia that inserts into the lateral border of the rectus muscle, was strong enough to prevent incisional herniation[82]. In 1950-1953, Shouldice, Obney, and Ryan Under local anaesthesia, he performed the Shouldice technique, which is a multiple layer repair of the posterior inguinal wall.

Darn Repairs

"McArthur used external oblique aponeurosis pedicled strips woven between the conjoint tendon and the inguinal ligament" in 1921. In 1921, Gallie and Lemesurier published papers on the use of fascia lata strips as sutures woven into the muscles, inguinal ligament, and tissues of the posterior wall of the inguinal canal—"much like darning a sock." Ogilvy pioneered floss silk lattice repairs with non-absorbable material in 1936, and Maingot quickly followed suit. Pratt used steel wire in 1948, and Koontz used tantalum gauze in 1950."

Patch Graft Repairs

"The approximation of tissues was under tension when the local tissues were weak and attenuated, causing the sutures to fail and the hernia to recur." As a result,

surgeons were forced to consider high tensile strength exogenous or endogenous prostheses.

To fill the gap in the canal's posterior wall, natural tissues and biological materials, as well as synthetic sheets, were used. The majority of the time, the silver wire mesh that was used was fragmented, corroded, and rejected by chronic sinuses, resulting in a higher rate of recurrence. post-operatively Burke introduced tantalum metal sheets in 1940, which were also not very successful due to metal fragmentation, which resulted in hernia recurrence. Surgeons began receiving sheets of thigh fascia natural tissue flaps. Sutures were used to attach the rectus sheath, internal oblique aponeurosis, or external oblique aponeurosis to the inguinal ligament. In 1943, Mayr underwent a skin graft. In 1958, Uscher was the first to use synthetic polyethylene mesh prosthesis to buttress and reinforce previously sutured repairs. Since then, a plethora of mesh designs and mesh placements have flourished, and Lichtenstein demonstrated the viability of mesh.

Lichtenstein introduced the concept of tension-free repair in 1989 by reconstructing the floor of the inguinal canal with prosthetic material. In 1991, Gilbert used cones and swatch suture less repair of small to moderate sized inguinal hernias, i.e. a suture less patch was placed over the entire posterior inguinal wall to reinforce this "Swatch." A more contentious use for prosthetic materials is as a swatch, plug, or sutureless patch. This technique, popularised by Robbins and Rutkow in 1993, entails inserting a roll of material into the hernial orifice with or without suture to obstruct hernia passage to the outside.

"Expended polytetrafluroethylene (ePTFE) sheaths made of woven monofilament polyamide or knitted monofilament polypropylene have been widely used in recent

years for both the external and preperitoneal approaches." A bilayered patch device for inguinal hernia was recently introduced."

"This polypropylene mesh device is one of a kind because it has three components, one of which is an underlay patch that provides posterior mesh repair." Connector combines the advantages of a plug repair with an Onlay patch that extends from the posterior wall to the internal inguinal ring[22]."

Figure- 5: Francis Usher

Figure- 6: Irving Lichtenstein repair

"In 1876, Thomas Annandale of Edinburgh proposed the pre-peritoneal approach for the first time." Lawson Tait of Birmingham, England, reported the benefits of treating hernias with a median abdominal section in 1883. Bates (1913) used transversalis fascia to repair the defect from the back. Cheatle reintroduced the preperitoneal approach (1920). In 1936, Henry proposed that this approach could help with the technical management of inguinal and femoral hernias. 'Nyhus' strongly advocated for this approach in 1960. Stoppa, a leading proponent of today's pre-peritoneal approach, recommends it, particularly in difficult cases involving multiple recurrent hernia repairs, where tissues have become scarred and weakened, and normal

anatomy has been destroyed. Stoppa invented a technique for reinforcing the peritoneum with a large unslit prosthesis in 1984."

Laparoscopic Inguinal Hernia Repair [24,25]

"Laparoscopic visualisation and treatment of inguinal hernias were introduced into the surgical arena with the advent of computer chip technology."[26]

"In 1982, Ger and his colleagues successfully closed the peritoneal opening of the hernia sac with a laparoscope and a Michel staple applied with a Kocher clamp."Schultz and colleagues (1990) described plug and patch laparoscopic inguinal herniorrhaphy.

"Spaw and colleagues (1991) provided a detailed description of the anatomy of the laparoscopic approach." Toy and Smoot (1991) described the intra peritoneal on lay patch (IPOM) technique, which involves applying a synthetic mesh to the defective peritoneal wall."

"The transabdominal preperitoneal patch (TAPP) technique, described by Dion and Morin (1992), involves making an intraperitoneal U-shaped incision in the peritoneum and inserting the mesh into a preperitoneal position."

Mc Kernan (1992) defined the totally preperitoneal patch technique (TEP) as "an extraperitoneal insertion of the preperitoneal mesh."

TAPP and TEP techniques, like Lichtenstein repair, have been used for the last 15 years and are considered evidence-based techniques. However, due to the higher price and steep learning curve. These techniques were not widely employed. [18]

Figure-7. Antonio Scarpa(1752–1832)

Figure-8. Astley Cooper (1768-1841)

Figure-9. August Richter (1742-1812)

Figure-10. Edoardo bassini (1844-1924)

EMBRYOLOGY[21,27]

“ The mammal's initial appearance, with his unexplained need to push his testicles out of their proper home and into the air, messed up the three-layered abdominal wall that had served the reptiles well for millions of years." The skin, the parietal peritoneum, and the embryologic and anatomic entities that connect them produce the future pathway for the testes in a highly synergistic manner. In males, the skin forms the scrotum, and in females, the skin forms the labia. The embryological entities that form the inguinal canal between the skin and the peritoneum allow the vaginal processes to penetrate and form the inguinal canal. In males, the inguinal

canal houses the spermatic cord, and in females, the round ligament of the uterus.[2] The descent of the testis to the scrotum is thus permitted, but the descent of the ovary outside the peritoneal cavity is prohibited.[21,27]"

Inguinal Region

The Testis was originally located near the upper lumbar vertebrae on the posterior abdominal wall. It is located medial to the mesonephros, where it is attached near the lower pole of the mesonephros by the mesorchium, a peritoneum fold. The testis descends into the corresponding scrotal chamber by following the fibromuscular band known as the gubernaculum testis. It is most common in the plica inguinalis, which is a peritoneal fold that runs from the inguinal region to the lower end of the mesonephros. Around the sixth month, the gubernaculum reaches its peak development and transforms into a strong, thick cord. It is attached to the lower end of the testis above and pierces the abdominal wall on its way to the bottom of the scrotal pouch below, forming the inguinal canal. Along with it, the processus vaginalis, a peritoneum process, descends into the scrotum, dragging thin fascial prolongations of the abdominal wall layers with it. As a result, the external and internal oblique aponeurosis, as well as the fascia transversalis, cover the processus vaginalis. The testis and cord structures are surrounded by remnants of the external oblique (external spermatic) and internal oblique as they pass through the abdominal wall (cremasteric fascia and muscle). The descending testis is received by invaginating the cup-shaped blind extremity of the vaginal processes. The gubernaculum shortens and eventually atrophies as the testis migrates, but some trace of the gubernaculum remains at the bottom of the scrotum below tunica vaginalis. The shortened remains of the gubernaculum, which connects the testis to the bottom of the scrotal pouch, form the scrotal ligament."

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

Sir Astley Patson Cooper, (1804) [28]

"The groin is defined as the area of the anterior abdominal wall beneath the anterior superior iliac spines." The medial boundary is formed by the pubis and the superior pubic (Cooper's) ligament. Laterally, the internal ring is bounded by epigastric vessels and transversalis fascia condensation. The anterior femoral sheath, inguinal ligament, and iliopubic tract are inferior, while the transverses abdominis aponeurosis and arch are superior."

MYOPECTINEAL ORIFICE OF FRUCHAUD

Boundaries

Medially: Rectus muscle

Laterally: iliopsoas

Superior: Conjoint tendon

Inferior: Pectin pubis

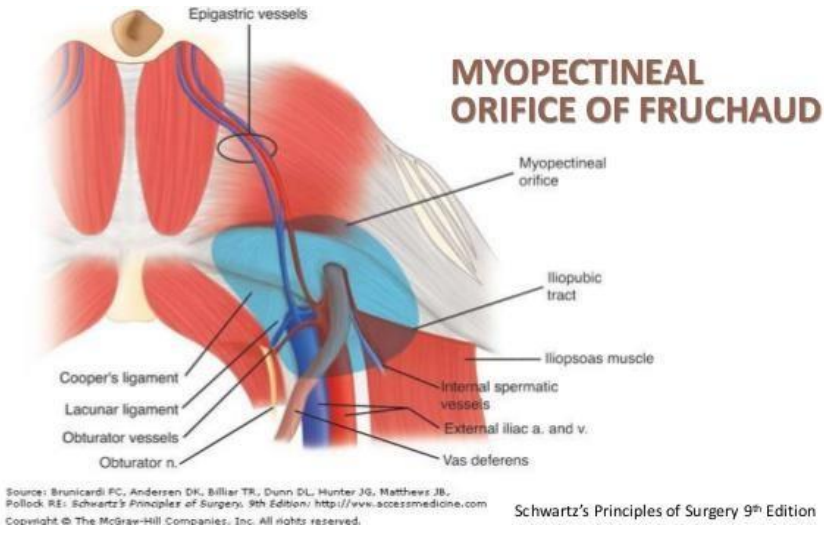


Figure - 11 Myopectineal orifice of fruchaud[1]

Skin

"Langer's lines are transverse lines in the groin with a downward convexity." The anterior superior iliac spine and pubic tubercle on the lateral margin of the pubis are easily palpable. The spermatic cord is recognised as it emerges from the external ring, which overlies the lateral aspect of the pubic tubercle. The deep inguinal ring is about 2 cm above the skin crease between the thigh and the abdomen, and about halfway between the anterior superior iliac spine and the pubic symphysis. The nerve supply is by the genitofemoral nerves, ilioinguinal, iliohypogastric, and genital branches."

Subcutaneous Tissues of Groin

"The subcutaneous tissue is divided into two layers: the superficial fatty Camper's fascia and the deeper membranous Scarpa's fascia, which extends into the perineum as the Colles fascia. "

External Oblique Muscle and Aponeurosis

"It originates in the lower eight ribs." Its fibres run downward, forward, and medially. The aponeurosis forms a free border from the anterior superior iliac spine to the pubic tubercle, which is referred to as the inguinal ligament or poupart's ligament. In the groin, the muscle becomes completely aponeurotic, with its fibres pointing obliquely downwards. It attaches to the pubis and becomes the external layer of the anterior rectus sheath. The lacunar ligament is the medial fan-shaped expansion of the inguinal ligament that inserts into the pubis.[2] A triangular opening in the external oblique aponeurosis 1 to 1.5 cm lateral to the pubic tubercle is the superficial inguinal

ring." The opening is created by splitting the external oblique. The spermatic cord emerges from the inguinal canal via the external inguinal ring.[2]

Internal Oblique Muscle and Aponeurosis

"The internal abdominal oblique muscle lies between the external and internal oblique muscles." It is the aponeurotic complex's middle layer in the abdomen. It develops from the inguinal ligament's outer half, the intermediate line on the iliac crests, and the lumbodorsal fascia's posterior lamella, where it connects to the lumbar spines. The anterior rectus sheath is formed by the anterior lamella joining the external oblique aponeurosis, and the posterior rectus sheath is formed by the posterior lamella joining the transversus abdominis aponeurosis. They join the transverses abdominis to form the posterior rectus sheath. They merge with the transverses abdominis to form the pubic crest. The tendinous portions of the internal oblique and transverses muscles fuse to form the conjoined tendon. Only 5% to 10% of the general population is affected by this condition.[2] This is the most internal of the abdominal wall's three flat muscles. The majority of its surface is oriented horizontally. This is the most important layer because of its role in hernia repair. This muscle is formed by the iliac fascia along the iliac crest and the inguinal ligament, as well as the lower six costal cartilages and ribs. [33] The general layer of the muscle (lateral portion) and the aponeurosis (medial portion) are directed towards the linea alba, where they form the anterior rectus sheath beneath the semicircular line of Douglas. It can be divided into continuous and discontinuous portions in the groin."

- "The continuous portion is an extension of the main muscle and aponeurosis, the lower border of which arches above and medial to cord structures and is known as the Transverses abdominis arch, which is referred to as falx inguinalis in 10% of cases due to its dense nature and insertion into the pubic tubercle and the crest." The falx receives assistance from the internal oblique aponeurosis in 3% of cases, resulting in the formation of the conjoined Tendon."

- "The discontinuous portion is located below the transverses arch and functions as the posterior wall of the inguinal canal, medial to the internal ring." "One-fourth of these fibres exhibits significant individual variation and is frequently deficient, represented only by the transversalis fascia (also known as endabdominal fascia), forming a critical weak spot in the posterior wall of the inguinal canal." The "iliopubic tract," a collection of aponeurotic fibres, forms the layer's inferior most edge.

Transversalis Fascia

"This is an endo-abdominal fascia segment that surrounds the abdominal cavity and peritoneum." The fascia that surrounds the transverses muscle and aponeurosis is known as the transversalis fascia. It is connected to the lumbar, iliac, psoas, obturator, and rectus fascia muscles. Because of the numerous slips of fibrous tissue that traverse the muscle and attach to the deep interpareital fascia, it is adherent to the transverses muscle - aponeurosis. As a result, it is practically integrated into the complex of transverses muscle aponeurosis fascia. Internal spermatic fascia is characterised by a tubular projection at the deep inguinal ring that extends outwards in a blunt funnel-like fashion to cover the ductus. The blunt funnel, on the other hand,

is not perfectly conical, but is skewed, and its axis is less oblique than the axis of the vessels through the deep inguinal ring."

"The redundant transversalis fascia in the deep ring's medial side is known as 'Transversalis fascia sling.' The transversalis fascia resembles a letter 'V,' with the open end pointing superolaterally to the groin and the diverging ends known as crurae. This fascia frequently represents only the posterior inguinal wall, resulting in a weak spot in the groin."

Rectus Sheath

"All three flat muscles contribute to the anterior sheath in the groin aponeurosis." The component layers of the rectus sheath differ depending on the level of the sheath being examined. The external oblique aponeurosis, anterior leaf of the internal oblique aponeurosis, and transverses abdominis aponeurosis make up the section of the sheath immediately inferior to the umbilicus"[33]

Peritoneum

"The peritoneum is a thin elastic membrane found throughout the body, including the groin. Its sole purpose is to lubricate the viscera it contains. Because of the peritoneum's elasticity, it plays no role in hernia prevention."

The Conjoint Tendon (Falx Inguinalis)

"Falx inguinalis is a Latin term that means "inguinal sickle." The aponeurosis of the transverses abdominis and the internal oblique are fused some distance lateral to the rectus sheath to form the conjoined tendon. The conjoint tendon is found deep to the superficial inguinal ring and lateral to the rectus muscle. It descends to the inguinal and lacunar ligaments for a deep insertion. The spermatic cord or round ligament of

the uterus lies anterior to the superficial inguinal ring while passing through it. The conjoint tendon has a very variable structure, and it does not exist as a discrete anatomic structure in 20% of the subjects - it may be absent or only slightly developed, or it may be replaced by a lateral extension of the tendon or original ring"

Cooper's Ligament (Iliopectineal Ligament)

Cooper's ligament, which represents the strongly reinforced periosteum of the superior ramus of the pubis, is remarkably constant in form and extent. The periosteum is supplemented by a significant amount of dense fibrous tissue on the superior and internal aspects of the superior pubic ramus, covering and immediately internal to the pectineal line, so that it usually becomes 2 cm or even 3 cm thick. Laterally, it continues posteriorly along the brim of the true pelvis, becoming thinner until it can no longer be distinguished from periosteum of ileum. Cooper's ligament is especially important in the surgical correction of femoral hernias and large direct inguinal hernias because it provides support for the femoral hernia.

The thickened lower portion of the external oblique aponeurosis is what it is. It extends from the anterior superior iliac spine all the way to the pubic tubercle. It is also rolled inward to form a gutter. It forms a bridge over the iliopsoas muscle, as well as neural and vascular structures, as it exits the pelvis. The innominate fascia connects the inguinal ligament's lower edge to the fascia lata. This fascia also connects the aponeurosis and inguinal ligament collagenous fibres. The inguinal ligament attaches to the pubic tubercle and forms a fan-shaped expansion downwards to the superior pubic ramus, known as the lacunar ligament.

