

DISSERTATION ON
**“COMPARATIVE STUDY OF CONVENTIONAL MESH VERSUS
SELF RETAINING MESH IN LICHTENSTEINS INGUINAL
HERNIA REPAIR” IN GMKMCH, SALEM**

SUBMITTED TO

THE TAMIL NADU DR.MGR MEDICAL UNIVERSITY, TAMILNADU

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF

MASTER OF SURGERY

IN

GENERAL SURGERY



**DEPARTMENT OF GENERAL SURGERY
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Year : 2017-2020

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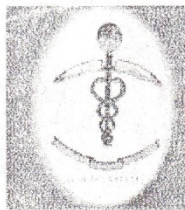
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ABSTRACT

Inguinal hernia is the one of the common disease a surgeon has to manage. The primary choice of repair in hernia repair is lichensteins technique. An alternative to lichensteins technique is using self retaining mesh instead of normal conventional mesh. The purpose of the study was to compare the clinical outcomes following selfretaining mesh to traditional lichensteins polypropylene mesh secured with sutures.

AIM OF THE STUDY :

To compare the Reduction in the operative time in hernia repair and the postoperative pain and postoperative infection and recurrence between the normal conventional mesh and self retaining mesh

MATERIALS AND METHODS :

This prospective study comprised of 40 cases of inguinal hernia which were randomly divided into two groups of 20 each named group A and group B.

Group A - Lichensteins repair using conventional mesh

Group B – lichensteins repiar using self- retaining mesh

OBSERVATION :

The data of patients who underwent surgery using conventional mesh and self Retaining mesh was compared in terms of operative time, post-operative pain, infection, complication & recurrence. Statistical significance between two groups were found out using standard error of difference between means and proportions.

CONCLUSION:

A study among patients suffering from inguinal hernia comparing between traditional methods and self retaining mesh repair reveals the following. The operative time was low in the Self-Retaining Mesh group with the maximum time reaching between 40-45 minutes for 45% of the participants. In the Conventional Mesh group, it was longer with maximum time reaching 65-70 minutes. The majority of them having operation time between 55-60 minutes . Pain was higher among the Conventional Mesh group. None of the group had recurrence. Self-Retaining Mesh is better than the conventional Mesh methods in terms of operative time and postoperative pain & complications.

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Introduction

One of the most common diseases that a surgeon has to manage is the inguinal hernia. A better understanding of the physiology and anatomy of the inguinal canal along with the etiopathogenesis has led to constant improvement in the surgical techniques and subsequent improvement in the outcome of the disease. Inguinal hernia surgery is not a new disease and has been a regular challenge for more than few decades. Since the beginning of the modern surgery, the hernia repair has undergone several modifications and in the last decade has accelerated due to the addition of specialised hernia clinics and introduction of tension free repair and laparoscopic repair. This has led to the replacement of traditional suture based repair with the tension free mesh repair. This is known as "hernioplasty". In the recent days, mesh repair is gaining more predominance over suture repair in many countries. In 1986, Lichtenstein came up with his own open mesh repair technique for treating inguinal hernias.

The primary choice of repair in unilateral primary groin hernias is the Lichtenstein technique¹. In spite of the low rate of morbidity and long term prognosis, chronic inguinal pain is reported in a high number of cases². It ranges between 12% and 53%³⁻¹¹. Though chronic post operative pain is seen as a primary outcome of the surgery, yet it affects

the social and personal life of the patients in 6% of the patients^{3,5,10,12}. Considering the global rate of 20 million hernia repairs, around 1 million lives are being complicated by chronic post operative pain in cases of simple hernia repair¹³.

The reasons for the post operative pain are; surgical expertise, presence of pain pre-operatively, surgical technique and mesh fixation. Post introduction of tension-free techniques, nerve entrapment in suture, scar tissue, foreign body reaction and inflammation of the periosteum of the pubic tubercle traditionally taken into the first stitch^{14,15}. The risk of chronic pain can be mitigated by using tissue-compatible glues which should be cheap, easy to store and use and also biocompatible. Fibrin glue gives good results but is costly and is not easy to store and use¹⁶⁻¹⁸. Therefore, the best choice for mesh fixation in open mesh repair of inguinal hernia is not long-lateral-chain cyanoacrylates.

For the last 30 years, Lichtenstein's technique for inguinal hernia repair has become more popular and most commonly attempted procedure^{19,20}. Being one of the most commonly performed surgeries in clinical practice, it has its own costs to the society and healthcare. The rate at which this procedure is being done is increasing annually with a significant potential to double in the coming days. From the time, Lichtenstein's repair was introduced, it is being done widely and has become the gold standard of

inguinal hernia repair. It is more effective than the other techniques that are available for treating inguinal hernia.