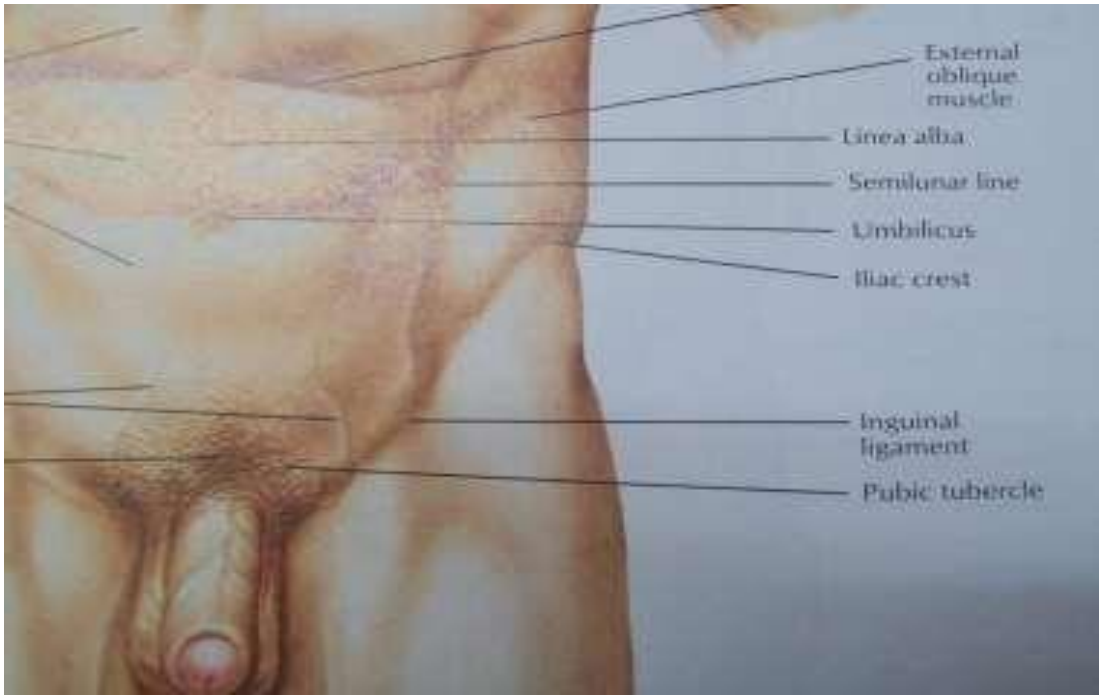


Figure-12. The left Groin

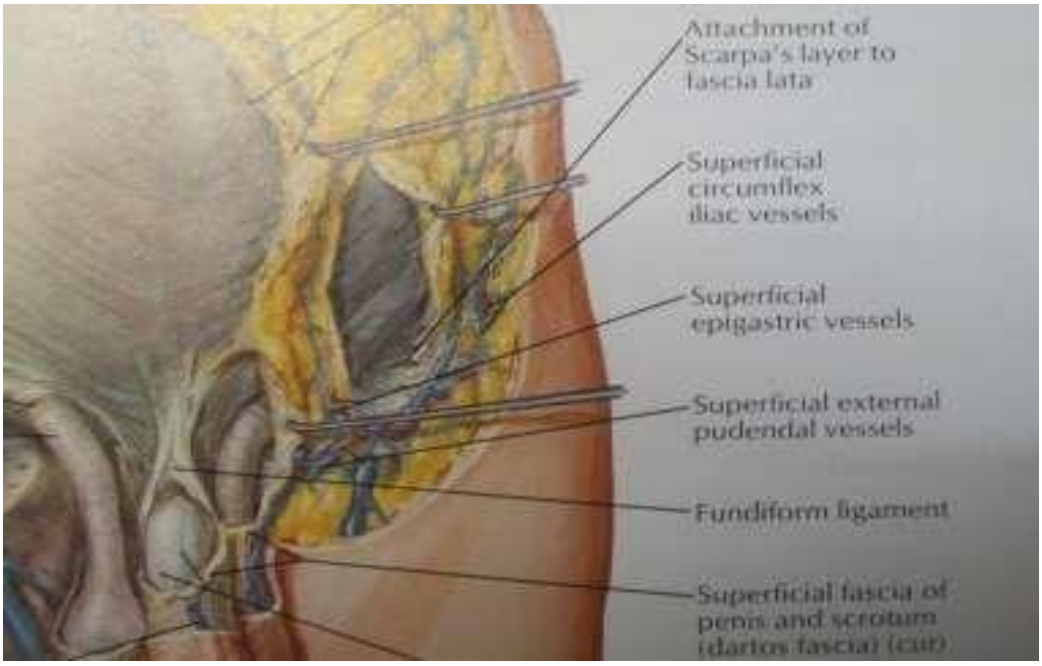


Figure -13. Subcutaneous tissues of Groin

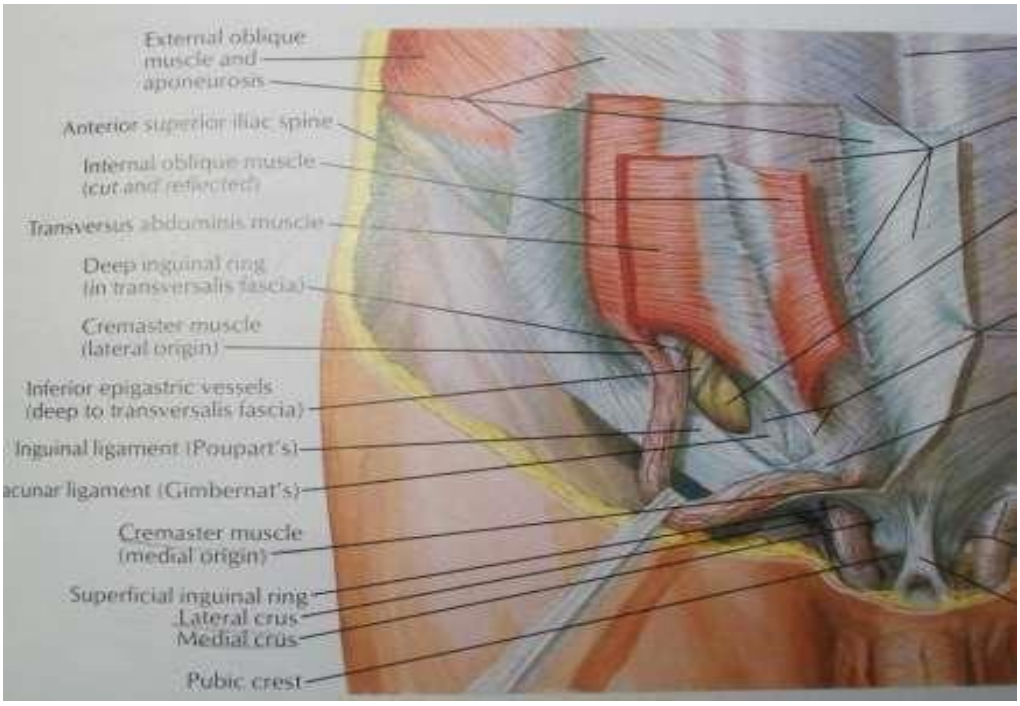


Figure -14. Deep ring and Superficial Inguinal ring

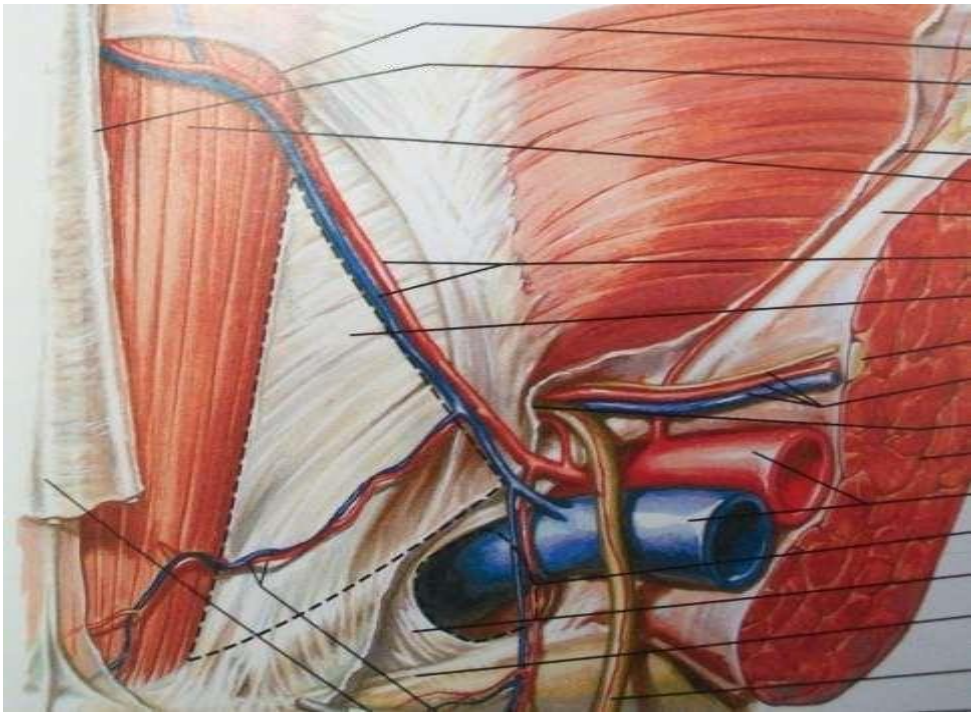


Figure-15.Hasselbach`sTriangle

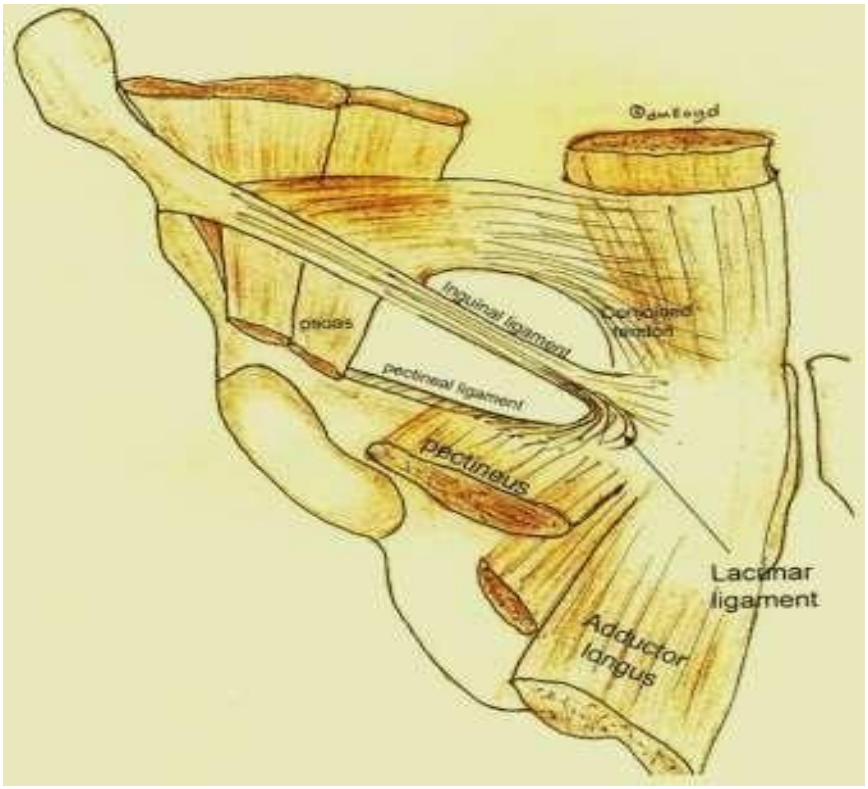


Fig- 16.Ligaments of the Inguinal region

Inguinal Ligament (Ligament of Poupart)

It is the thickened lower portion of the external oblique aponeurosis. It reaches all the way to the pubic tubercle from the anterior superior iliac spine. Its edge is also rolled inward to form a gutter. As it exits the pelvis, it forms a bridge over the iliopsoas muscle, as well as neural and vascular structures. The Innominate fascia connects the lower edge of the inguinal ligament to the fascia lata. This fascia also connects the collagenous fibres of the aponeurosis and the inguinal ligament. The inguinal ligament inserts on the pubic tubercle and forms a fan-shaped expansion downwards to the superior pubic ramus, known as the lacunar ligament.

Lacunar Ligament of Gimbernat

The Gimbernat ligament is a triangular fascial extension of the inguinal ligament before it reaches the pubic tubercle. It is inserted at the pectin pubis and laterally meets the proximal end of Cooper's ligament. It serves to broaden the attachment area for the inguinal ligament by fanning.

The Cremaster Muscle

The cremaster muscle is composed of a network of loosely connected muscle fascicles that runs along the spermatic cord. They are joined by areolar tissue to form the sac-like cremasteric fascia, which wraps around the cord and testis within the external spermatic fascia. The lateral part of the muscle, which arises from the inguinal ligament, has been described variously as being in continuity with the medial edge of the internal oblique, deep to the internal oblique and extending as far as the anterior superior iliac spine and in continuity with either the internal oblique or transverses, or as a pointed tendon piercing the internal oblique. The fibres pass along the lateral aspect of the spermatic cord through the superficial inguinal ring before spreading out into the fasciculi in loops of increasing length along its anterolateral aspect.

Inguinal Canal

It begins at the site of spermatic cord emergence through the transversus aponeurosis (internal ring) and ends at the pubic tubercle in males, but envelops the round ligament in females. It measures 3.75 cm in length and is oblique, slanting downwards and medially, parallel to and slightly above the inguinal ligament. It runs from the deep to the superficial inguinal rings.

The boundaries are:

- **Anteriorly** it is bounded by the skin, superficial fascia, external oblique aponeurosis and in its lateral one third by the muscular fibres of the internal oblique.
- **Posteriorly** by the transversalis fascia, reinforced medially by the falx inguinalis (when present).
- **Superiorly** it is bounded by the arched fibres of internal oblique and transverses aponeurosis.
- **Inferiorly** the inguinal ligament and its continuation and lacunar ligament forms the boundary.

Hesselbach's Triangle

It is a weak area that is bounded medially by the lateral border of the rectus sheath and falx inguinalis, laterally by the inferior epigastric vessels, and below by the inguinal ligament.

The spermatic cord emerges from the deep ring.

Contents of spermatic cord are

a. Arteries: Testicular, cremasteric and artery to vas.
b. Veins: Corresponding veins, mainly testicular (pampiniform plexus).
c. Nerves: Genital branch of genitofemoral nerve, cremasteric nerve, sympathetic plexus derived from Para aortic and pelvic plexus.
d. Lymphatics of the testes.
e. Vas deferens and areolar connective tissue.

Coverings of the spermatic cord from within are: processus vaginalis, internal spermatic fascia (Transversalis fascia), cremasteric fascia (Internal oblique muscle and fascia) and external spermatic fascia (External oblique muscle and fascia).

Blood Vessels and Nerves ; Before crossing beneath Poupart's ligament and becoming the femoral artery, the external iliac artery splits into two major branches. These tributaries, which are the deep circumflex iliac and inferior epigastric vessels, are not vital. The latter serves as the deep ring's medial border or the direct triangle's lateral border. The cremasteric and pubic arteries are branches of the epigastric artery. To supply the testis, the testicular artery arises directly from the aorta. The umbilical artery, which supplies the ductus deferens, is another small vessel in the spermatic cord.

NERVES

The Ilioinguinal nerve, Genital branch of the genitofemoral nerve, and Iliohypogastric nerve are all encountered when the groin is explored from the front.

1. Ilioinguinal nerve(T 12 – L 1)

It emerges from behind the psoas muscle, near the iliohypogastric nerve. It runs obliquely across the quadratus lumborum muscle, perforates the transvesus abdominus muscle near the anterior end of the iliac crest, and pierces the internal oblique muscle to run along the inguinal canal until it exits through the external ring or by piercing the fascia just adjacent to the ring.

Function: In males, it provides motor function to the internal oblique as well as sensory innervation to the upper medial thigh, upper scrotum, and root of the penis, and in females, it provides to mons pubis and labia majora.

-It is the nerve that is classically described as the primary cause of chronic pain.

2 . Genitofemoral nerve (L 1– L 2)

It travels obliquely through the psoas muscle, stimulating the medial border of the L-4 spinous process. It then travels behind the ureter and splits superior to the inguinal ligament. The genital branch follows the external iliac artery, enters the inguinal canal through the internal ring, and innervates the cremasteric muscle and scrotal skin, also known as the labia majora and mons pubis.

3. Iliohypogastric nerve (T12 - L1)

This nerve emerges lateral to the psoas muscle and runs in anteriorly front of the quadratus lumborum muscle. It perforates and innervates the tranversus abdominus muscle above the iliac crest. The anterior cutaneous branch runs between the transversus abdominis muscle and the internal oblique muscle until it passes through the internal oblique muscle about 2 cm medial to theASIS. It then moves medially, piercing the external oblique aponeurosis above the external ring. It innervates the suprapubic skin and connects to the ilioinguinal nerve.

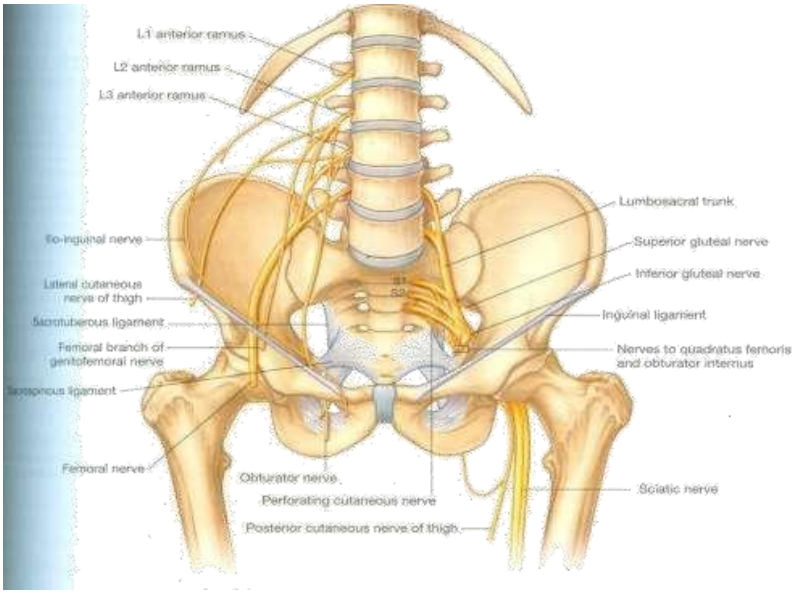


Figure-17. Lumbar Plexus

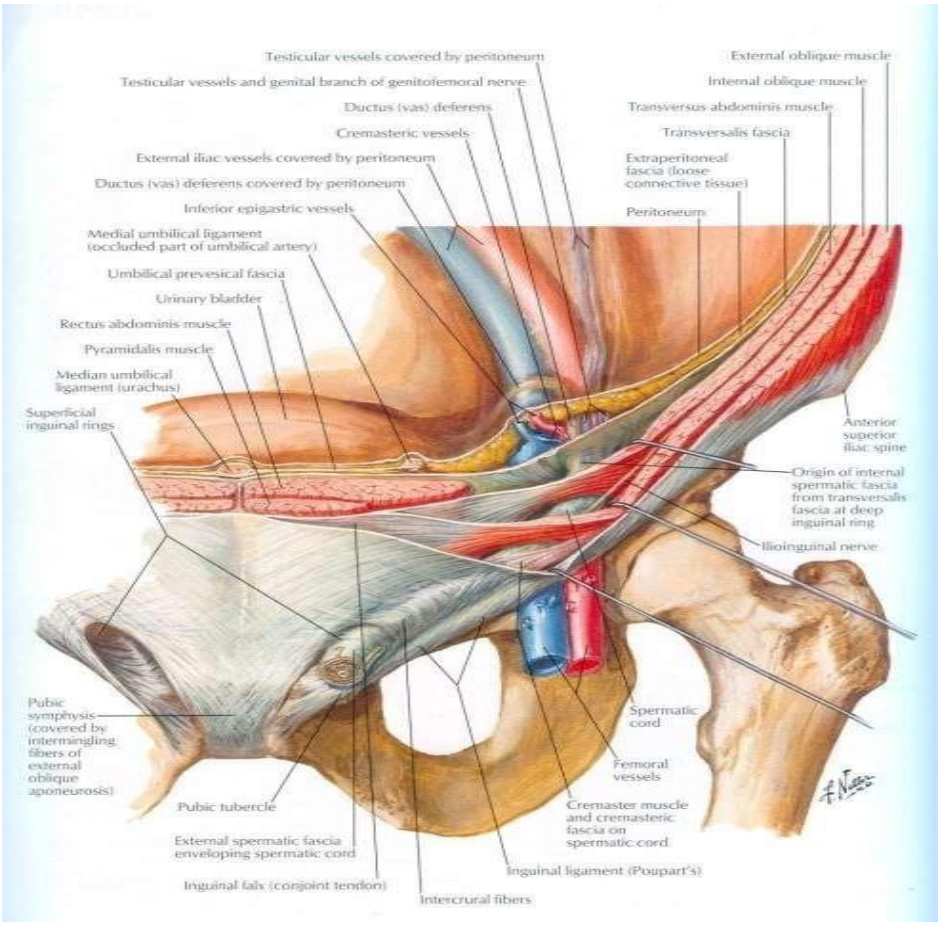


Figure-18. Layers of Abdominal wall forming the Inguinal canal and its contents

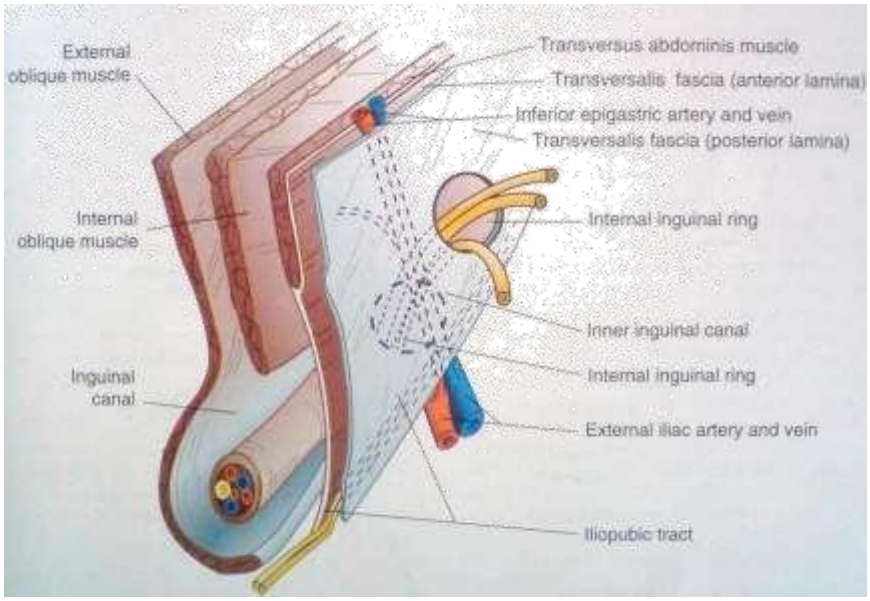


Figure -19. Inguinal canal and its contents

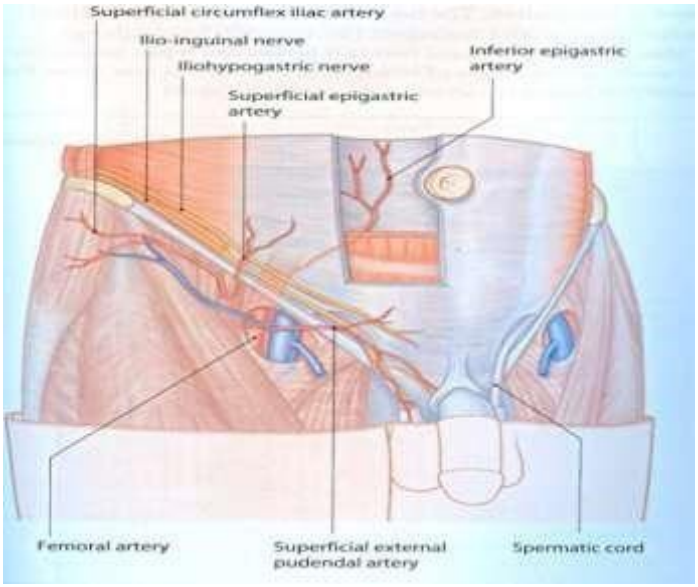


Figure -20. Nerves and Blood Vessels at Groin

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

The groin accounts for 75% of all abdominal hernias; 95% of groin hernias are inguinal hernias, with the remainder being femoral hernias. Although inguinal hernias are nine times more common in men than in women, they are the most common hernia in women. The overall lifetime risk of developing a groin hernia is approximately 27% in men and less than 3% in women. According to research, there is a clear link between age and hernia diagnosis. Similarly, hernia complications (incarceration, strangulation, bowel obstruction) are common in the elderly. Every year, approximately 700,000 inguinal hernia repairs are performed in the United States, with men accounting for 90% of cases and women accounting for 10%. There is unmistakably a link between age and hernia diagnosis. Male inguinal hernias have a bimodal distribution, with peaks before the first year of life and after the age of 40. Those aged 25 to 34 years had a lifetime prevalence rate of 15%, while those aged 75

and up had a rate of 47% 20. Hernia complications (incarceration, strangulation, and bowel obstruction) are more common in the elderly.

The most common type of groin hernia in both men and women is an indirect inguinal hernia. Men are 25 times more likely to have a groin hernia than women, and while femoral hernias are more common in women, inguinal hernias remain the most common hernia in women[21]. Direct hernias are extremely uncommon in women. Both indirect inguinal and femoral hernias are more common on the right side. This is due to a delay in vaginal atrophy following the normal slower descent of the right testis to the scrotum during foetal development. The most common serious hernia complication, strangulation, occurs in only 1% to 3% of groin hernias and is more common at the extremes of life. The majority of strangulated hernias are indirect hernias. In India, there are approximately 19,57,850 cases of inguinal hernia per year across all age groups and genders (Asia pacific hernia society).

Hernias are multifactorial in nature, and it is assumed that the following factors are involved.

1. Evolution

The absence of a posterior rectus sheath below the arcuate line, as well as only a small amount of unsupported transversalis fascia resisting intraabdominal pressure and holding the abdomen and thigh gap together. Humans adopting an upright posture and transitioning from quadrupedal to bipedal locomotion exacerbates it.

2. Congenital and Acquired Factors

a. **Patent Processes Vaginalis**: In infants and children, this is the most common cause of inguinal hernia. The formation, migration, and eventual obliteration

of the processus vaginalis are all intertwined with the descent of the testis from the abdominal cavity into the scrotum. The prevalence of patent processes vaginalis in adults who do not develop hernias can reach up to 20%.

b. Minor differences in abdominal muscle attachment and arrangement.

c. Females are particularly free of direct inguinal hernia: The narrowing of the transversus arch-inguinal ligament interval, as well as the hermetical attachment of the external oblique aponeurosis, are important factors in preventing direct hernia in women. Women's musculoaponeurotic attachments, on the other hand, are such that they frequently develop femoral hernia. The number of aponeurotic fibres in the transversus aponeurosis, on the other hand, determines the intrinsic strength of the layer.

3. General Contributory Factors

a. aging-related muscle and fascia weakening,

b. smoking, obesity, ascitis

c. pregnancies in multiples.

d. Pulmonary diseases such as COPD and asthma, bronchitis, tuberculosis (TB),

e. chronic constipation, ano-rectal stricture

f. Benign prostatic hypertrophy, urethral stricture,

g. strenuous work,

h. previous surgery, such as Appendicectomy, can result in direct hernia.weakening of muscle and fascia by advancing age,

4. DEFENCE MECHANISM

A. The obliquity of the inguinal canal (flap valve mechanism): Sudden exertion raises intraperitoneal pressure, compressing the anterior and posterior canal walls and occluding the canal.

B. Slit valve mechanism: contraction of the external oblique causes the two crura of the superficial inguinal ring to come together (slit valve mechanism).

The inter crural fibres determine the integrity of the superficial inguinal ring

C. Ball valve mechanism: caused by contraction of the cremasteric muscle, which plugs into the superficial ring.

D. Sling shutter mechanism : The transversus abdomins muscle contracts during coughing or other activities that cause an increase in intra abdominal pressure. The crura of the transversalis fascia sling would be drawn closed together and laterally, with this motion transmitted from the contracting transverses abdominis muscle to its investing transversalis fascia. The sling's crura would close the internal inguinal ring partially, while the sling's lateral sliding motion would flatten the cord structures against the abdominal wall, increasing the obliquity. Providing additional protection to this vulnerable area from forces that could lead to hernia in the same way that the momentary action of a camera shutter does.

E. Shutter Mechanism[86]

The accepted explanation is the physiologic "Shutter mechanism," which is activated when the abdominal muscles contract in order to raise intra abdominal pressure. As the internal oblique and transverse abdominis muscles contract, the lower fibres

forming the myoaponeurotic roof of the inguinal canal "the conjoined tendon" that arches over the spermatic cord contract sharply as well, and as the fibres shorten, the arch straightens out and descends to lie close to or on the inguinal ligament, covering and protecting the fascia transversalis. The shutter also passes down in front of the internal ring, counteracting the pressure from inside the abdomen on the internal ring.[86]

Contraction of the transverses abdominis muscle also pulls up the crurae of the internal ring, which comprise the thickened bands of the iliopubic tract and fascia transversalis, causing the internal ring to close snugly around the cord like a sphincter.[86]

F. Hormones play an important role in preserving the inguinal region's integrity.

THEORIES ON HERNIA FORMATION

1. Russell's theory of preformed sac
2. Reid's smoking-caused metastatic emphysema theory
3. Cloquet's lipoma theory — fat action is driven by a pile.
4. Fruchard's theory- the inguinal ligament divides the large opening in the lower abdomen between the pubic bone and the conjoint tendon. The inguinal hernia passes through the upper part, and the femoral hernia passes through the lower.
5. Denervation theory- ilioinguinal nerve injury, particularly following appendectomy.

6. Oblique pelvis theory- a high arch in the internal oblique leads to an inefficient shutter mechanism and an increased risk of inguinal hernia.
7. Broad female pelvis- the lower arch of the internal oblique provides a more efficient shutter mechanism. As a result, indirect inguinal hernias are uncommon in females, resulting in a wider femoral ring and a higher prevalence of femoral hernia in females.
8. Uglavasky theory- as a result of chronically elevated intra-abdominal pressure.
9. Peacock's theory: Inadequate collagen synthesis
10. Walk's theory: abdominal wall weakness at the exit of the neurovascular bundle.
11. Kith's theory- stress-related degeneration of connective tissue, particularly in the fascia transversalis.
12. Inadequate insertion of the conjoint tendon in males, particularly whites, predisposes to direct inguinal hernia due to less support to the postinguinal canal wall.Females have a wide range of attachment, so direct hernias are rare.
13. According to Dr. Desarda's theory, the cause of hernia formation is loss of strength and physiologically dynamic nature of the posterior wall of the inguinal canal, absence of aponeurotic extension in the posterior wall, and loss of strength of cremasteric fascia and musculo-apneurotic structure around the inguinal canal.

Components of Inguinal Hernia[28]

The **sac** is made up of a peritoneum diverticulum that is divided into the mouth, neck, body, and fundus. The **mouth** is the area between the interior of the sac and the abdominal cavity. The **neck** is the narrowest section of the sac between the mouth and the body. It is the most common site of impediment. It is located between the neck and the fundus.

The fundus is the sac's blind end or the most distal part.

2. Contents of Hernia

Except for the liver, it can be almost any abdominal viscera. The most common are:

• Enterocele: a loop of the intestine

• Omentocele (Synonym: Epiplocele): omentum.

3. Coverings[32]

Coverings for an indirect inguinal hernia are as follows, from the inside out: Extraperitoneal tissue a. internal spermatic fascia b. cremastric fascia c. cremastric fascia d. external spermatic fascia e. skin.

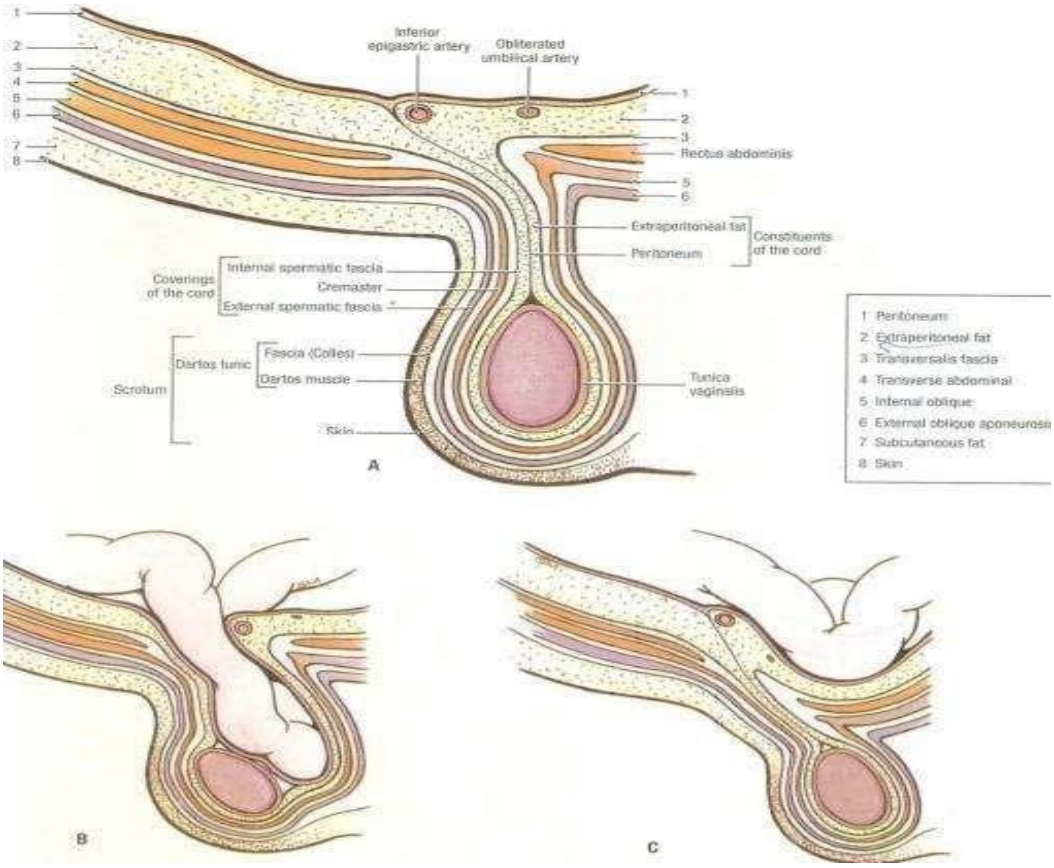


Figure-21. Coverings of inguinal hernia (A), Indirect (B), and Direct (C)

CLASSIFICATION OF INGUINAL HERNIAS [34,39]

Anatomical Classification

a. Direct hernia

b. Indirect hernia

c. Femoral hernia

Classification according to extent of the Sac

A. Bubonocele

B. Funicular

C. Complete

Classification according to contents of sac

a. omentocele

b. epiplocele

c. cystocele

Clinical Classification

This is based on the clinical presentation of hernia:

- Reducible hernia
- Irreducible hernia
- Obstructed hernia (Incarcerated hernia)
- Strangulated hernia
- Inflamed hernia

Gilbert's Classification (Addition by Rutkow and Robbins)

It is based on anatomical and functional defects established intra-operatively, Gilbert categorized groin hernias in to 7 types. Type1, 2 and 3 were indirect hernias whereas type 4 and 5 were direct hernias.

Indirect Hernia

Type I : Snug internal ring, intact canal floor.

Type II : One finger breadth internal ring, intact canal floor. Not more than 4 cm.

Type III : Two-finger breadth internal ring. Canal floor is defective (Scrotal and sliding hernias).

Direct Hernia

Type IV : Entire canal floor defective, no peritoneal sac anterior to canal floor, intact internal ring.

Type V : Diverticular defect, admitting no more than one finger, internal ring intact.

Type VI : Consists of both direct and indirect components.

Type VII : Covers all femoral hernias.

Nyhus Classification of Groin Hernias

Is based on strict anatomic criterias, focusing on functional state of posterior wall of the inguinal canal and the internal ring .

Type I : Indirect inguinal hernia -- internal inguinal ring normal (Congenital hernia).

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

Type III : Posterior wall defects

A. Direct inguinal hernia.

B. Indirect inguinal hernia - internal ring dilated, medially encroaching or destroying the transversalis fascia of the Hesselbac's triangle. (e.g. massive scrotal, Sliding or Pantaloon hernias).

C. Femoral hernia.

Type IV : Recurrent hernias

BENDAVID TSD CLASSIFICATION

TYPES

1. Anterolateral (indirect)
2. Anteromedial (direct)
3. Posteromedial (femoral)
4. Posterolateral (perivascular)

STAGES

I. Sac in canal

II. Sac outside external ring

III. Sac into scrotum

AACHEN CLASSIFICATION:

Grades:

I. Normal diameter of internal ring of upto 1.5 cms

II. Diameter of internal ring1.5cms to 3cms

III. Diameter of internal ring >3 cms

In combined hernia, total diameter of defects is considered.

Terms:

- M-Medial
- L-Lateral

- F-Femoral
- C-Combined

HALVERSON AND McVAY CLASSIFICATION

1. Small indirect inguinal hernia

2. Medium indirect inguinal hernia

3. Large indirect or direct inguinal hernia

4. Femoral hernia

PONKA'S CLASSIFICATION

1. INDIRECT INGUINAL HERNIA

-Uncomplicated indirect hernia

-Sliding inguinal hernia

2. DIRECT INGUINAL HERNIA

-Small defect on the medial aspect of the Hesselbach's triangle -Diverticular hernia in the posterior wall with an otherwise intact inguinal floor. -A large diffuse direct inguinal hernia of the entire floor of Hesselbach's triangle.

CASTEN'S CLASSIFICATION

Stage 1: An indirect hernia with a normal internal ring

Stage 2: An indirect hernia with enlarged

internal ring Stage 3: All direct or femoral

hernias.

EHS(EUROPEAN HERNIA SOCIETY)

- Primary or Recurrent(P or R);
- Lateral, Medial or Femoral(L,M or F);
- Defect size in finger breadths assumed to be 1.5cm.

RARE VARIETIES OF HERNIA

- Richter's hernia : A portion of the circumference of the intestine.
- Ovary with or without the corresponding Fallopian tube.
- Littre's Hernia Meckel's diverticulum .
- Maydl's hernia :Two loops of intestine in the manner of W
- Rarely some times stomach, spleen or caecum may be found within the sac.
- Sliding or Hernia-en-Glissade (Contents - Caecum, Urinary bladder).
- Amyand's Hernia: appendix as its content.
- Dual hernia (saddle or pantaloon). Hernia, on either side of the inferior epigastric vessels.

CLINICAL FEATURES OF INGUINAL HERNIA [40 ,41]

History

Inguinal hernias can occur at any age. They can be present at birth or appear unexpectedly in an 80-year-old. Peak incidence occurs in the first few months of life, in the late teens and early twenties, and between the ages of 10 and 60. In young people, indirect inguinal hernias are more common, whereas direct hernias are more common in the elderly.

Males are 20 times more likely to be affected than females.

Occupation: Heavy work, particularly heavy lifting, increases the risk of inguinal hernias because it puts a strain on the abdominal muscles. If an underlying weakness exists, the appearance of a hernia may coincide with strenuous physical effort. Manual labourers, weight lifters, and athletes are at a higher risk.

Diseases associated with it:

Hernias are frequently caused by diseases that cause anterior abdominal wall weakness, such as obesity, ascites, previous lower abdominal operations, and Malgaigne's bulges. Certain diseases, such as prostatic enlargement, chronic cough, respiratory disorders, urethral stricture, chronic smoking, and constipation, cause an increase in abdominal pressure.

Symptoms at the site:

In the early stages, the patient complains of discomfort, heaviness, and pain. It is a dragging or aching sensation in the groin that worsens throughout the day. As a

result, pain may appear before swelling. The pain increases as the hernia progresses, but stops when it is fully formed.

Swelling: The second most common complaint is groyne swelling. This can range from a small swelling of about 2-3 cm to a massive swelling that extends all the way down to the knee. When the patient lies down, it feels smaller, and when he strains or stands, it feels larger.

If the hernia obstructs the lumen of the bowel loop, the patient may experience one or more of the four cardinal symptoms of intestinal obstruction: colicky abdominal pain, vomiting, abdominal distension, and absolute constipation. In late-stage strangulation cases where gangrene has developed, the patient may exhibit symptoms of peritonitis, particularly if bowel perforation has occurred.

Associated symptoms include a persistent cough, constipation, and dysuria caused by benign prostate enlargement or urethral stricture**.**

ON LOCAL EXAMINATION

INSPECTION: In both standing and supine positions, a bulge or swelling in the groin will be visible. If the hernia is reducible spontaneously, as in direct hernia, it may disappear when lying down. In reducible hernias, there is a cough impulse. Scrotal skin rugosities are lost in large inguino-scrotal hernias. Enterocele is distinguished by obvious peristalsis.

Malgaigne's bulges are seen in patients who have a weak abdominal wall. In most cases, an indirect hernia is sausage or pear shaped and runs parallel to the inguinal ligament. It reappears laterally after reduction and runs downwords above the inguinal ligament towards the scrotum. A direct hernia is more rounded, medial,

bulges forward, and does not extend all the way to the scrotum. It reappears in a forward direction after being reduced.

PALPATION: Manipulation to reduce the hernia is referred to as taxis. This is usually done while the patient is lying down. As the hernia shrinks, the following characteristics emerge:

a. An enterocele produces a gurgling sound.

b. The first part of an enterocele takes longer to reduce than the second part of an omentocele.

c. A cough impulse is felt.

Getting above the swelling: Differentiates a pure scrotal swelling from an inguino-scrotal swelling by palpating the root of the scrotum between the thumb and the other fingers; in an inguinal hernia, it is impossible to get above the swelling. Relationship of the swelling to the testis and spermatic cord: In the case of an indirect hernia, the cord will be felt behind the swelling, whereas in the case of a direct hernia, the cord will be felt in front and external to the swelling. Congenital hernias have the testis within the swelling and can be felt behind the swelling. The swelling in acquired and funicular hernias ends at the upper pole of the testis.

Cough impulse: This test is performed with the patient standing with his or her legs apart and looking up at the ceiling. If there is no visible swelling, a finger is placed over the external ring and the root of the scrotum is held between the thumb and index finger while the patient coughs. This will force the hernia's contents out through the external ring and separate the thumb and index finger held at the

scrotum's root. This is known as an 'expansile cough impulse.' Strangulated and incarcerated hernias lack it.

Reducibility: Hernias appear when the patient stands and shrink when he lies down in the early stages. It may not reduce spontaneously when he is lying down as it grows larger, and the patient must learn to reduce it manually. The first part of an enterocele is difficult to reduce, but the last part slips in easily. It is simple to reduce the first part of an omentocele but difficult to reduce the last part.

Zieman's Test: The examiner places his corresponding index, middle, and ring fingers on the indirect, direct, and femoral hernia sites when there is no obvious swelling or after the has been reduced. The patient is instructed to hold his or her nose and blow out. If a hernia is present in any of these corresponding sites, a strange gliding motion of the walls of an empty sac or a typical pushing sensation will be felt beneath the fingers.

Internal Ring Occlusion Test: The internal ring is obliterated, and the patient is asked to cough.

It is a direct inguinal hernia if there is a bulge medial to the occluding finger, if not an indirect hernia.

External Ring Occlusion Test: The external ring is occluded with a finger after complete reduction, and the patient is gently asked to stand up. In the case of varicocele and lymphvarix, the occluding finger prevents the descent of the reducible inguinoscrotal swelling, whereas the swelling fills gradually from below.

Finger Invagination Examination: This test may be performed after the hernia has been reduced to palpate the hernial orifice. The skin is invaginated from the

scrotum's bottom with the little finger, which is then pushed up to palpate the pubic tubercle. After that, the finger is rotated and pushed deeper into the superficial inguinal ring. A standard ring is a triangular slit that only allows the tip of a finger to be inserted. In direct hernia, the finger enters the ring directly backwards, whereas in indirect hernia, the finger enters the ring upwards, backwards, and outwards. The finger is rotated once more so that the pulp of the finger is facing backwards. The patient is asked to cough once more. The hernia is direct if the impulse is felt on the pulp of the finger; if it is felt on the tip, it is indirect. During the finger invagination test, a "Sharma's ring" may be felt in the sac.

Percussion: If the swelling is an enterocele, the hearing is tympanic; if it is an omentocele, the hearing is impaired or dull.

Auscultation: In enterocele, bowel sounds can be heard.