It is unwise to ignore the impact of Lichtenstein's repair. Since its advent, various modifications have been introduced and has been revolutionary in nature. It has been useful in reducing the morbidity risk and can also be used in patients who are otherwise unsuited for the traditional methods. Also the recovery in the post-operative period and low post-operative pain and complications make it a preferred method of hernia repair in the groin region. This is why Lichtenstein's tension free repair has become a gold standard and is widely used by surgeons worldwide. The recurrence rates of hernia are also less than 2% with the use of this procedure.

One of the most commonly reported sign post operatively is chronic pain that can be attributed to the fixation techniques used which has led to several modifications of the technique. The modifications began with the introduction of nonabsorbable sutures, absorbable sutures, usage of glue and has today come to self-fixating systems²¹.

The following image shows the self-retaining mesh. It was launched by Covidien as ProGrip™ mesh in 2008. It is being used in inguinal and incisional hernia repairs. Self retaining mesh is known to offer better comfort after surgery. It also gives the physicians the ability to accurately position and secure the mesh within a short span of 60 seconds. This may

help in the reduction of overall surgery time²². The polyester mesh is macroporous and contains resorbable polylactic acid (PLA) micro-grips on one side. This helps to quickly secure the mesh without the need for sutures, fibrin glue, tacks or any form of fixation²³.



Image 1: Self-Retaining Mesh(ProGrip™)

The main aim of the study is to compare and find out the reduction in the operative time in fixing the mesh, to compare the postoperative pain, to compare postoperative infection and recurrence and patients satisfaction after surgery.

Review of literature

A complex region to comprehend, the inguinal region is an important part especially in the light of the presence of inguinal canal. Just above the inguinal ligament in the lower part of the anterior abdominal wall, lies a passage that is referred to as inguinal canal.

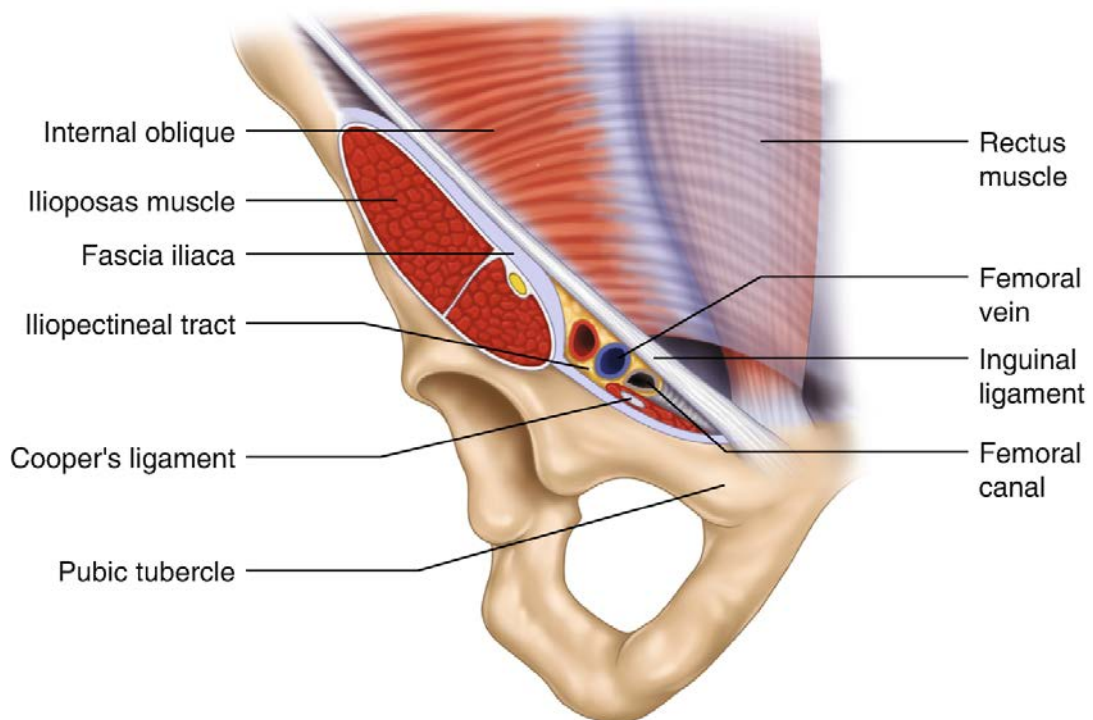


Image 1: Anatomy of the inguinal canal

The canal begins from the internal inguinal opening and extends up to the external inguinal opening. In between these orifices, it traverses medio-inferiorly through the layers of the abdominal wall.