ALWAYS EXAMINE : 1. External Genitalia

- Scrotum for spermatic cord thickening.
- The epididymis and testes
- External urethral meatus for pinhole meatus and prepuce for phimosis.

2. Based on a rectal examination

1) Per Abdomen Examination: To rule out any abdominal mass, ascites, or recti divarication.

2) Respiratory System: This is to rule out COPD and Koch's disease.

DIFFERENCE BETWEEN DIRECT AND INDIRECT HERNIA[44]

TABLE NO 1

FEATURES	**INDIRECT**	**DIRECT**
Age	Occur at any age from childhood to adult	Common in elderly
Development	Occurs in a pre-existing sac	Acquired
Site	Can be unilateral or bilateral	Usually bilateral
Shape	Pyriform / oval	Globular
Internal ring occlusion	Swelling does not appear	Swelling appears medial to occluding finger
Ziemann's technique	Impulse felt on index finger	Impulse felt on middle finger
Finger invagination test	Felt in the tip of finger	Felt at pulp of fingers
Malgaigne's bulges	Usually absent	Usually present
descends into scrotum	common	Rare
Obstruction and strangulation	common	Rare
Relation of sac to cord	Anterolateral	Posterior

Differential Diagnosis of Inguinal Hernia

- Femoral hernia.
- Enlarged Inguinal Lymph Nodes.
- Lymph Varix:
- Femoral Aneurysm.
- Lipoma of the Cord.
- Hydrocele: infantile, Encysted Hydrocele of the Cord, large vaginal, bilocular hydrocele
- Undescended or Ectopic Testis.
- Groin Abscesses

COMPLICATIONS OF GROIN HERNIA [42]

Certain complications are well recognized.

- Irreducibility
- Incarceration
- Reduction-en-masse
- Strangulation
- Gangrene
- Peritonitis due to perforation of the intestinal wall

and Malignant mesothelioma (very rarely).

INVESTIGATIONS 43 ,44 ,45

The use of laboratory and radiological aids in the diagnosis of inguinal hernias is limited.

1. A chest x-ray to rule out pulmonary pathology.
2. An X-ray of the abdomen (Plain x-ray erect abdomen) may reveal patterns typical of intestinal obstruction, such as air and fluid-filled loops of intestine as in inguinal hernias.
3. Abdominal ultrasound to diagnose obstructive urinary outflow diseases.
4. Routine laboratory tests such as haemoglobin, urine routine, blood urea, and serum creatinine will aid in the search for normal parameters before referring the patient to surgery.
5. Additional investigations to rule out precipitating factors.

Herniography:

Herniography is most commonly used in patients with unexplained groin pain or to detect non-palpable, symptomatic cases of hernia recurrence, according to the literature. Gullimo describes this examination technique. The midline below the umbilicus is punctured with a 20 to 22 gauge Veress needle. 50 to 80 ml of contrast medium is injected after inserting the catheter into the lower pelvis. The contrast medium pools in the inguinal region as soon as the patient in the prone position turns from side to side. Even though the complication rate is low, we believe that herniography is no longer necessary with the new techniques available.

TREATMENT OF INGUINAL HERNIAS [46,47,48]

The primary goal of inguinal hernia treatment is to expose the defect, correct the anatomical defect, and strengthen the deficiency in the posterior wall of the inguinal canal. Inguinal hernias are treated primarily surgically, with the exception of when clinical manoeuvring is used to keep the hernia in a reduced state until the patient is fit for surgery.

CONSERVATIVE MANAGEMENT:

Truss is used in the elderly who are unable to undergo surgery. Its use should be discouraged due to its complications

TYPES OF SURGICAL TREATMENTS FOR INGUINAL HERNIA REPAIR

1. **PURE TISSUE REPAIR**: Desarda, Shouldice, MacVay, Modified Bassini's
2. **PROSTHETIC REPAIR**: Lichtenstein, Rives, Gilbert, Stoppas, TEP, TAPP

APPROACH FOR REPAIR:

1. **ANTERIOR**:

Bassini's, Desarda, Shouldice, MacVay, Andrew's, Rives, Cooper's, Wilkinson's, Lichtenstein

2. **POSTERIOR**

Nyhus, Stoppas, Kugel's, TEP, TAPP

Herniotomy: The fundamental operation of dissecting out and opening the hernial sac, reducing any contents, and then transfixing the sac's neck and removing the

remainder. It can be used as a stand-alone procedure or as the first step in herniorrhaphy or hernioplasty. In infants and adolescents, a herniotomy is sufficient for hernia treatment.

The sac is removed at the level of the deep inguinal ring during a high herniotomy.

Herniorrhaphy: refers to the strengthening of the posterior wall of inguinal canal.

Hernioplasty: refers to the addition of grafts or a prosthesis to herniorrhaphy (Reinforcement).

Bassini's Repair: Bassini described this classic operation for the first time in 1888.

Indications:

• Indirect inguinal hernia in young healthy adults with good musculature who do not have a stretched deep ring

• Also appropriate for large indirect inguinal hernias with stretched internal rings and distorted posterior inguinal wall in adults.

Aim of the operation: To narrow the internal ring and reinforce the posterior wall of the inguinal canal with a conjoint tendon.[86]

Technique: A simple herniotomy is performed. Fat and areolar tissue are carefully removed from the lower part of the conjoint tendon and the upper surface of the inguinal ligament. Because this is the most common site of recurrence, the muscle and tendon are lifted forward on the finger and 4 to 5 stitches are inserted at about a centimetre interval between the conjoint tendon and the inguinal ligament at the canal's medial end. The first bite should be taken through the periosteum of the pubic bone to ensure that the medial gap is closed. The stitches should be placed at different depths into the inguinal ligament to avoid splitting along the suture line. When sutures are placed in the inguinal ligament, care should be taken not to injure the

external iliac vessels, which are located directly beneath the inguinal ligament. Sutures should be placed in the inguinal ligament with care to avoid injuring the external iliac vessels, which are located directly beneath the inguinal ligament. Nonabsorbable monofilament suture (prolene) is commonly used, but the surgeon can use any suture material of his or her choice. It is important to ensure that the stitches are not too tight. It is critical to exclude the iliohypogastric nerve. The internal ring should be wrapped snugly around the joint muscle. It is critical not to tie the suture while it is under tension. The cord is sutured with interrupted or continuous suture over the strengthened posterior wall and external oblique aponeurosis. The skin is sutured.

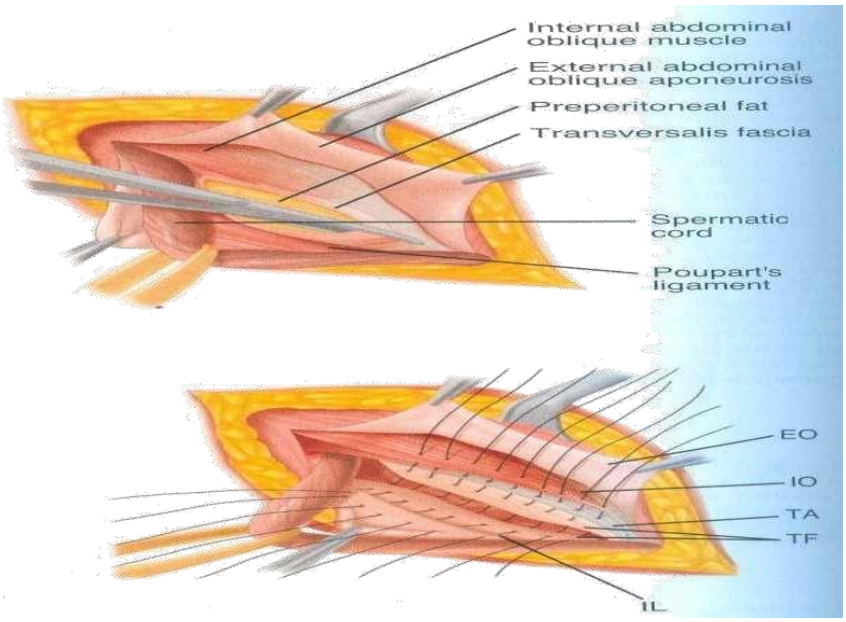


Figure -22. Bassini's

The darn:

Working with Shouldice at his hernia clinic, Obney and Ryan developed a denovo hernioplasty (1950-53) that is nearly identical to the Bassini procedure. In this procedure, the transversalis fascia is imbricated with a continuous suture of at least two layers, corresponding to identical myoaponeuroticofascial layers between the

conjoint tendon and the inguinal ligament. Darning is done from the pubic tubercle to and above the internal ring, then back to the beginning. Darning is kept loose to form a lattice on which fibrous tissue is laid.

Tissues are not drawn together by a darn, and the stitches are not tense.

Shouldice operation [42,49,50]

Shouldice of Toronto described the classic Shouldice hernia repair method (1908-1965). It is the most common, relying solely on local tissues. It's essentially a multi-tiered Bassini business. Shouldice Hospital performs all operations under local anaesthesia. Following the opening of the inguinal canal, a herniotomy is performed. The posterior wall was repaired with four layers of non-absorbable 2/0 polypropylene. The **first line** of repair begins at the pubic tubercle and extends just medial to the internal ring, roughly corresponding to the upper and lower transversalis fascia flaps.

The same running suture is used in the opposite direction for the **second line** of repair. The upper flap is completely sutured to the inguinal ligament below, including muscle and aponeurotic fibres from the internal oblique and transverses muscles.

The **third line** of defence starts just medial to the internal ring. It picks up the surface of the internal oblique muscle from above and the underside of the lower flap of the external oblique aponeurosis near the inguinal ligament from below.

The **fourth line** of repair is as follows: This suture, which returns from the pubic bone, connects the structures of the third line of repair in a slightly more superficial plane, removing as much of the lower flap as desired over the aponeurotic and muscle surface above. Closure of the external oblique aponeurosis: Because the repair has

taken up 1 cm or more of the lower flap of the external oblique, the spermatic cord and ilioinguinal nerve will be in a higher arch than before when they are returned to the canal. The new external ring will be taller and wider on the lateral side.

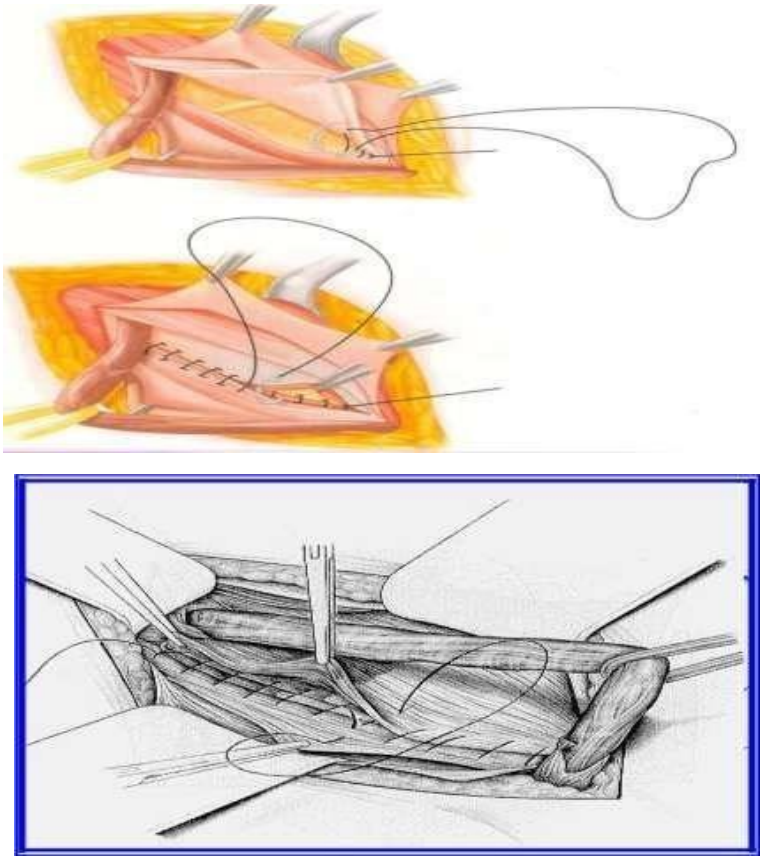


Figure -23. Shouldice Repair (A and B)

Lichtenstein technique

In 1984, Lichtenstein proposed a "tension-free" polypropylene mesh onlay for inguinal hernia repairs. This technique is used by Lichtenstein to repair all primary direct and indirect hernias without closing the defect.[87]

Operative technique[87]: To gain access to the external oblique aponeurosis, a transverse skin crease incision is made. The spermatic cord is activated, as is customary. To flatten the posterior wall, direct sacs are inverted and imbricated with a non-absorbable suture. Indirect sacs are excised or inverted after being dissected

from the cord to the extraperitoneal fat. This stage is distinguished by high dissection rather than high ligation. If the deep ring is widened (Gilbert classification 2 or 3), a cone of mesh is inserted and anchored to the inguinal ligament by two or three non-absorbable sutures, usually superolaterally and occasionally inferiorly. Inguinoscrotal sacs are transected in the canal and the proximal portion is closed and dealt with, whereas the mouth of the distal portion is left undissected but wide open [87]. **Onlay mesh:**[52,53] A polypropylene mesh is sutured along its lower border to the pubic tubercle, the lacunar ligament, and the inguinal ligament to beyond the internal ring with a continuous monofilament 3-0 polypropylene suture. The rectus sheath's medial edge is also sutured to the rectus sheath with continuous suture. The superior edge is tacked down to the aponeurosis or muscle of the internal oblique with a few absorbable interrupted sutures, while avoiding injury to or entrapment of the iliohypogastric nerve. At the lateral end, a slit is cut, resulting in two tails, one wider (2/3) above and one narrower (1/3) below. The lower edges of the two tails that encircle the cord are secured to the shelving margin of Poupart's ligament. This results in the formation of a new internal mesh ring. Trim the excess patch on the lateral side, leaving about 3-4 cm of mesh beyond the internal ring. The wound is routinely closed.

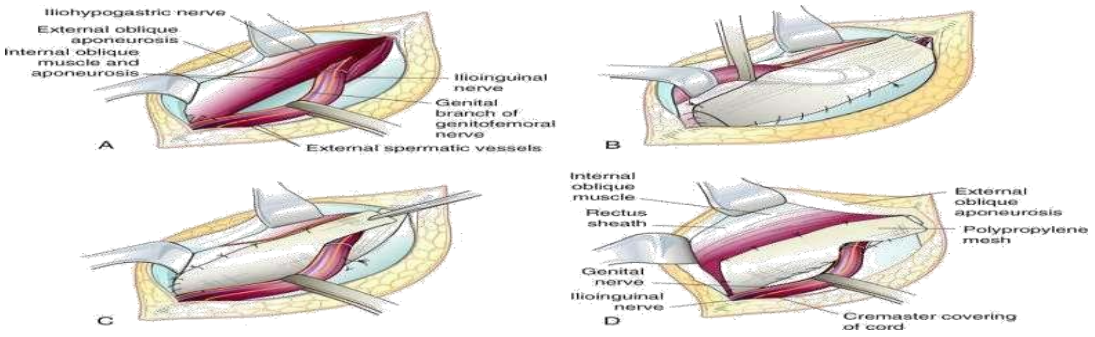


Figure -24. Lichtenstein Tension free Mesh Repair

Figure- 25. Polypropylene mesh

Gilbert's sutureless Repair. [54]

Suture-free repair of small and medium-sized indirect inguinal hernias was described by Arthur L. Gilbert (1992). To complete the repair, one swatch of polypropylene mesh was shaped into an umbrella plug and inserted through and immediately deep into the internal ring. As an overlay graft, a second swatch with a slit in the upper part is placed, covering the canal's posterior wall, under and around the spermatic cord.

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

This method was used by Robbins and Rutkow to treat all groin hernias, both primary and recurrent. The sac is dissected and then reinserted into the abdominal cavity through the internal ring in an indirect inguinal hernia. A mesh plug is inserted through the internal ring, tapered end first, and placed just beneath the crurae. An interrupted 3-0 vicryl holds the plug in place.

Giant prosthetic reinforcement of visceral sac (GPRVS or Stoppa)[85]

Stoppa's technique for the procedure has been applied to a single groin hernia for use with local anaesthesia since his original description. GPRVS uses a large prosthesis that extends far beyond the myopectineal orifice of Fruchaud to reinforce the transversalis fascia in the groin. The prosthesis encircles the visceral sac and is held in place by intra-abdominal pressure and, eventually, connective tissue growth. The mesh adheres to the peritoneum and keeps it from protruding through the parietal defect. GPRVS is a tension-free and suture-free repair.[85]

GPRVS enables direct access to the pre-peritoneal space and hernia parietal defects without requiring dissection of the inguinal canal, spermatic cord, or groin sensory nerves[85].

GPRVS allows direct access to the pre-peritoneal space and hernia parietal defects without dissection of the inguinal canal, spermatic cord, or groin sensory nerves when performed through a transabdominal incision. Primary inguinal hernia recurrence rate is 0.7 percent, and recurrent inguinal hernia recurrence rate is 0.8 percent.

Laparoscopic Inguinal Hernia Surgery[9,10,43]

Despite being minimally invasive, the laparoscopic approach has several advantages, including reduced postoperative pain and disability. The femoral and inguinal areas can be inspected and repaired bilaterally in a single sitting. It avoids the previous operative site in patients with recurrent hernias, lowering the risk of nerve injury or ischemic orchitis. The disadvantages include peritoneal cavity violation, the need for general anaesthesia, and the procedure's high cost. The use of general anaesthesia is not advised for all patients. Despite the fact that there are numerous techniques for

laparoscopic hernia repair, only two types of laparoscopic inguinal herniorrhaphy are commonly used.

1. Transabdominal pre peritoneal (TAPP)

At the moment, this is the most widely used technique. To detect the presence of a hernia, a diagnostic laparoscopy is performed. The peritoneum is incised transversely above the hernia defect, and the pre-peritoneal space is completely dissected using instruments inserted intra-abdominally through accessory ports. Direct sacs are reduced during preperitoneal dissection, and indirect sacs are either dissected from the cord structures and reduced or divided circumferentially at the internal ring, leaving the distal sac in place. TAPP necessitates the use of prosthetic mesh, with a large piece of polypropylene mesh (16/12cm) used to cover the myopectineal orifices, including the direct, indirect, and femoral hernial spaces. Depending on the surgeon's preference, the prosthesis is either slit to accommodate the cord structure or simply placed over them. Finally, the mesh is stapled in place using the landmarks listed below.

a. Medial symphysis pubis

b. Transversalis fascia superiorly, above the internal ring.

c. An arbitrary point 1 cm medial to ASIS on the lateral side.

Cooper's ligament is located inferomedially.

e. Iliopubic tract inferolaterally.

It is the preferred technique in patients with peritoneal adherence due to a lower abdominal wall incision. Laparoscopically, we must look for two critical triangles.

TRIANGLE OF PAIN: A 'V'-shaped area with an apex at the internal inguinal ring.

The iliopubic tract runs anteriorly.

In the middle: testicular vessels

Laterally, there is peritoneal reflection.

This triangle is made up of the femoral branch genitofemoral nerve, as well as the anterior and lateral femoral cutaneous nerves.

TRIANGLE OF DOOM: Is an Inverted V shape

In the middle: vas deferens

Laterally: spermatic vasculature

Peritoneal fold is located inferiorly.

External iliac artery and vein, deep circumflex iliac vein, genital branch of genitofemoral nerve, and femoral nerve are all found in this triangle. Surgical staples should be avoided in this area. Presently, this is the most commonly used technique.

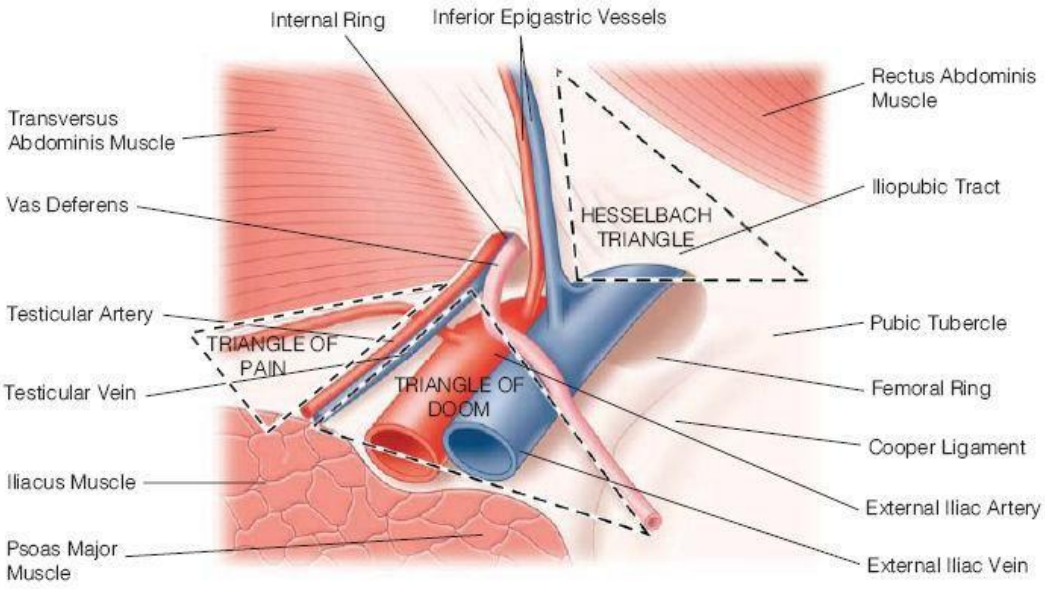


Figure-26. Triangle of pain and triangle of doom

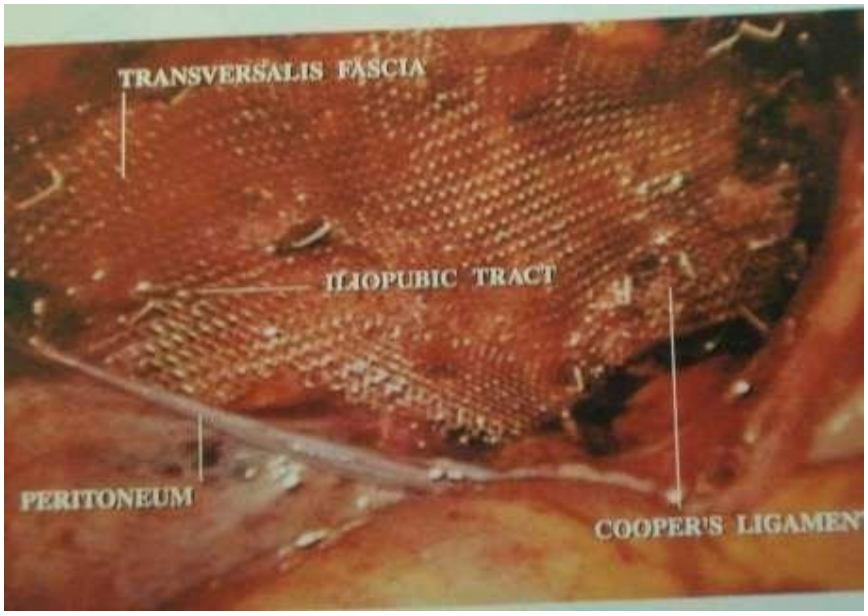


Figure-27. Laparoscopic Hernia Repair (TAPP)

2. Totally Extra Peritoneal Herniorrhaphy (TEP)

The procedure is entirely extra-peritoneal, avoiding bowel and vascular injuries as well as intra-peritoneal adhesions. After a 1.5 cm infra-umbilical incision and advancement through the subcutaneous tissues, the rectus muscles are separated bluntly. To create a tunnel between the rectus muscles and the underlying preperitoneal fat, retractors or a balloon dissection device are used. The pubic symphysis has been exposed by dissecting the peritoneum of the rectus muscle's posterior aspect. The dissection is extended up to the iliac crest, the cord structures are examined, and the presence of an indirect sac is minimised. Polypropylene mesh is positioned such that it covers all hernial orifices (direct, indirect, femoral and obturator). In the case of a bilateral hernia, two pieces of polypropylene mesh with mirror images are prepared.

Figure-28. Laparoscopic Hernia Repair (TEP)

COMPLICATIONS OF INGUINAL HERNIA SURGERY[59,60]

Nothing prevents complications from occurring as much as one's awareness and fear of them. Complications cannot be completely avoided. They can be reduced by using precise and meticulous surgical techniques. Complications are as follows:

- Hemorrhage
- Bowel and bladder damage
- Seroma Hematoma Lymphocele hematocele
- Infection at the surgical site
- Pubic osteitis
- Hydrocele after herniorrhaphy
- Atrophy of the testicles

- Thrombosis of the pampiform plexus
- The iliohypogasric nerve causes hyperesthesia on the medial side of the inguinal region.
- Chronic groin pain

Chronic post-herniorrhaphy groin pain is more common, defined as pain that lasts more than three months. The prevalence ranges from 0% to 10%.

Scar tissue, a reaction to prosthetic material, or the involvement of a nerve in staples or suture material during hernia repair can all cause groin pain syndromes.

Complications with prosthetics

• Infection and migration of meshes

Complications of laparoscopic surgery

- Vascular damage
- Gas embolism • Intra-abdominal • Retroperitoneal • Abdominal wall
- Bowel perforation • Bladder perforation • Visceral injury

Problems at the Trocar Site

• Haematoma • Hernia • Wound infection • Keloid Bowel Obstruction • Miscellaneous Adhesions • Diaphragmatic dysfunction • Hypercarbia

Recurrence

The recurrence rate is one percent. They are common with tissue repairs due to the fact that they are performed under tension. It is lower when tensionless mesh repair is used. The most common cause of recurrence is a technical failure. The following are the causes of recurrence:

PRE OPERATIVE:

Smoking

Cough that persists

Constipation

Anemia in old age

Hypoprotenemia

Increased intra-abdominal pressure as a result of squeezing

OPERATIVE:

Ascitis

Suture tensile tension

Incorrect technique

Anterior abdominal wall weakness

POST OPERATIVE:

Infection

Hematoma

Retained sac of pantaloon

Straining

Figure -29. Bilateral direct Inguinal Hernia

Figure -30. Left sided Indirect Inguinal Hernia

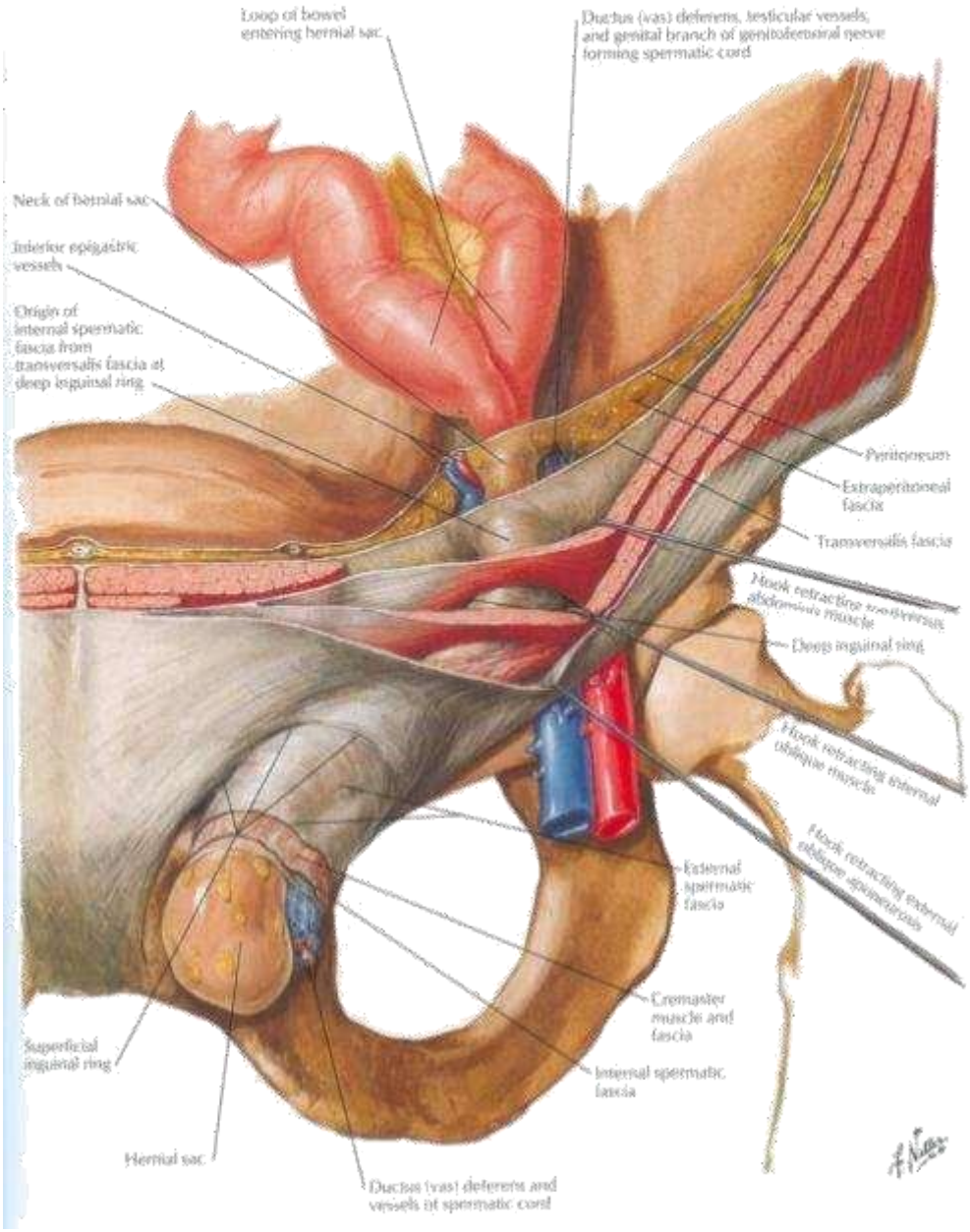


Figure -31. Hernial sac with Indirect Component

METHODOLOGY

A detailed history will be taken, and patients will be thoroughly examined. Patients will be subjected to necessary tests, such as a blood routine that includes haemoglobin, total count, differential count, platelet count, bleeding time, clotting time, and a biochemical routine that includes blood urea, serum creatinine, and urine analysis. If necessary, a chest X-ray and electrocardiogram will be performed. Other investigations will be conducted if necessary based on the history and other complaints.

Written informed consent will be obtained from all patients, along with a detailed explanation of the procedure that will be performed on them, as well as the risks and complications involved, as well as the benefits and drawbacks of the same, and the patient will be given a choice of which procedure he wishes to undergo Primary outcome is post-operative pain was calculated at post op day 1, 3 and 5 by visual analogue scale.

0-*no pain,*

1-3 : *mild*

4-6 : *moderate-severe*

7-9 : *very severe*

10 : *worst pain possible*

Patient will be asked to fill a proforma detailing all the study aims and objectives.

STUDY DESIGN

- A prospective comparative study.
- Proposed study period : October 2019- June 2021

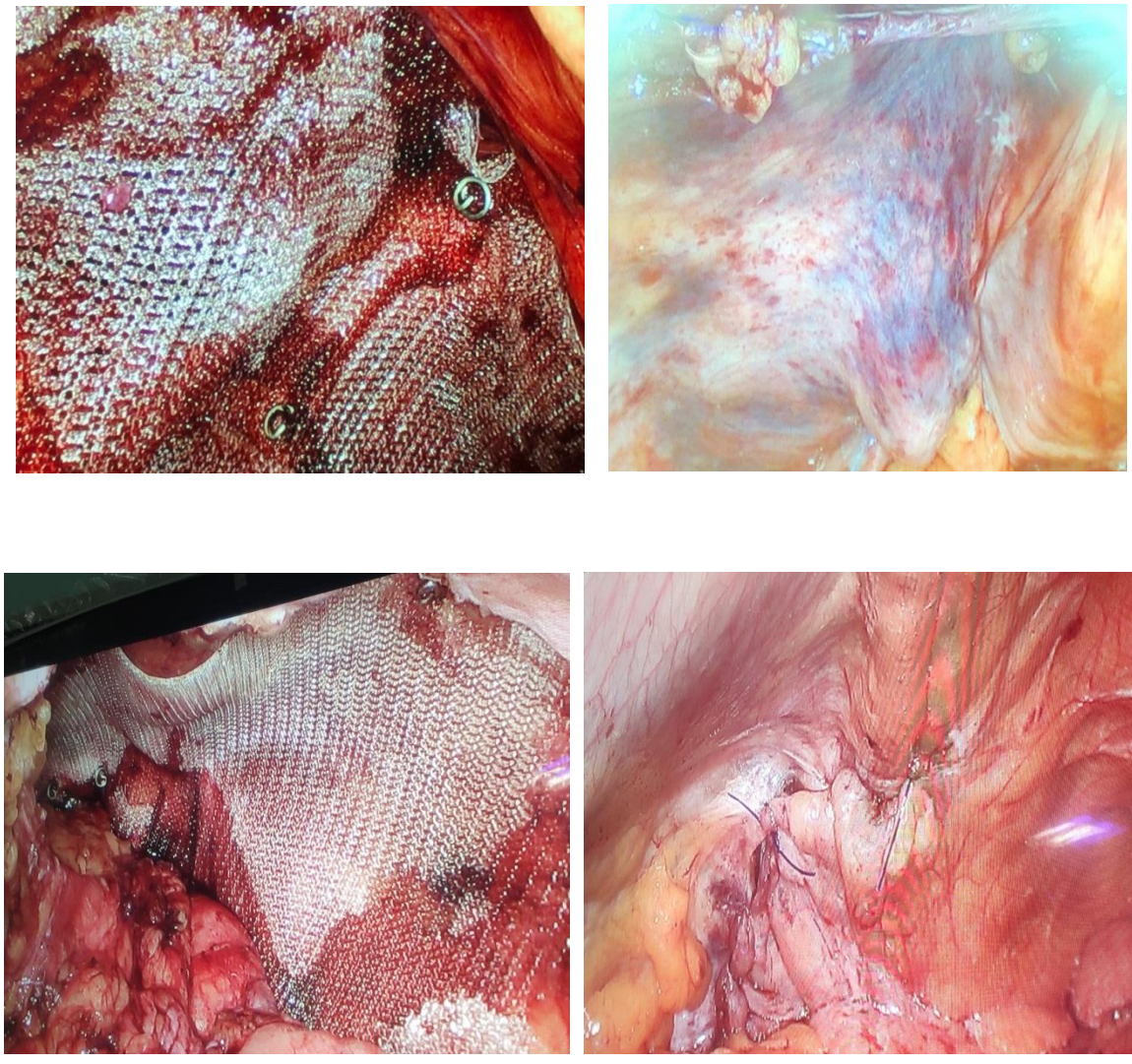


Figure -32. Images of Laparoscopic hernioplasty (TAPP) fixation of mesh with tackers and closing of peritoneum

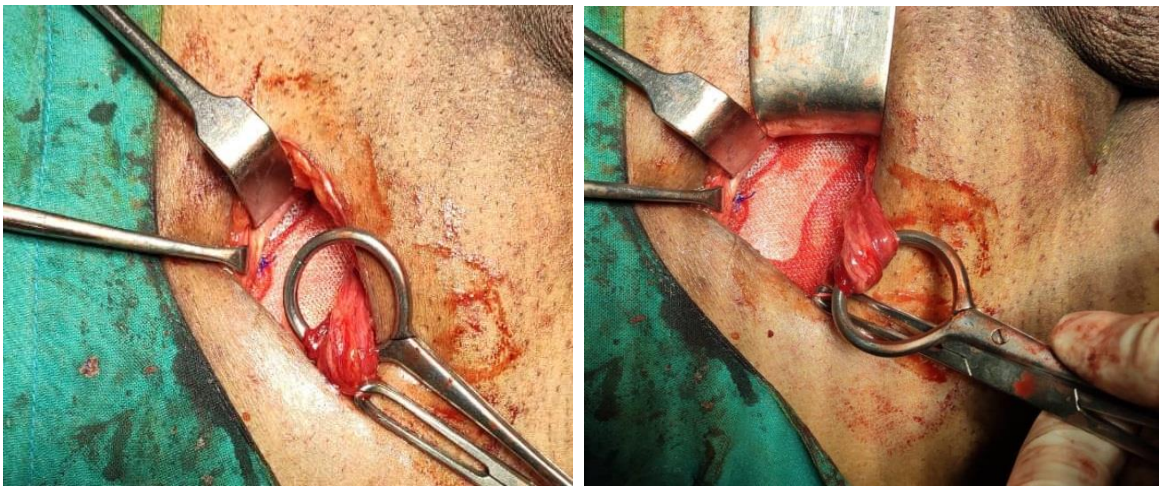


Figure -33. Images of open hernioplasty

SAMPLING

With Anticipated Mean Difference of mean operating time between the study groups as 35 min and Anticipated SD as 30 the minimum sample size per group is 30 With 95% power and 1% level of significance.

Total sample size 30+30=60

By using the formula:

$$n = \frac{(z_{\alpha} + z_{\beta})^2 \, 2\,SD^2}{MD^2}$$

Where Z= Z statistic at a level of significance

MD= Anticipated mean difference

SD= Anticipated Standard deviation

Statistical analysis

Data will be represented using Mean ±SD, and analyzed by Chi square test for association, comparison of means using t test, ANOVA and diagrammatic presentation.

CRITERIA FOR SAMPLING

INCLUSION CRITERIA

- All males above 18yrs of age diagnosed to have inguinal hernia.

EXCLUSION CRITERIA

- All patients diagnosed with complete scrotal hernia, complicated big hernias, femoral hernia or incarcerated hernia requiring emergency surgery and patient unfit for general anaesthesia.

TOOLS FOR DATA COLLECTION

Patient will be given a proforma to fill up and the objectives will be studied in detail by following up the patient for 3 months with periodical follow up.

TIME AND DURATION OF THE STUDY

First 18 months is utilized for taking patient into study group and last 3 months for follow up and analysis of data from October 2019-June 2021.

TIME AND DURATION OF THE STUDY

First 18 months is utilized for taking patient into study group and last 3 months for follow up and analysis of data from October 2019-June 2021.

RESULTS

The present study was carried out at Department of General Surgery, **B.L.D.E (Deemed to be University) SHRI B.M PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA**

STUDY DESIGN: Single Centre, Single Blind, Randomized two group comparative Surgical Study.

TOTAL SUBJESTS: A Total of 60 patients were enrolled for the study. They were randomised into two groups TAPP and open mesh group.

TAPP: This group included 30 patients who underwent repair using Laparoscopic technique ie. Transabdominal Pre-peritoneal mesh repair.

OPEN MESH : This group included 30 patients who Underwent Lichtenstein's Procedure.

In accordance with the predetermined objectives, all patients included in the study were evaluated in terms of history, physical findings, operative findings, and postoperative complications. TAPP was performed on 30 patients, and Lichtenstein mesh repair was performed on 30 patients. All patients in both groups were followed for three months. Patients were monitored for complications at one-day, three-day and five-day intervals. Any recurrence of hernia or patient death was regarded as the end point. The Observations made during the course of the study were as follows.