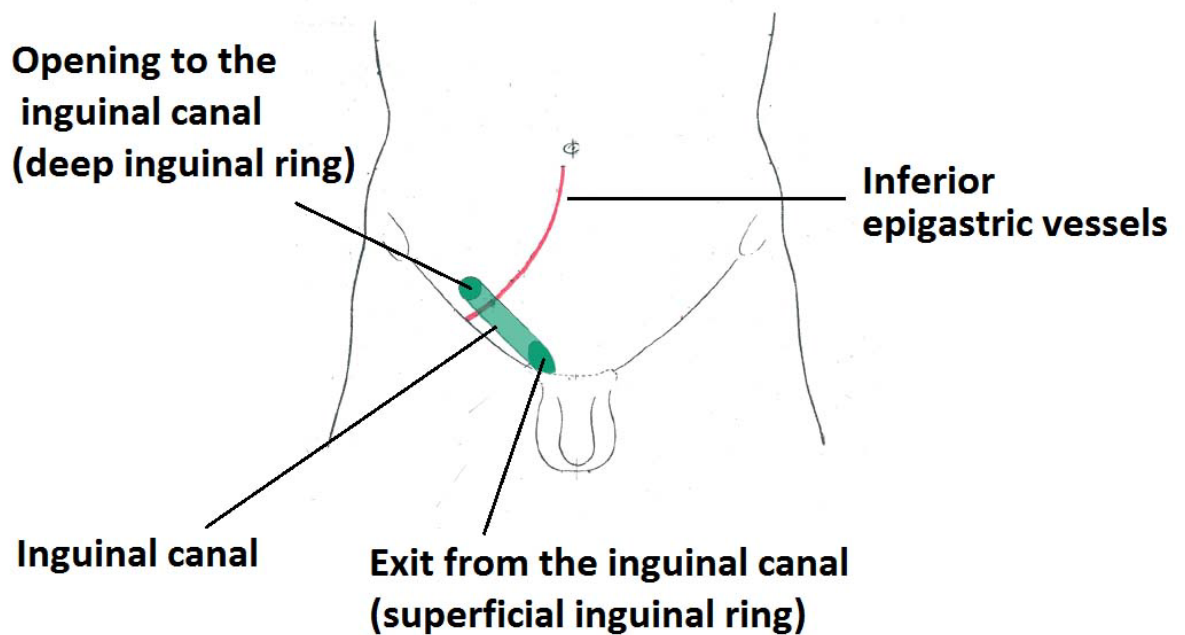


Image 2: Position of the inguinal canal

The canal is around 4-6 cm in length that changes between different age groups from the paediatric age to the adults. It acts as the conduit between the extra abdominal and intra-abdominal structures. The structures that pass through this canal are different between males and females. The

canal in females contains the round ligament of the uterus while in males, spermatic cord, gonadal vessels and lymphatics^{24,25}. The clinical relevance of the area comes from the reason that the most frequently encountered surgical problem, inguinal hernia is found in this place. Other reasons being varicocele and inguinal lymphadenopathy.

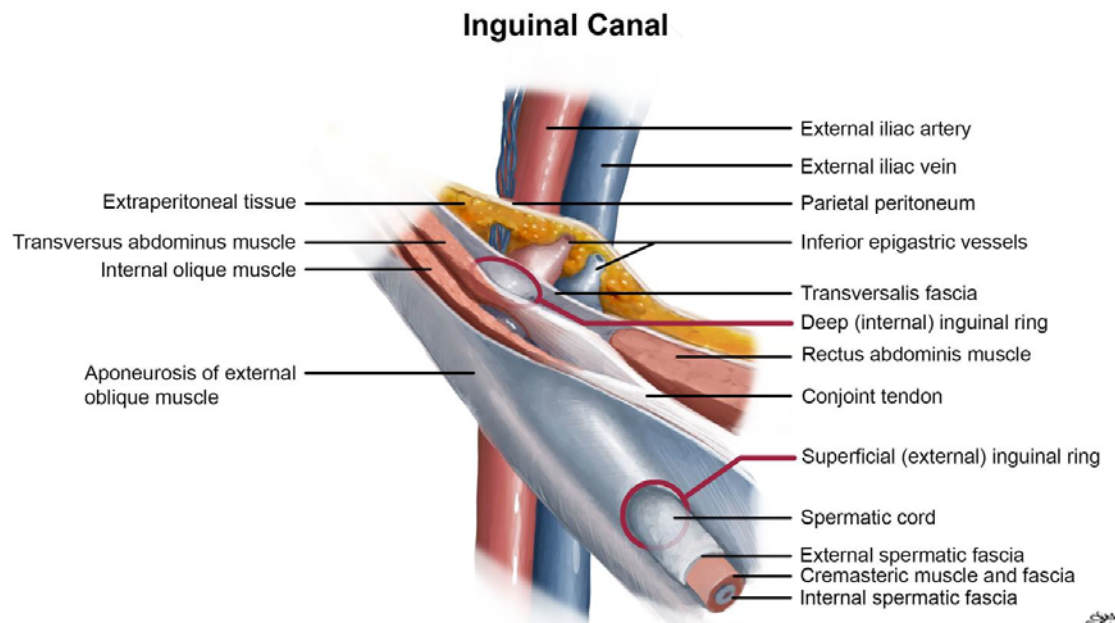


Image 3: Contents of the inguinal canal

Structure and Function

From a surgeon's perspective, it is necessary to understand the anatomy of the inguinal canal for planning surgical management. The natural structure of this canal permits widening and the passage of structures

from the internal abdominal cavity to the extra-abdominal space. The hernias in the inguinal canal are mainly due to the chronic increase in the pressure of the abdominal cavity. This makes it important to understand the structure of this area²⁶.

The canal has a roof, floor, anterior wall and a posterior wall. These are the constituents of the canal;

- 1) Anterior wall- external oblique aponeurosis
- 2) Posterior wall- transversalis muscle
- 3) Floor- inguinal ligament (thickened inferior portion of the external oblique aponeurosis)
- 4) Roof- the combination of fibers from internal oblique and transversus abdominis muscle and aponeurosis including the conjoint tendon

The medial part of the posterior wall is mainly formed by conjoint tendon.

All this understanding of the inguinal canal is essential to plan adequate surgical procedures and approaches. The mid-inguinal point is the area between pubic symphysis and anterior superior iliac spine. This is the point where the femoral artery enters the lower limb in the pelvic cavity. Just below the inguinal ligament, the femoral artery can be palpated²⁷⁻²⁹.

Embryology

A brief understanding of the embryology of the inguinal canal is essential for surgeons. In the initial period of embryogenesis, the testes start from high above the wall of the posterior abdominal cavity. They descend and gradually settle inside the scrotal sac. This migration is guided by Gubernaculum, which is a cord-like structure. It is the attachment from the scrotal sac to the inferior pole of the testes. As the testes descends, processus vaginalis which is an outpouching of the peritoneum assists the testicular descent into the scrotum. Once the descent completes, the processus vaginalis disintegrates. When this processus fails to degenerate, it forms a path through which the internal abdominal cavity communicates with the exterior. When the peritoneal fluid travels into the

scrotal sac through this, it leads to hydrocele. The inguinal hernias too travel through this persistent processus vaginalis. On the other hand, when the testes doesn't descend normally, it will lead to complications of the pediatric age group like the undescended testes.

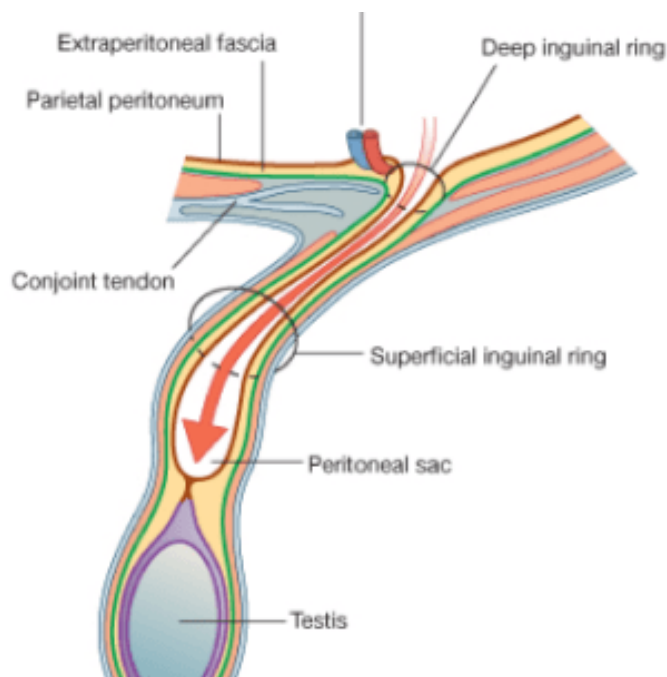


Image 4: Embryology of inguinal canal

Nerves

Two nerves pass through this canal namely;

- 1) Ilioinguinal
- 2) Genitofemoral(genital branch)

One more nerve called the iliohypogastric nerve penetrates the transversus abdominis muscle and subsequently the external oblique of the inguinal region before supplying the skin over the genitalia.

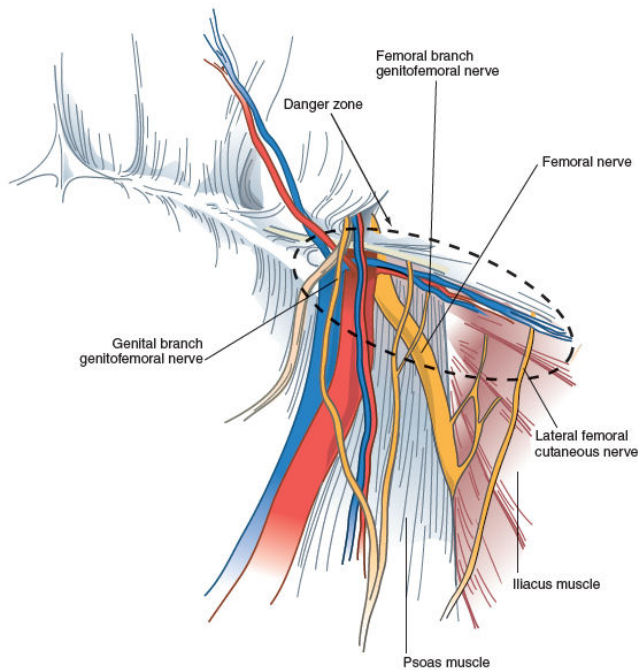


Image 5: Nerves of the inguinal canal

Ilioinguinal Nerve

- Branch of L1
- Passes along with the cord structures through the deep inguinal opening
- It provides sensation to the following areas;