TABLE 1: COMPARSION OF THE MEAN AGE BETWEEN THE GROUPS USING INDEPENDENT SAMPLE T TEST

Groups	N	Minimum	Maximum	Mean	S.D	Mean diff	p value
TAPP	30	27	72	46.43	14.03	-1.46	0.70
Open Lichtenstein	30	22	74	47.90	15.26		

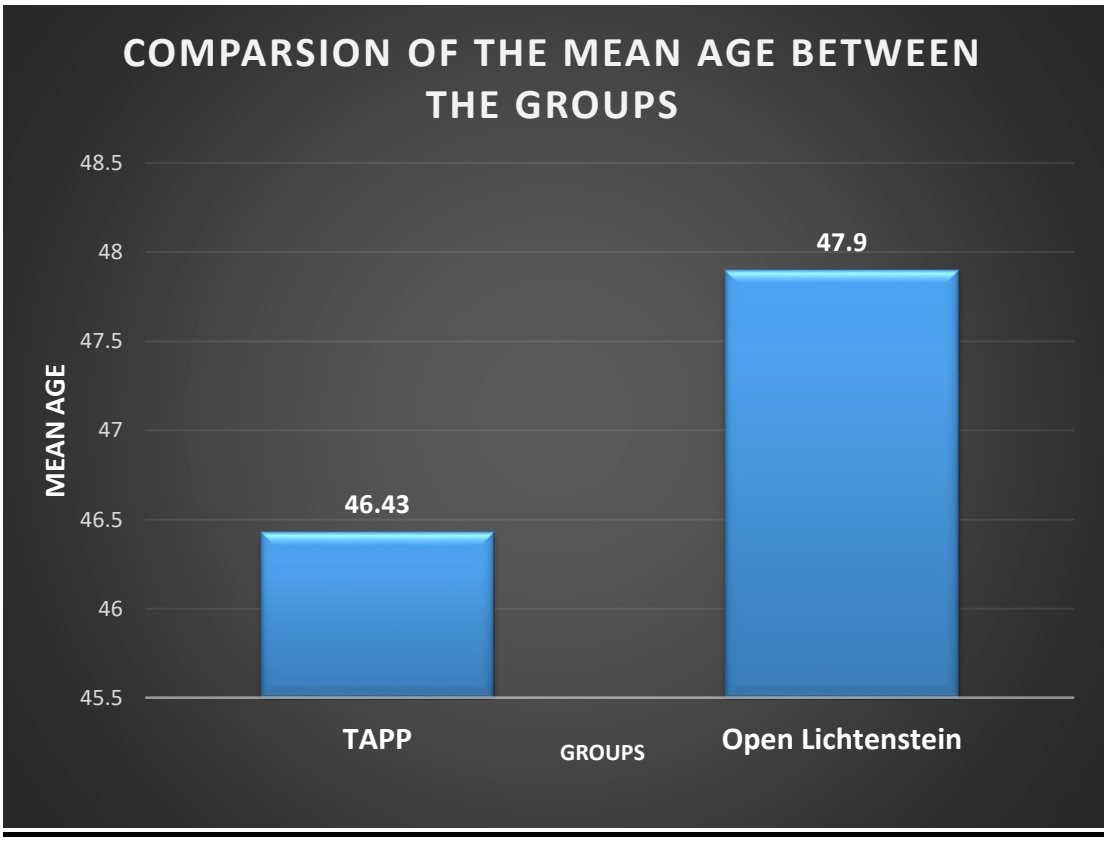
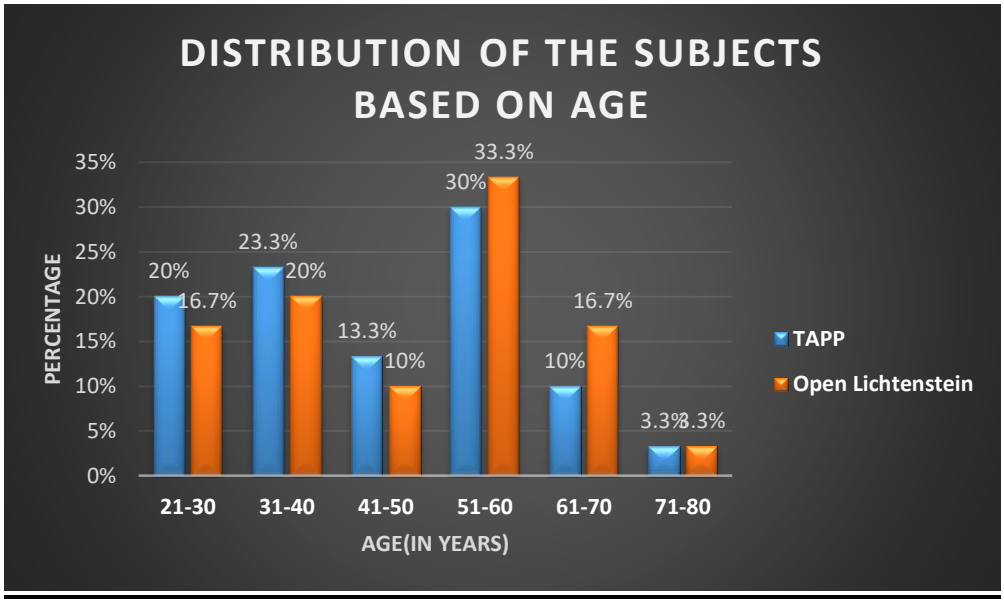


TABLE 2: DISTRIBUTION OF THE SUBJECTS BASED ON AGE

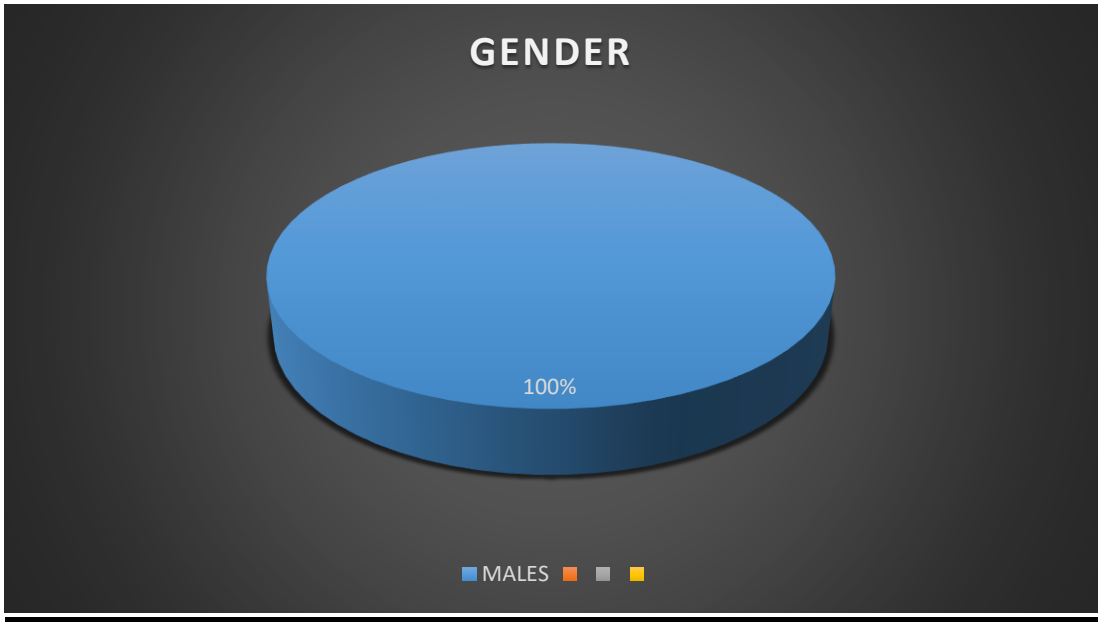
Age (in yrs)		Type of surgery		Total
		TAPP	Open Lichtenstein	
21-30	Count	6	5	11
	%	20.0%	16.7%	18.3%
31-40	Count	7	6	13
	%	23.3%	20.0%	21.7%
41-50	Count	4	3	7
	%	13.3%	10.0%	11.7%
51-60	Count	9	10	19
	%	30.0%	33.3%	31.7%
61-70	Count	3	5	8
	%	10.0%	16.7%	13.3%
71-80	Count	1	1	2
	%	3.3%	3.3%	3.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 0.86				
p value- 0.97				



Age ranged between 28 to 72 years among patients undergoing TAPP repair and 22 to74 years in Lichtenstein repair. With the mean age of presentation between Lichtenstein mesh vs and TAPP group is 47.9 and 46.43 years respectively. P value between open mesh and TAPP group is 0.70. There was **no significant difference** in the age in both the groups.

TABLE 3: DISTRIBUTION OF THE SUBJECTS BASED ON GENDER

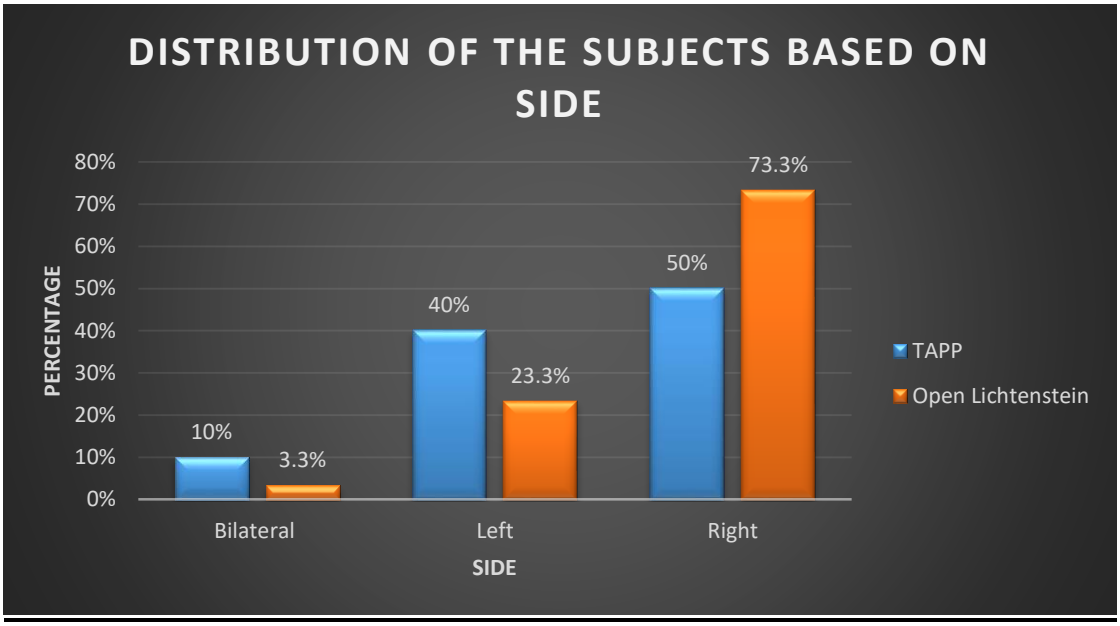
Gender		Type of surgery		Total
		TAPP	Open Lichtenstein	
Males	Count	30	30	60
	%	100.0%	100.0%	100.0%
Females	Count	0	0	0
	%	0%	0%	0%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%



The present study consisted of all male patients in both the groups

TABLE 4: DISTRIBUTION OF THE SUBJECTS BASED ON SIDE

SIDE		Type of surgery		Total
		TAPP	Open Lichtenstein	
B/L	Count	3	1	4
	%	10.0%	3.3%	6.7%
L	Count	12	7	19
	%	40.0%	23.3%	31.7%
R	Count	15	22	37
	%	50.0%	73.3%	61.7%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 3.64				
p value- 0.16				

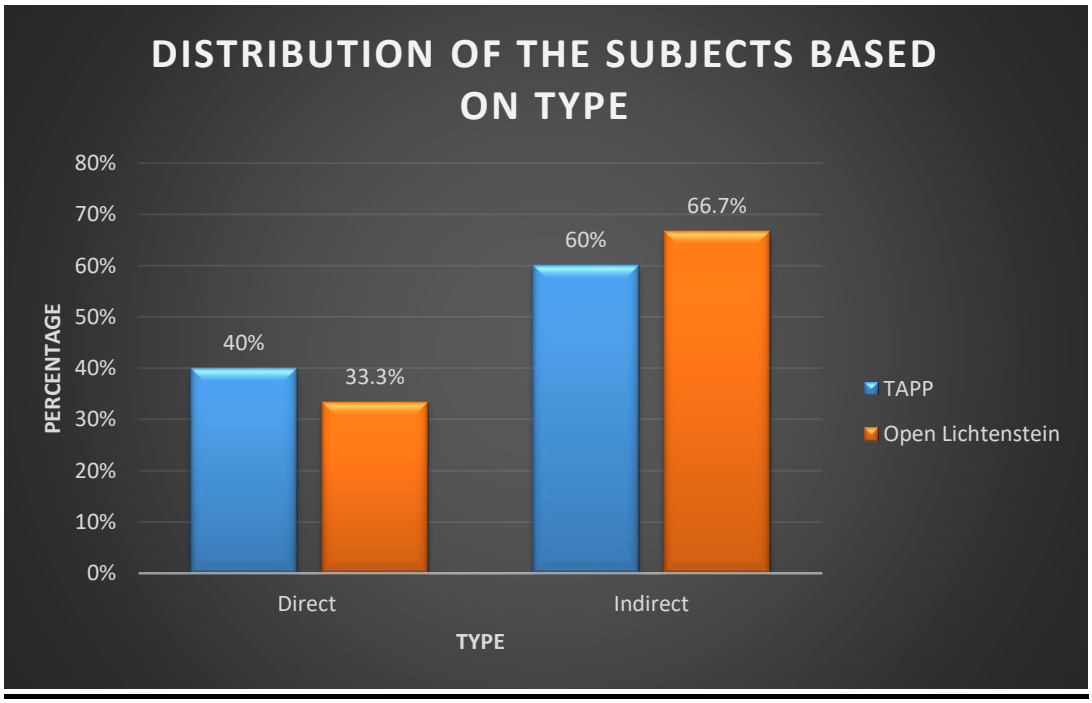


The present study showed that hernia was more common on right side 73.3% and 50% in Lichtenstein group and TAPP group. Left sided hernia comprised about 23.3% and 40% in Lichtenstein mesh and TAPP group. Bilateral was seen in 3.3% and 10% in Lichtenstein group and TAPP group.

However the difference was **not satistically significant** with P value of 0.16.

TABLE 5: DISTRIBUTION OF THE SUBJECTS BASED ON THE TYPE

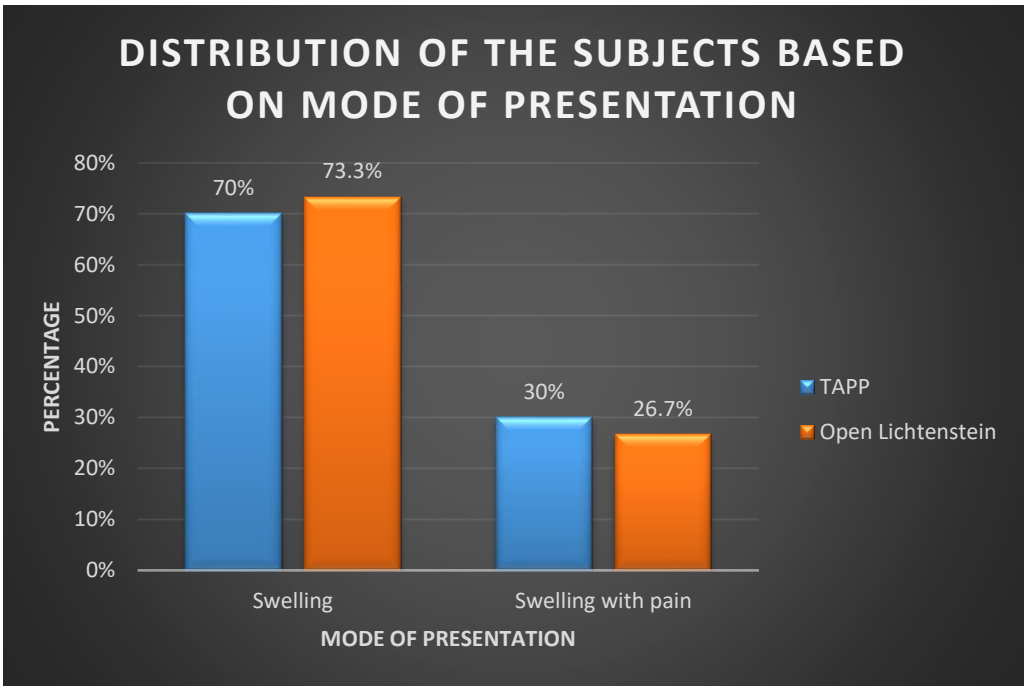
Type		Type of surgery		Total
		TAPP	Open Lichtenstein	
Direct	Count	12	10	22
	%	40.0%	33.3%	36.7%
Indirect	Count	18	20	38
	%	60.0%	66.7%	63.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 0.28				
p value- 0.59				



In this present study 30cases of TAPP group had Direct and Indirect hernia which contributed 40% and 60% in each type. And 30 cases of Lichtenstein mesh had 33.3% Direct hernia and 66.7% Indirect hernia.

TABLE 6: DISTRIBUTION OF THE SUBJECTS BASED ON MODE OF PRESENTATION

MODE OF PRESENTATION		Type of surgery		Total
		TAPP	Open Lichtenstein	
Swelling	Count	21	22	43
	%	70.0%	73.3%	71.7%
Swelling with pain	Count	9	8	17
	%	30.0%	26.7%	28.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 0.082				
p value- 0.77				

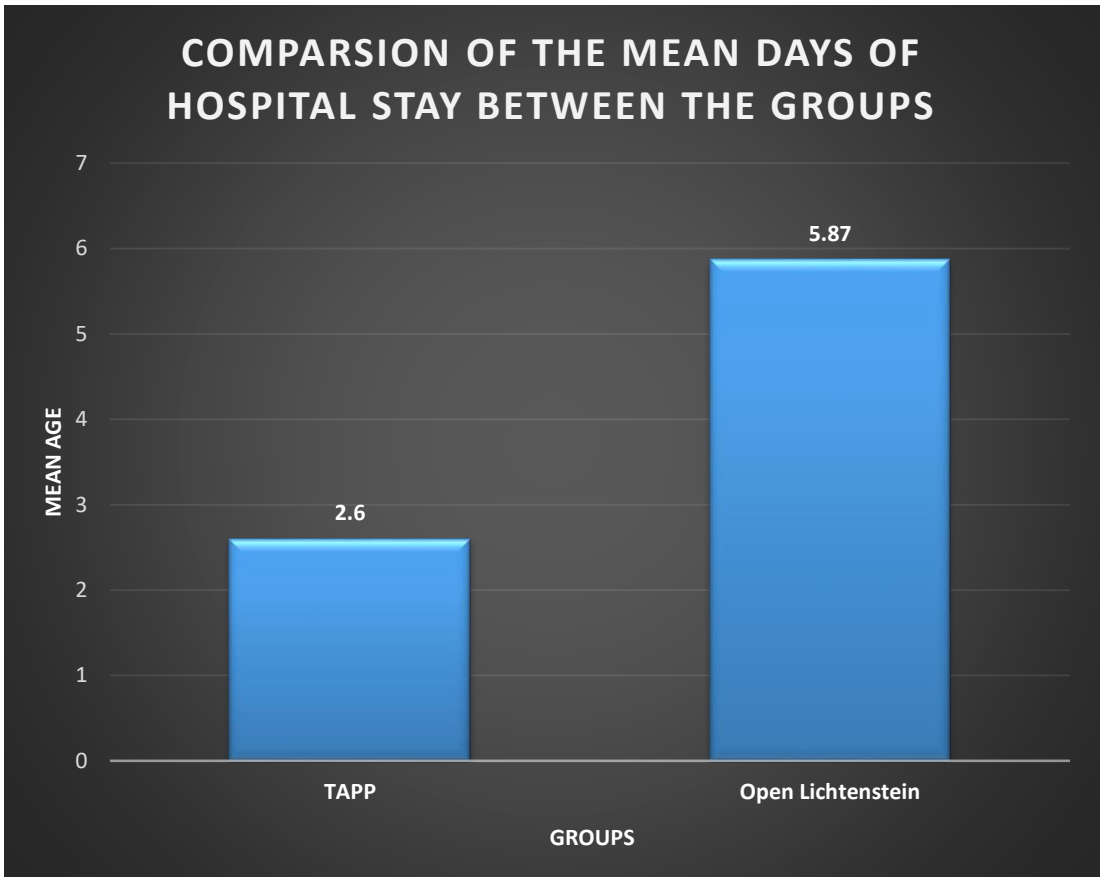


Without exception all the patients presented with swelling, of these 70% and 73.3% presented with only swelling 30% and 26.7% patients presented with both swelling and pain in TAPP and Lichtenstein mesh group respectively. There was **no statistical difference** in both groups with P value 0.77.