- a) Anterior perineum
- b) Medial and Upper thigh
- c) Anterior Scrotal area in males
- d) Labio majora and mons pubis in females

Genitofemoral

- Derivation of the spinal nerve roots of L1 and L2
- Anatomically the nerve divides just above the inguinal canal as genital and femoral branches.
- The genital nerve travels with the cord structures through the deep inguinal orifice
- The femoral nerve passes under the canal
- The cremasteric muscles get their innervation from these nerves and upper thigh in males
- In females, Labia is supplied by these nerves

An important anatomical consideration about these nerves is the close course of these nerves with the blood vessels in the cord structures. This makes it tricky while wrapping the mesh or dissecting the sac as these nerves are likely to be entrapped due to injury. When the mesh is sutured to conjoint tendon or internal oblique, the chances of injury to iliohypogastric nerve is higher. This incidence is variable³¹.

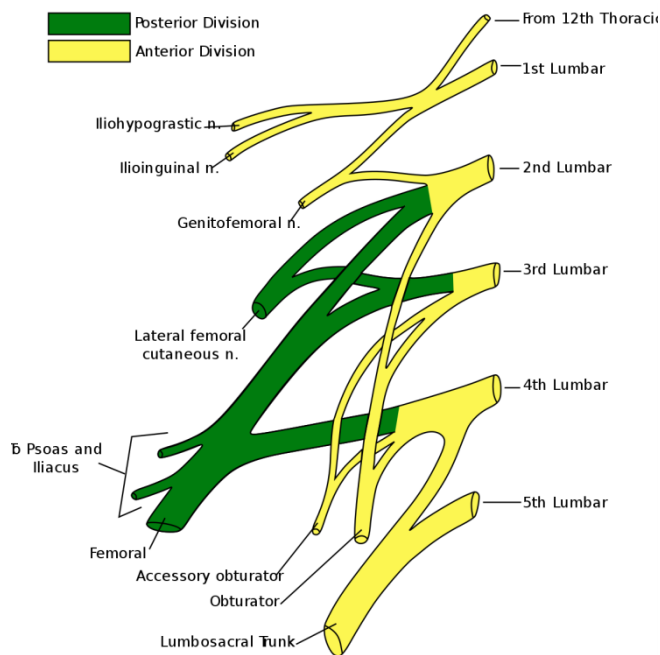


Image 6: Nerves of the inguinal canal

Muscles

The following is the composition of the inguinal canal;

- a) The roof- Superior wall

- External oblique aponeurosis (medial crus)
- Internal Oblique arches
- Transverse abdominis muscles
- Fascia transversalis

b) Floor—Posterior wall

- Deep inguinal ring
- Conjoint tendon
- Fascia transversalis

c) Anterior wall

- External oblique muscle aponeurosis
- Lateral reinforcement by internal oblique
- Medial third is formed by superficial inguinal ring

d) Inferior wall

- Inguinal ligament
- Medial reinforcement by lacunar ligament

- Lateral reinforcement by iliopubic tract

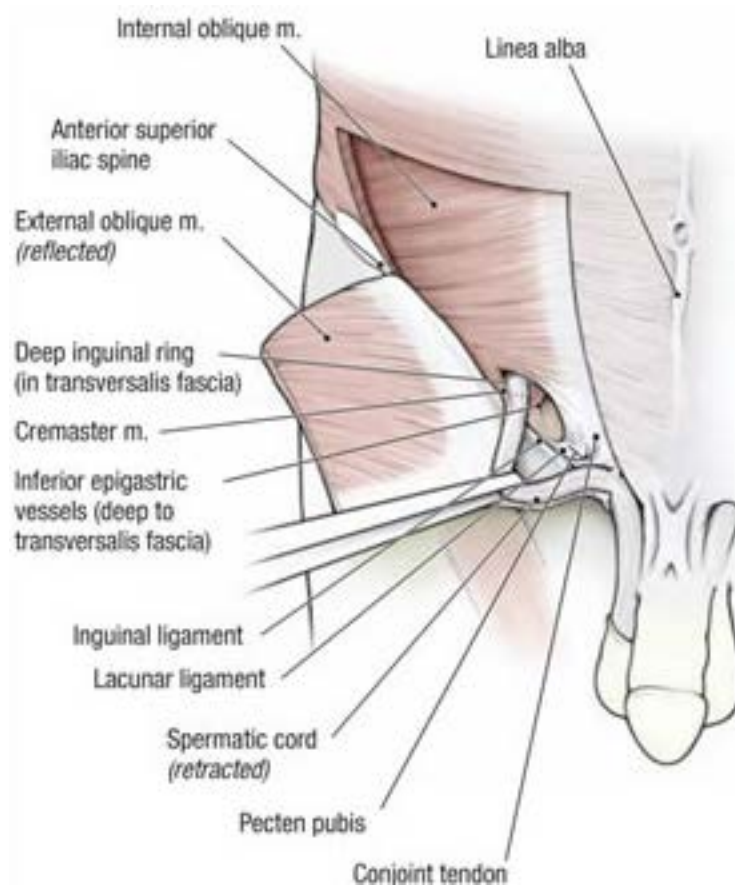


Image 7: Muscles of the inguinal canal

The normal mechanism of action of the canal is that when the pressure inside the abdomen increases, there is an increased tendency of the contents to move out through the canal. In order to avoid this, the posterior wall contracts and the anterior wall tightens. This narrows the canal³².

Surgical considerations

The surgical correction of an inguinal hernia depends on correcting the hernia defect and reinforces the posterior wall of the inguinal canal. All this should be done after reducing the contents of the hernia and the sac.

The surgical repair has evolved over the years. The initial repair was performed by doing a primary closure of the defect or by the approximation of the edges of the inguinal ring. This method was plagued by recurrence. The recurrence can be attributed to the high tension created by the repair. This tension will lead to further weakening and hernia defect. Then the idea of using a mesh was advocated for strengthening the posterior wall. The mesh brought in the idea of being tension free.

Open inguinal repair of hernia is done by incising the external oblique aponeurosis which opens the inguinal canal. Then the contents of the inguinal canal are dissected and mobilised, followed by the identification, isolation and reduction of the hernia sac. The posterior wall of the inguinal canal is then repaired and reinforced by placing a synthetic flat

mesh which is sutured to peri-tubercular tissue of the inguinal canal, conjoint tendon and the incurved part of the inguinal canal.

The last two decades witnessed minimally invasive techniques like TEP- Totally Extra-Peritoneal and TAP- Trans-Abdominal Preperitoneal.

These techniques ensure that there is minimal disruption to the structure and function of the inguinal canal. In these procedures, the mesh is placed centrally on the defect pre-peritoneally.

Clinical significance

During the procedure, it is ensured that the nerves of the inguinal canal are well preserved to reduce the morbidity. When there is compression of the ilioinguinal and genital nerves during the suture of mesh to the internal oblique muscle, there is pain and tingling sensations post-operatively. The spermatic cord is easy to recognise as it runs along with the small vessels and the nerves connecting with the testes. The structures of clinical importance here are;

- a) Testicular artery

- b) Artery to vas deferens
- c) Cremaster artery
- d) Lymphatics
- e) Pampiniform plexus
- f) Genital branch that runs with the cord

Any of these structures can be injured in this surgery either alone or in combination.

This area is prone for inguinal hernias and other diseases namely varicocele, hydrocele and undescended testes.

Hernias can be direct or indirect.

Indirect hernias

When the peritoneal sac enters the inguinal canal at the deep inguinal ring and the hernia protrudes through the external inguinal orifice, then it is an indirect hernia which is typically associated with the failure of atrophy of processus vaginalis after birth.

Direct hernias

When there is a defect in the posterior wall leading to the direct entry of the peritoneal sac into the inguinal canal, then it is called direct hernia.

Both the hernias are present in the same location.

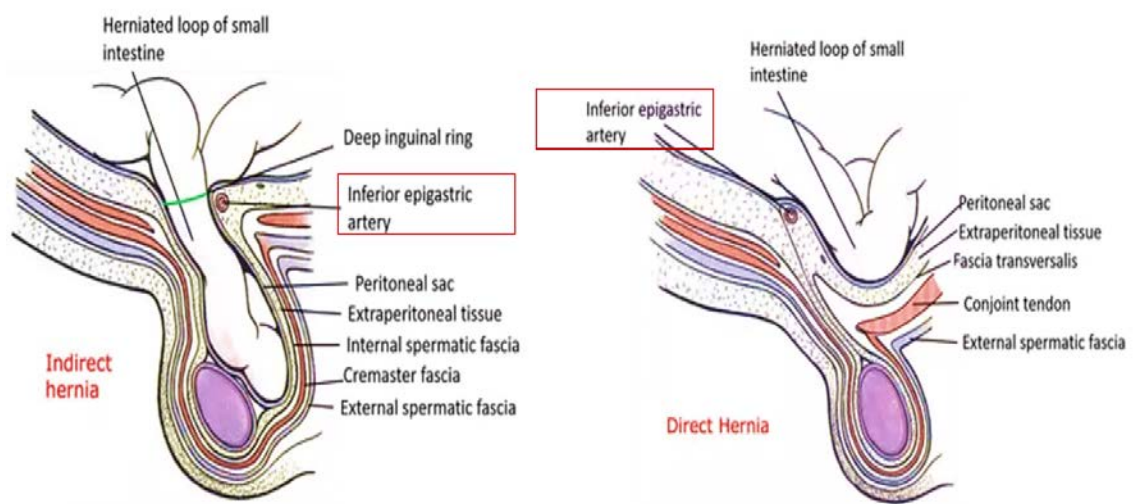


Image 8: Direct and indirect hernias

Surgical management of inguinal hernias

Since the beginning of the modern surgery, the hernia repair has undergone several modifications and in the last decade has accelerated due to the addition of specialised hernia clinics and introduction of tension free repair and laparoscopic repair. This has led to the replacement of traditional suture based repair with the tension free mesh

repair. This is known as "hernioplasty". In the recent days, mesh repair is gaining more predominance over suture repair in many countries. In 1986, Lichtenstein came up with his own open mesh repair technique for treating inguinal hernias.