TABLE 7: COMPARSION OF THE DAYS OF HOSPITAL STAY BETWEEN THE GROUPS USING INDEPENDENT SAMPLE T TEST

Groups	N	Minimum	Maximum	Mean	S.D	Mean diff	p value
TAPP	30	1	5	2.60	1.003	-3.26	0.00*
Open Lichtenstein	30	2	13	5.87	2.097		

*significant

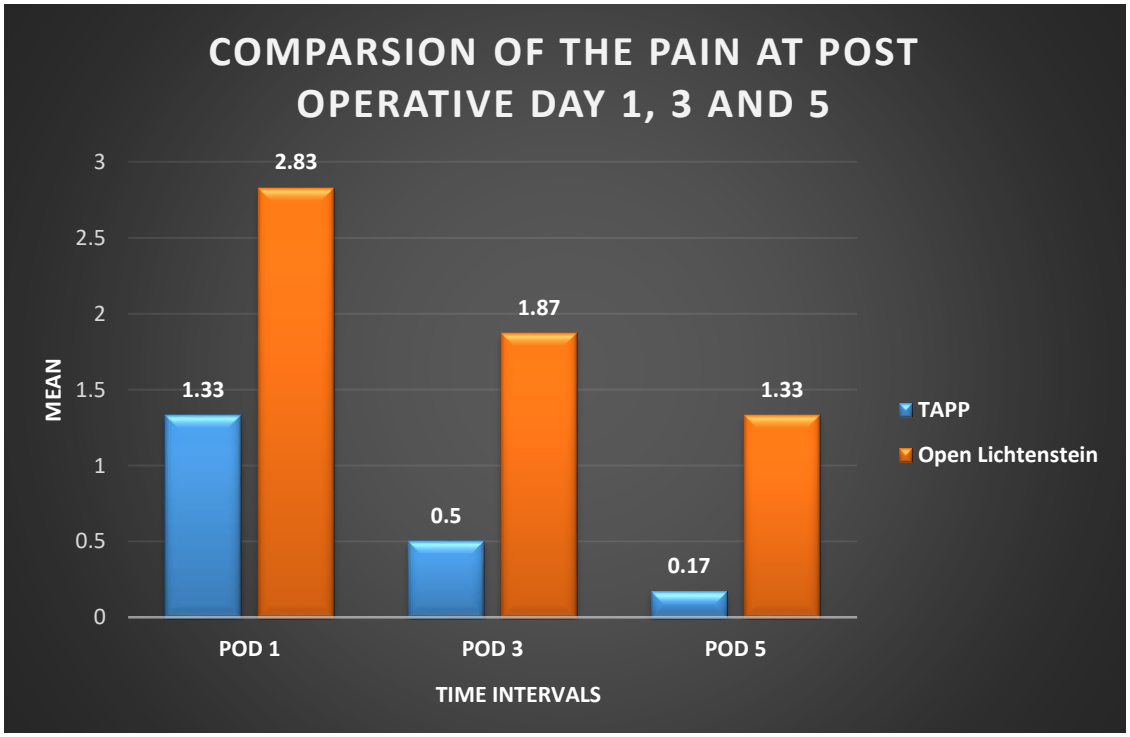


Mean duration of post operative hospital stay in TAPP group was 2.6 days while Lichtenstein group was 5.87 days with **significant** p value of 0.00.

TABLE 8: COMPARSION OF THE PAIN AT POST OPERATIVE DAY 1, 3 AND 5

Time intervals	Groups	N	Minimum	Maximum	Mean	S.D	Mean diff	p value
POD 1	TAPP	30	1	3	1.33	.606	-1.5	0.00*
	Open Lichtenstein	30	1	6	2.83	1.87		
POD 3	TAPP	30	0	1	.50	.509	-1.36	0.00*
	Open Lichtenstein	30	1	4	1.87	1.10		
POD 5	TAPP	30	0	1	.17	.379	-1.16	0.00*
	Open Lichtenstein	30	1	3	1.33	.606		

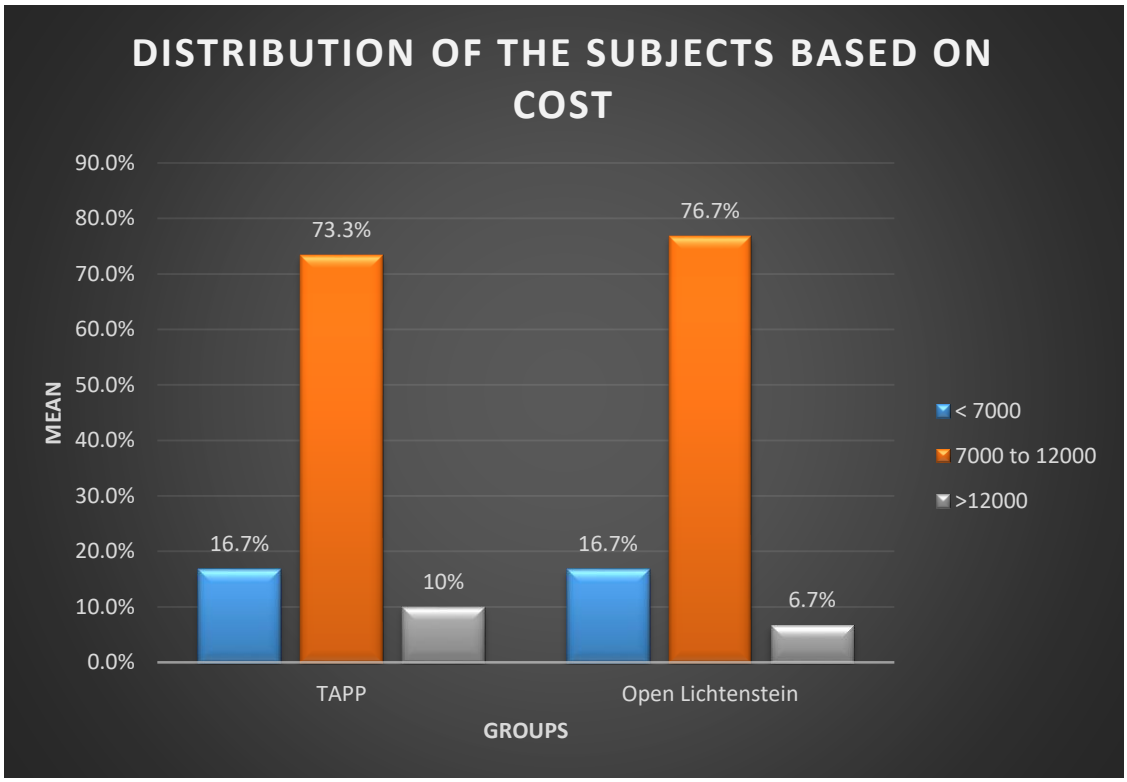
*significant



Mean pain at POD1, 3 and 5 in TAPP and Lichtenstein group was 1.33, 0.5, 0.17 and 2.83, 1.87, 1.33 respectively which was **statistically significant** with P value of 0.00 in POD 1, 3 and 5.

TABLE 9: DISTRIBUTION OF THE SUBJECTS BASED ON COST

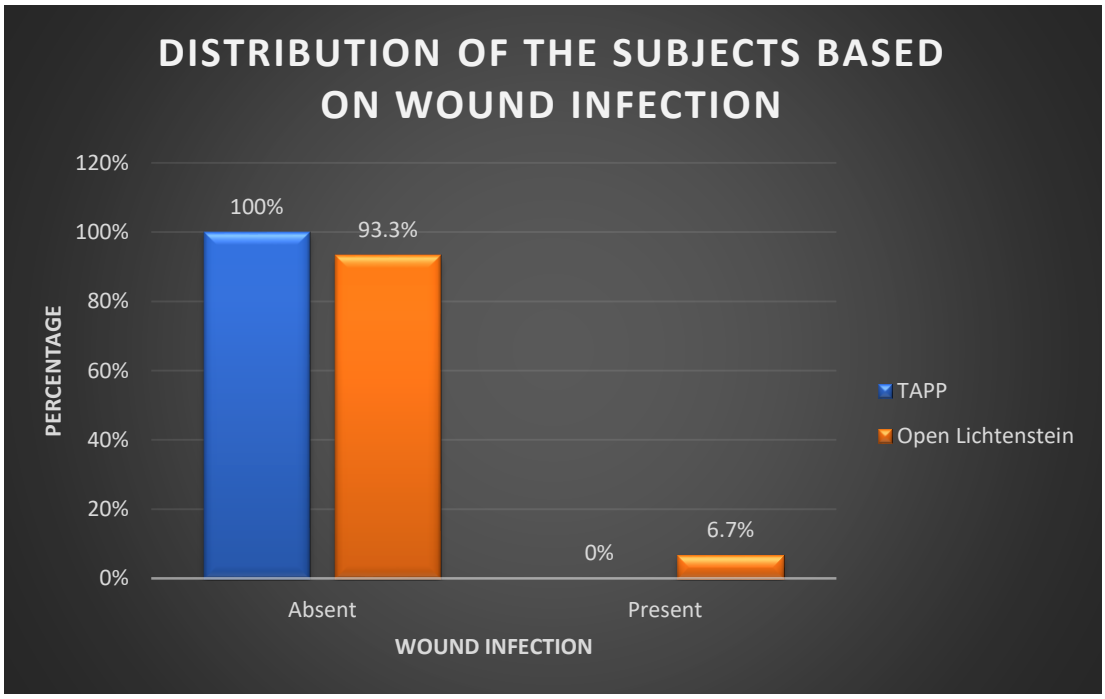
COST		Type of surgery		Total
		TAPP	Open Lichtenstein	
< 7000	Count	5	5	10
	%	16.7%	16.7%	16.7%
7000 to 12000	Count	22	23	45
	%	73.3%	76.7%	75.0%
>12000	Count	3	2	5
	%	10.0%	6.7%	8.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 0.22				
p value- 0.89				



The cost of treatment in total between two groups was compared. The cost of treatment in TAPP group in comparison with Lichtenstein group which was on the higher side by nearly Rs.2000. The difference was however **not statistically significant** (p value of 0.89) as the Lichtenstein group had come complications and hence had prolonged hospital stay and prolonged use of antibiotics. The cost was comparable in B/L hernia patients who underwent TAPP and open hernioplasty.

TABLE 10: DISTRIBUTION OF THE SUBJECTS BASED ON WOUND INFECTION

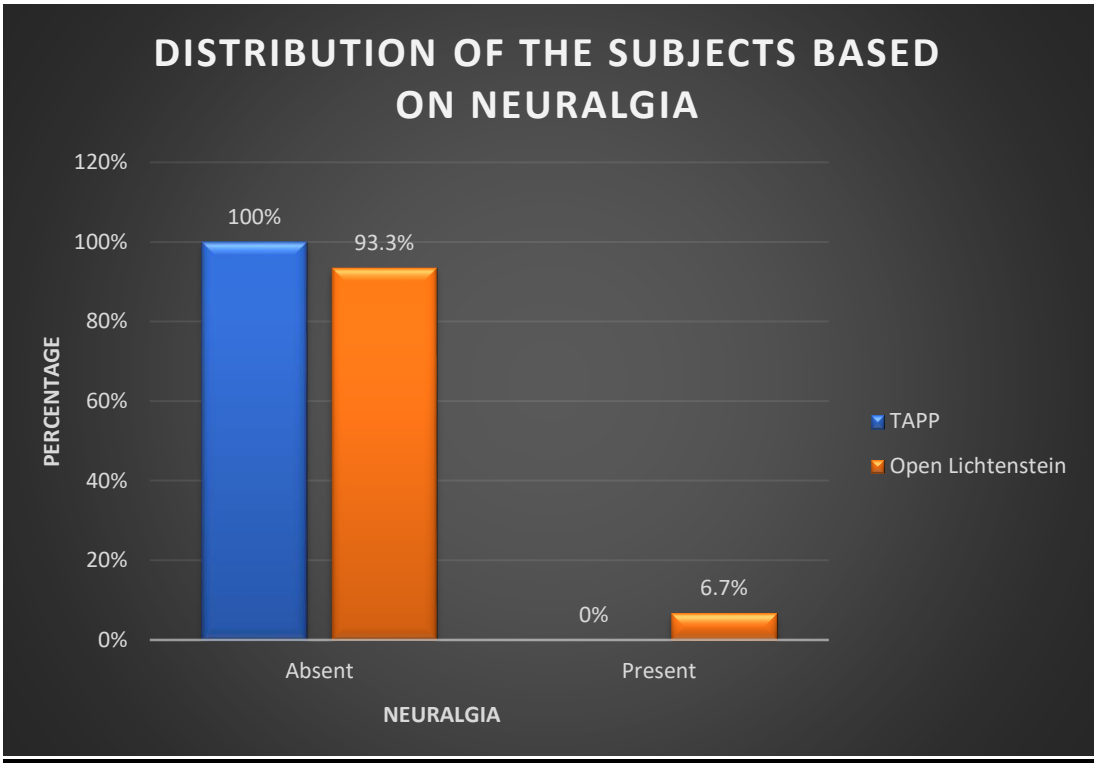
Wound infection		Type of surgery		Total
		TAPP	Open Lichtenstein	
Absent	Count	30	28	58
	%	100.0%	93.3%	96.7%
Present	Count	0	2	2
	%	0.0%	6.7%	3.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 2.06				
p value- 0.15				



In the present study 2(6.7%) patients had wound infection in TAPP group and none in Lichtenstein mesh group. Here p value is **not significant**(0.15).

TABLE 11: DISTRIBUTION OF THE SUBJECTS BASED ON NEURALGIA

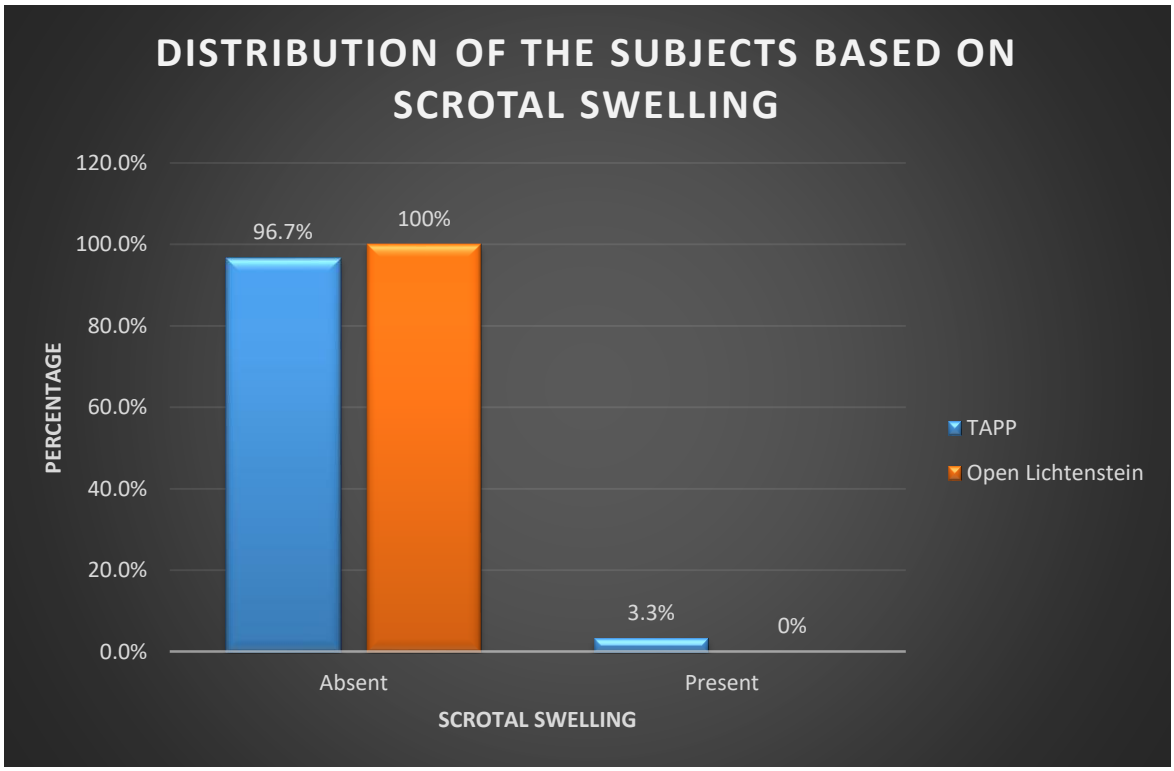
Neuralgia		Type of surgery		Total
		TAPP	Open Lichtenstein	
Absent	Count	30	28	58
	%	100.0%	93.3%	96.7%
Present	Count	0	2	2
	%	0.0%	6.7%	3.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 2.06				
p value- 0.15				



In the present study 2(6.7%) patients had neuralgia in Lichtenstein group and none in TAPP group. P value is **not significant** ie. 0.15

TABLE 12: DISTRIBUTION OF THE SUBJECTS BASED ON SCROTAL SWELLING

Scrotal swelling		Type of surgery		Total
		TAPP	Open Lichtenstein	
Absent	Count	29	30	59
	%	96.7%	100.0%	98.3%
Present	Count	1	0	1
	%	3.3%	0.0%	1.7%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 1.01				
p value- 0.31				

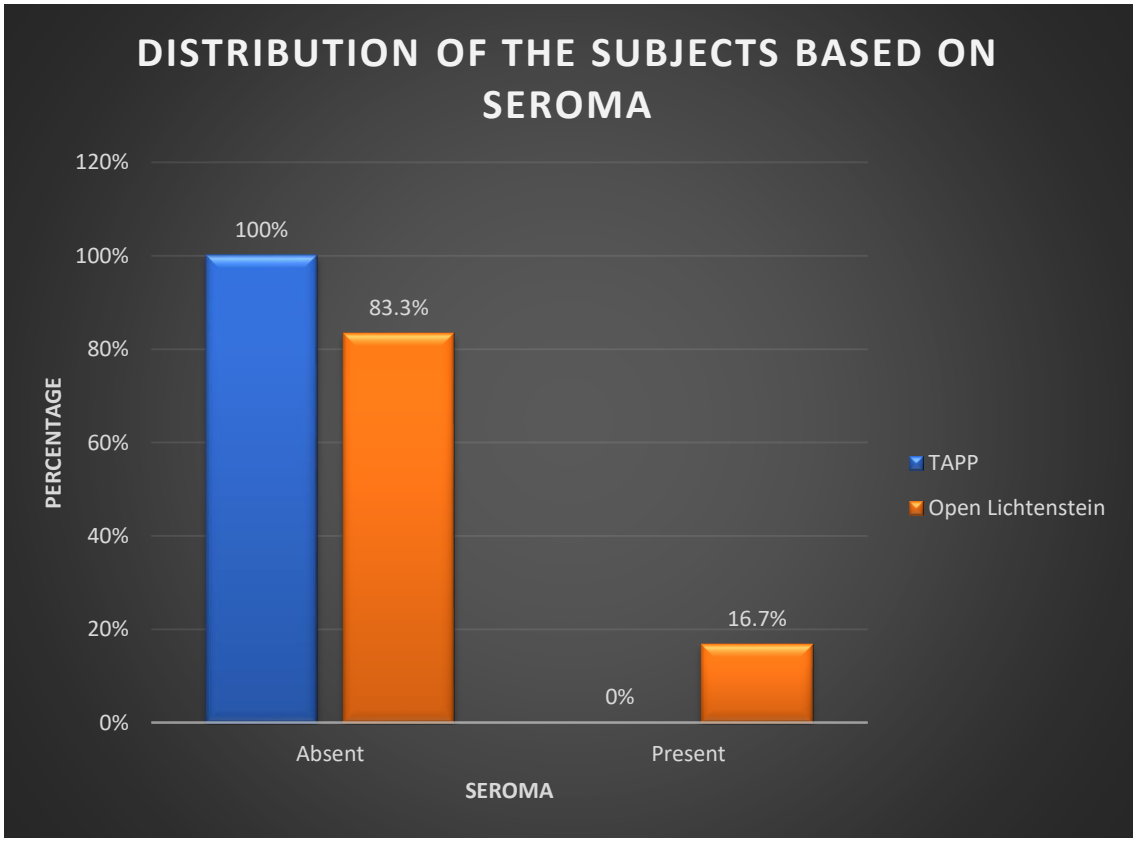


In the present study 1(3.3%) patient had scrotal swelling in TAPP group which was statistically **not significant** with p value of 0.31

TABLE 13: DISTRIBUTION OF THE SUBJECTS BASED ON SEROMA

Seroma		Type of surgery		Total
		TAPP	Open Lichtenstein	
Absent	Count	30	25	55
	%	100.0%	83.3%	91.7%
Present	Count	0	5	5
	%	0.0%	16.7%	8.3%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%
Chi-square value- 5.45				
p value- 0.02*				

*significant



In the present study 5(16.7%) patients had seroma formation in Lichtenstein group and none in TAPP group. Here p value is **significant** ie. 0.02

DISCUSSION

Inguinal hernia is the most common surgical abdominal entity in the adults. In the past decade Lichtenstein repair has become the gold standard for treatment of inguinal hernias mainly due to the reduction in recurrences noted. It is used as blanket surgery for all types and sizes of inguinal hernia with very few exceptions. This study compares the outcomes in patients with inguinal hernias who underwent laparoscopic hernioplasty (TAPP) versus Lichtenstein's open mesh repair. The mean age of the patients was similar in both the groups in our study. This was similar to earlier studies by Anilkumar B et al and Tanweer Karim et al. Our study analysed both unilateral and bilateral hernia patients unlike the previous studies such as Tanweer Karim et al which looked into unilateral hernias only. In our study, 56 had unilateral inguinal hernia and 4 had bilateral. 3 out of those with bilateral underwent laparoscopic hernioplasty and 1 open mesh repairs.

In the open hernioplasty, group post-operative complications like wound infection was noted in 2 patients and 5 patients had seroma formation which was statistically significant. In TAPP group none had wound infection or seroma but 1 patient had scrotal swelling postoperatively.

On comparing the mean pain score of two groups, POD 1 score was not statistically significant (p value 0.00) but the pain score of POD 3 (p=0.00) and POD 5 (p=0.00) was statistically significant.

The mean duration of hospital stay showed a statistically significant difference of 2.6 days in laparoscopic group and 5.87 days for Lichtenstein group.

The present study was carried out at **B. L. D. E. (Deemed to be university)'s**

SHRI B.M. PATIL MEDICAL COLLEGE, HOSPITAL &RESEARCH CENTRE, VIJAYAPUR, KARNATAKA. Comparing these two procedures in various clinical scenarios and comparing the outcomes in immediate post-operative period and by following up these patients for 3 months. The results were analysed and compared to various other studies done in this field.

DEMOGRAPHICS AND SYMPTOMATOLOGY: The mean age of presentation in Lichtenstein group was 47.9 years and 46.43 years in TAPP. This was compared with the results in other studies and the correlated well which reported 45.44 years mean age in Lichtenstein group and 41.60 years in TAPP [88]

Swelling was the most common presentation with most patients presenting within 6 months. Pain was present in the 17 patients was also correlating well with other studies. The distribution of types of hernia were comparable with other studies with Right indirect inguinal being most common. Tanweer Karim et al reported Right indirect hernia as the most common type.[88]

PAIN ASSESMENT: The pain patterns were significant when compared on post-operative day 1, 3, 5and after 1week of surgery. The pain was comparable in both the groups. Since early post-operative pain was less in TAPP group it aided in early mobilization and early discharge from hospital.

COMPARISION OF COMPLICATIONS: Among the postoperative complications encountered in the present study seroma rate and wound infection rate was higher in open group, as in comparison to Anilkumar B et al at the same time scrotal swelling, neuralgia rates were more than the given study.

Comparative parameter(Lvs O)	**Present study**	**Anilkumar B et al**	**Tanweer et al**
Seroma Rate	0% vs 16.7%	1.9%vs0%	7.29% vs 20%
Rate of wound infection	0% vs 6.7 %	0% vs 14.3%	7.29% vs 20%

COMPARISION OF OTHER PARAMETERS: The mean duration of hospital stay was :

5.87days and 2.6days in Lichtenstein and TAPP group respectively. The comparison of other parameters with others studies was not possible due to different operational definition of these variables in different studies. However a common trend of earlier mobilization and discharge was noted in a TAPP group in all studies.

CONCLUSION

The present study comparing Transabdominal pre-peritoneal mesh technique for hernia repair with Lichtenstein's mesh repair for inguinal hernia came out with the following conclusions:

1. The postoperative pain is lesser with TAPP technique on all postoperative days and patients ambulate faster and get discharged faster with this technique than with open mesh repair.
2. The duration of hospital stay is lesser in TAPP group as there is less postoperative pain and early ambulation and hence early discharge and early return to work.
3. The risk of complications is roughly equal in both the procedures, however open mesh repair technique has slightly higher rate of wound infection and seroma formation.
4. There is a difference in incidence of neuralgia in mesh repair technique as compared TAPP.
5. On comparison of costs TAPP technique is definitely more costly than Lichtenstein's as it depends on the number of tackers used. However it negates in the early discharge of patients and hence less expenditure in terms of ward rates and prolonged medications
6. TAPP technique is definitely a promising procedure and has a lot of potential as the trend towards laparoscopic technique is increasing especially for recurrent hernias and studies are underway to make it the gold standard technique. However the only drawback being the long learning curve among surgeons. More number of Randomized control trails and multicentre trails needs to be undertaken to study the pros and cons of this procedure in future.

SUMMARY

The present study was done to compare two different surgical procedures for Inguinal hernia repair, namely Lichtenstein's mesh repair and Laparoscopic technique ie. Transabdominal pre-peritoneal mesh repair.

The present study was done between October 2019-June 2021 with a follow up period of 3 months. A total of 60 patients were included in the present study with 30 patients in Lichtenstein's group and 30 patients in TAPP group.

The results of the study were inferred and it was found both the procedures were similar in certain aspects, however TAPP repair was superior to Lichtenstein's repair in terms of post-operative pain, duration of hospital stay and complications.

The present study concluded that TAPP repair is superior to mesh repair in short term outcomes.

However though TAPP repair procedure is slightly expensive it is better suited in terms of outcomes and certain clinical situations.

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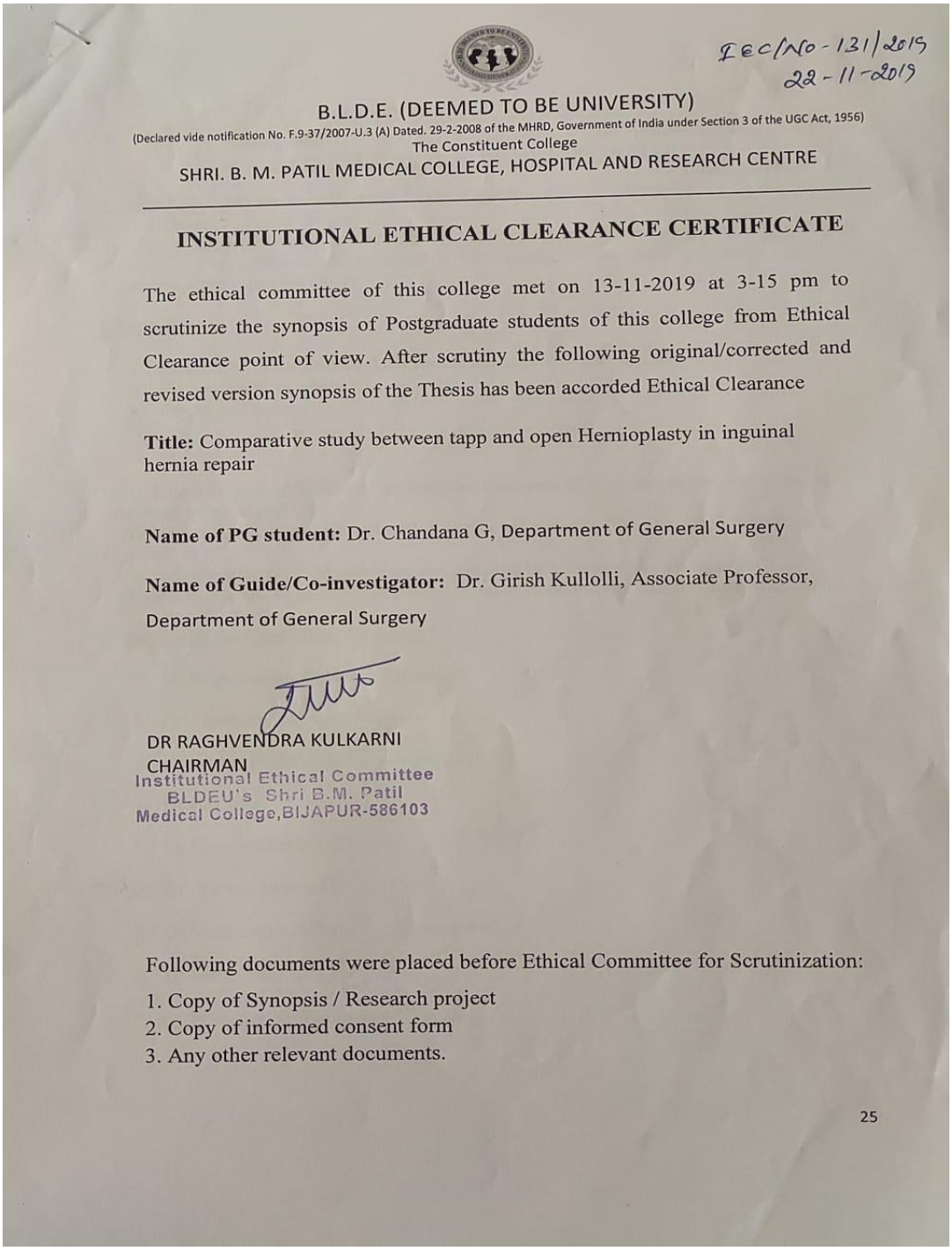
ANNEXURE I

CERTIFICATE OF ETHICAL CLEARANCE



IEC/No-131/2019
22-11-2019

B.L.D.E. (DEEMED TO BE UNIVERSITY)
(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)
The Constituent College
SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The ethical committee of this college met on 13-11-2019 at 3-15 pm to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: Comparative study between tapp and open Hernioplasty in inguinal hernia repair

Name of PG student: Dr. Chandana G, Department of General Surgery

Name of Guide/Co-investigator: Dr. Girish Kullolli, Associate Professor, Department of General Surgery

DR RAGHVENDRA KULKARNI
CHAIRMAN
Institutional Ethical Committee
BLDEU's Shri B.M. Patil
Medical College,BIJAPUR-586103

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

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ANNEXURE II

PARTICIPANT CONSENT FORM

Participant' s name: **Address:**

TITLE OF THE PROJECT:

"COMPARATIVE STUDY BETWEEN TAPP AND OPEN HERNIOPLASTY IN INGUINAL HERNIA REPAIR"

The details of the study have been provided to me in writing and explained to me in my own language. I confirm that I have understood the above study and had the opportunity to ask questions. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without the medical care that will normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have been given an information sheet giving details of the study. I fully consent to participate in the above study.

_____ _____

(Participant) (Date)

_____ _____

(Witness to signature) (Date)

_____ _____

(Investigator to signature) (Date)

ANNEXURE III

PATIENT INFORMATION SHEET

TITLE OF THE PROJECT:

"COMPARATIVE STUDY BETWEEN TAPP AND OPEN HERNIOPLASTY IN INGUINAL HERNIA REPAIR"

NAME OF THE INVESTIGATOR: DR. CHANDANA G

NAME OF THE GUIDE: DR. GIRISH KULLOLLI

PROCEDURE:

CONFIDENTIALITY OF RECORDS:

This study will become a part of hospital records and will be subject to the confidentiality. If the data are used for publication, no name will be used. And photographs will be used with special written permission.

INJURY STATEMENT:

In the unlikely event of injury resulting directly from participation in this study, the injury will be reported promptly and the appropriate treatment will be given.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

Participation is voluntary and you may refuse to participate or withdraw consent and discontinue participation in the study at any time.

I, **DR. CHANDANA G**(Investigator) have explained to the patient in detail about the study in their own language and the written copy of the same will be given to participant.

INVESTIGATOR' S NAME AND ADDRESS:

DR. CHANDANA G

POST GRADUATE

DEPARTMENT OF SURGERY

SHRI B M PATIL MEDICAL COLLEGE

HOSPITAL AND RESEARCH CENTRE,

VIJAYAPURA-586103

ANNEXURE IV

PROFORMA FOR CASE TAKING

SL NO

NAME

AGE IP NO

SEX UNIT

RELIGION DOA

OCCUPATION WARD

ADDRESS DOD

SOCIO-ECONOMIC STATUS

Complaints:

Brief history:

1. : Swelling

I. Duration ii. Site and Size iii. Rate of Progress iv. Reducibility: +/-, Spontaneous/Manual

2. Pain in Swelling: Absent/Present

3. Others: Abdominal Pain/Vomiting/Abd. Distension/Fever

4. History of Straining Factors: Chr. Cough / Chr. Constipation / Straining at Micturition.

Past history:

I Previous surgery

1. For hernia a. Same side b. Opposite side
2. Other abdominal surgery (particularly appendicectomy by extended grid iron incision)

II History of any associated medical condition Diabetes/Hypertension/PTB/cardiac diseases.

Personal History:

GENERAL PHYSICAL EXAMINATION

BUILT: WELL/MODERATE/POOR

NOURISHMENT: WELL/MODERATE/POOR BMI=

PALLOR

ICTERUS

CYANOSIS

CLUBBING

PEDAL EDEMA

GENERAL LYMPHADENOPATHY

VITAL DATA:

TEMPERATURE:

PULSE

RESPIRATORY RATE

BLOOD PRESSURE:

Local examination

(Patient in standing and recumbent positions)

INSPECTION

1. Swelling

   Unilateral/bilateral

   Position and Extent

   Size and Shape

   Type: Incomplete/ Complete

   Spontaneous Visible Peristalsis

2. Skin over the Swelling

3. Expansile Impulse on Coughing

Direction of Impulse

4. Spontaneous reducibility in recumbent position

PALPATION

1. Swelling: Position and Extent

Warmth/ Tenderness

Consistency: Doughy and Granular/ Elastic/ Tense

Reducibility: Partial/Complete/Gurgling felt during reduction/ not reducible

2. Finger Invagination Test

3. Internal Ring Occlusion Test

SYSTEMIC EXAMINATION

- **PER ABDOMEN**

- **RESPIRATORY SYSTEM**

- **CARDIOVASCULAR SYSTEM**

- **CENTRAL NERVOUS SYSTEM**

PER RECTAL EXAMINATION:

CLINICAL DIAGNOSIS:

LABORATORY TESTS

HB%

TOTAL COUNT

DIFFERENTIAL COUNT

N/L/E/B/M

B.UREA

S.CREATININE

HIV

HBsAg

HCV

CHEST X RAY

SYSTEMIC ANTIBIOTICS USED

Post operative details

Seroma

Wound infection

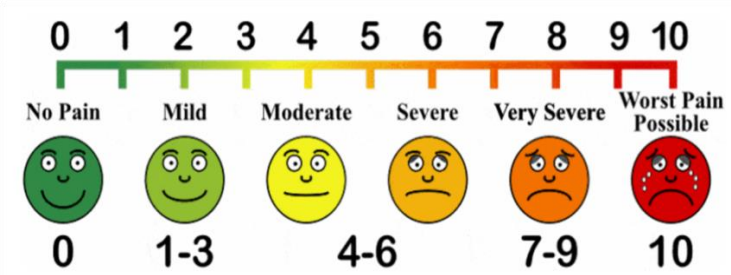
Neuralgia

Numbness

Scrotal swelling

Postoperative hospital stay

Post operative pain



1st day

3rd day

5th day

Details of Cost Comments

ANNEXURE V

KEY TO MASTER CHART

SL NO	Serial number
IP NO	In patient number
AGE	AGE – In Years
SEX	**M**- Male **F**- Female
SIDE	**R**- Right **L**- Left
TYP	**D**-DIRECT **IND**-INDIRECT
P	PRESENT
A	ABSENT
MP	MODE OF PRESENTATION **S**: Swelling only **SWP**: Swelling with pain
POD	POST OPERATIVE DAY ;PAIN GRADE 0 : No pain 1-3 : mild 4-6 : moderate to severe 7-9 : very severe 10 : worst pain possible
POS	Postoperative stay in hospital
SM	SEROMA
H	Hematoma

WI	Wound infection
NEUR	Neuralgia
NUMB	Numbness
SW	Scrotal swelling
CO	COST **A**;<7000 **B**;7000-12000 **C**;>12000

ANNEXURE VI

MASTER CHART

SL NO	IP NO	AGE	SEX	SIDE	TYPE	MP	POS	POD1	POD3	POD5	COST	H	WI	NEUR	NUMB	SW	SM
1	38425	58	M	R	D	S	4	2	1	1	B	A	A	A	A	A	A
2	43877	68	M	B/L	D	S	3	1	0	0	C	A	A	A	A	A	A
3	616	68	M	L	D	SWP	5	2	1	1	A	A	A	A	A	A	A
4	2066	48	M	R	D	SWP	4	1	1	0	A	A	A	A	A	A	A
5	4999	52	M	L	IND	SWP	4	1	0	0	A	A	A	A	A	A	A
6	9740	27	M	R	IND	SWP	3	2	0	0	B	A	A	A	A	A	A
7	12768	51	M	B/L	IND	S	3	1	0	0	C	A	A	A	A	A	A
8	21886	40	M	R	IND	S	3	1	1	0	B	A	A	A	A	A	A
9	22956	30	M	L	D	S	2	1	0	0	B	A	A	A	A	P	A
10	69836	32	M	L	IND	S	5	2	0	0	B	A	A	A	A	A	A
11	81093	60	M	R	IND	S	2	1	1	0	B	A	A	A	A	A	A
12	131941	29	M	L	D	SWP	2	1	0	0	B	A	A	A	A	A	A
13	140348	46	M	B/L	IND	S	2	1	0	0	C	A	A	A	A	A	A
14	15436	50	M	L	D	SWP	2	1	0	0	B	A	A	A	A	A	A
15	165926	54	M	R	IND	S	2	1	0	0	B	A	A	A	A	A	A
16	106000	32	M	R	IND	SWP	1	1	1	1	A	A	A	A	A	A	A
17	114127	60	M	L	D	S	2	1	1	1	B	A	A	A	A	A	A
18	120526	56	M	R	IND	S	2	1	1	1	B	A	A	A	A	A	A
19	116252	40	M	L	IND	S	1	1	1	0	B	A	A	A	A	A	A
20	127890	58	M	L	D	S	3	3	1	0	B	A	A	A	A	A	A
21	109800	65	M	R	D	S	3	3	1	0	B	A	A	A	A	A	A
22	121109	48	M	L	IND	SWP	2	2	0	0	B	A	A	A	A	A	A
23	12620	32	M	R	IND	S	2	1	0	0	B	A	A	A	A	A	A
24	11901	35	M	R	IND	S	3	1	0	0	B	A	A	A	A	A	A
25	112109	58	M	L	D	S	2	2	1	0	B	A	A	A	A	A	A
26	133098	29	M	R	IND	S	2	1	1	0	B	A	A	A	A	A	A
27	100219	37	M	R	IND	S	2	1	0	0	B	A	A	A	A	A	A
28	110021	72	M	L	D	SWP	3	1	0	0	B	A	A	A	A	A	A
29	13521	28	M	R	IND	S	2	1	1	0	A	A	A	A	A	A	A
30	12621	30	M	R	IND	S	2	1	1	0	B	A	A	A	A	A	A
31	33327	32	M	R	IND	S	7	4	3	1	B	A	A	A	A	A	A
32	34365	58	M	R	D	SWP	13	6	4	3	C	A	P	P	A	A	P
33	36948	35	M	R	IND	S	4	3	1	1	B	A	A	A	A	A	A
34	37579	28	M	R	IND	S	6	4	2	1	B	A	A	A	A	A	A
35	44159	22	M	R	IND	S	5	1	1	1	B	A	A	A	A	A	A
36	44079	45	M	L	IND	SWP	5	2	2	2	B	A	A	A	A	A	P
37	1991	60	M	R	D	S	7	6	4	2	B	A	A	A	A	A	A
38	3313	74	M	R	IND	S	6	2	1	1	B	A	A	A	A	A	A
39	3339	54	M	R	IND	S	6	2	1	1	B	A	A	A	A	A	A
40	7104	22	M	L	IND	S	4	1	1	1	B	A	A	A	A	A	P
41	7673	65	M	R	IND	S	5	1	1	1	B	A	A	A	A	A	P
42	8055	55	M	R	IND	S	7	5	3	1	B	A	A	A	A	A	A
43	8178	50	M	R	D	S	5	3	1	1	B	A	A	A	A	A	A
44	8858	65	M	R	D	SWP	5	1	1	1	B	A	A	A	A	A	A
45	9200	38	M	R	IND	S	5	1	1	1	B	A	A	A	A	A	A
46	13783	68	M	R	D	S	7	5	3	1	B	A	A	A	A	A	A
47	13786	68	M	L	IND	S	5	3	3	3	B	A	A	A	A	A	A
48	14271	60	M	L	D	S	8	3	2	2	B	A	A	A	A	A	A
49	15001	31	M	R	IND	SWP	7	6	4	2	C	A	P	P	A	A	P
50	19046	25	M	R	IND	S	6	1	1	1	B	A	A	A	A	A	A
51	19130	55	M	R	D	SWP	9	6	4	2	B	A	A	A	A	A	A
52	39730	28	M	R	IND	S	6	1	1	1	B	A	A	A	A	A	A
53	60175	45	M	R	IND	S	9	5	2	2	B	A	A	A	A	A	A
54	71223	60	M	R	IND	S	6	2	2	1	A	A	A	A	A	A	A
55	81093	61	M	R	IND	SWP	4	1	1	1	A	A	A	A	A	A	A
56	79680	51	M	L	IND	S	2	2	1	1	A	A	A	A	A	A	A
57	89395	34	M	R	D	S	6	5	2	1	A	A	A	A	A	A	A
58	12789	56	M	L	D	SWP	4	1	1	1	A	A	A	A	A	A	A
59	68715	52	M	L	IND	S	4	1	1	1	B	A	A	A	A	A	A
60	76374	40	M	B/L	D	SWP	3	1	1	1	B	A	A	A	A	A	A