The primary choice of repair in unilateral primary groin hernias is the Lichtenstein technique. In spite of the low rate of morbidity and long term prognosis, chronic inguinal pain is reported in a high number of cases. It ranges between 12% and 53%. Though chronic post operative pain is seen as a primary outcome of the surgery, yet it affects the social and personal life of the patients in 6% of the patients. Considering the global rate of 20 million hernia repairs, around 1 million lives are being complicated by chronic post operative pain in cases of simple hernia repair.

The reasons for the post operative pain are; surgical expertise, presence of pain pre-operatively, surgical technique and mesh fixation. Post introduction of tension-free techniques, nerve entrapment in suture, scar tissue, foreign body reaction and inflammation of the periosteum of the pubic tubercle traditionally taken into the first stitch. The risk of chronic pain can be mitigated by using tissue-compatible glues which should be cheap, easy to store and use and also biocompatible. Fibrin glue gives good results but is costly and is not easy to store and use. Therefore, the

best choice for mesh fixation in open mesh repair of inguinal hernia is not long-lateral-chain cyanoacrylates.

For the last 30 years, Lichtenstein's technique for inguinal hernia repair has become more popular and most commonly attempted procedure. Being one of the most commonly performed surgeries in clinical practice, it has its own costs to the society and healthcare. The rate at which this procedure is being done is increasing annually with a significant potential to double in the coming days. From the time, Lichtenstein's repair was introduced, it is being done widely and has become the gold standard of inguinal hernia repair. It is more effective than the other techniques that are available for treating inguinal hernia.

It is unwise to ignore the impact of Lichtenstein's repair. Since its advent, various modifications have been introduced and has been revolutionary in nature. It has been useful in reducing the morbidity risk and can also be used in patients who are otherwise unsuited for the traditional methods. Also the recovery in the post-operative period and low post-operative pain and complications make it a preferred method of hernia repair in the groin region. This is why Lichtenstein's tension free repair has become a gold standard and is widely used by surgeons worldwide. The recurrence rates of hernia are also less than 2% with the use of this procedure.

One of the most commonly reported sign post operatively is chronic pain that can be attributed to the fixation techniques used which has led to several modifications of the technique. The modifications began with the introduction of nonabsorbable sutures, absorbable sutures, usage of glue and has today come to self-fixating systems.

It was launched by Covidien as ProGrip™ mesh in 2008. It is being used in inguinal and incisional hernia repairs. ProGrip™ is known to offer better comfort after surgery. It also gives the physicians the ability to accurately position and secure the mesh within a short span of 60 seconds. This may help in the reduction of overall surgery time. The polyester mesh is macroporous and contains resorbable polylactic acid (PLA) micro-grips on one side. This helps to quickly secure the mesh without the need for sutures, fibrin glue, tacks or any form of fixation.

Need for study

The main aim of the study is to compare and find out the reduction in the operative time in fixing the mesh, to compare the postoperative pain, to compare postoperative infection and recurrence and patients satisfaction after surgery.

Materials and Methods

Aims and objectives of the study:

- 1.Reduction in the operative time in fixing the mesh
- 2.To compare the postoperative pain
- 3.To compare postoperative infection and recurrence
- 4.Finally comparing patients satisfaction after surgery

Study design

Prospective Single Center Study

Place of study

GMKMC hospital

Study period

December 2017 to September 2019

Study population & Sampling Methodology

- Patients admitted to department of surgery GMKMCH , during study period dec 2017 to sept 2019, satisfying inclusion and exclusion criteria are considered into study.
- A detailed history and clinical examination of the cases are done.

- Routine preoperative investigations.
- Randomization of the cases done by lottery method and grouped into A or B.
- A note is made about the intra-operative and post-operative pain recurrence infection and pt. satisfaction.
- The results are analyzed statistically.

Inclusion criteria:

- Patients with primary uncomplicated inguinal hernia
- Patients aged above 20 yrs
- Patients with unilateral hernia

Exclusion criteria:

- Patients with recurrent hernia
- Patients below 20 yrs
- Patients with bilateral hernia, femoral hernia
- Patients with complicated hernias like- irreducibility, obstruction, strangulation, incarceration
- Patients with psychiatric problems, pregnancy, DM
- Patients with associated hydrocele

Methodology

-The cases admitted in all the surgical ward of the Department of General Surgery in GMKMCH who are diagnosed to have inguinal hernias were included in the study.

- A detailed history is taken and examination is done to diagnose inguinal hernias.

-Systemic examination and basic investigations done.

Procedure

This prospective study comprised of 40 cases of inguinal hernia which were randomly divided into two groups of 20 each named group A and group B.

Group A - Lichensteins repair using conventional mesh

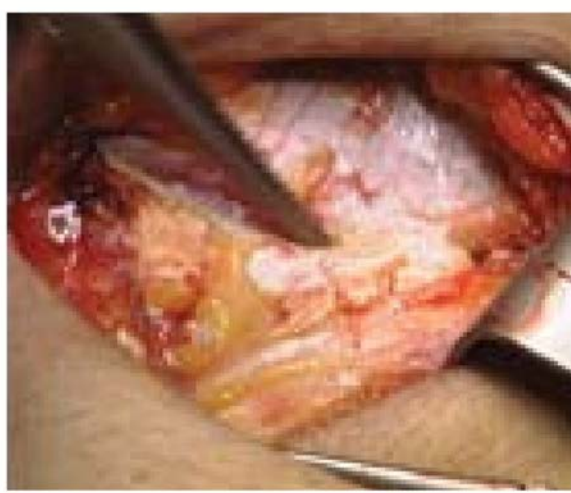
Group B – lichensteins repiar using self- retaining mesh

The following steps detail the procedure followed in the surgery.

Step 1 – Incision

A 5-centimeter horizontal or vertical incision is made in the fold of the groin.

Step 2 – Dissection



A. A large lateral dissection of the aponeurosis of the external oblique muscle is performed with partial dissection of the cremaster muscle. The partial dissection of the cremaster muscle is made at the surgeon's discretion.



B. It is necessary to widely dissect the superficial inguinal space up to the aponeurosis of the medial rectus muscle, then to the superior rectus muscle up to the anterior superior iliac spine.

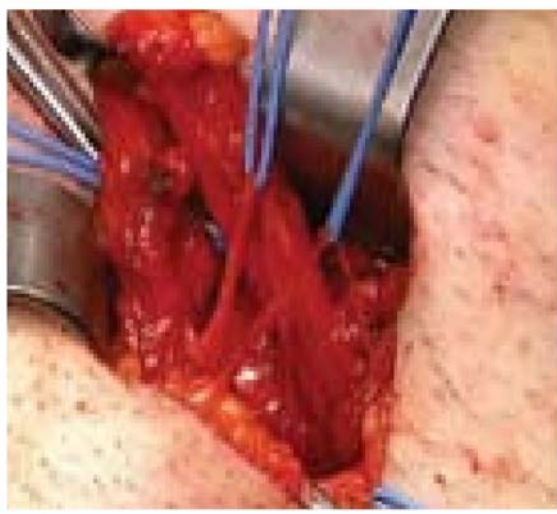
Step 2 – Dissection (cont.)



C. Free the inguinal ligament.



D. Section the cremasteric fibers and skeletonize the cord. Once the hernia is dissected up to the subperitoneal space, it is simply retracted.



E. Ilio-hypogastric, ilio-inguinal and the genital branch of the genito-crural nerves are located and preserved.

Step 3 – Replacement of the hernia sac



A. Reduce the hernia sac. In case of voluminous direct hernia, the sac could be simply reduced in the abdominal cavity.



B. In case of voluminous indirect hernia, like a pantaloon hernia, superficial sutures could be indicated, avoiding any tension.

Step 4 – Close and position the mesh around the spermatic cord



A. Present the mesh and close the self-gripping flap around the cord

The mesh should be presented slit upward, flap open, colored yarn marker toward the pubis, gripping side facing the deep muscular plane. The blue mark on the interior portion of the mesh allows it to be correctly oriented. Fit the slit around the cord.



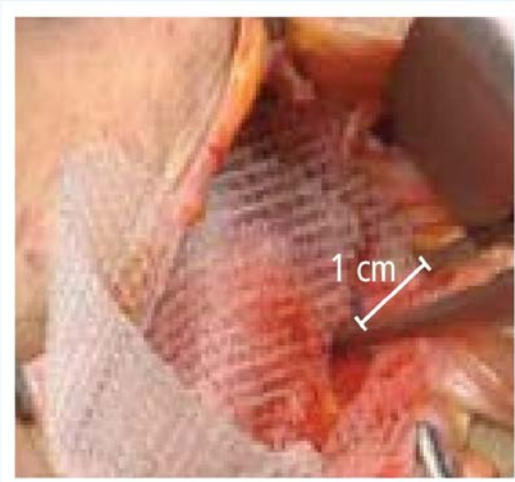
B. Fold the flap back onto the mesh. Gripping is reversible to allow the slit closure to be adjusted several times.



C. Lowering and positioning the mesh

The mesh is then lowered along the length of the cord. Lightly position the mesh against the adjacent tissue and check for proper fit.

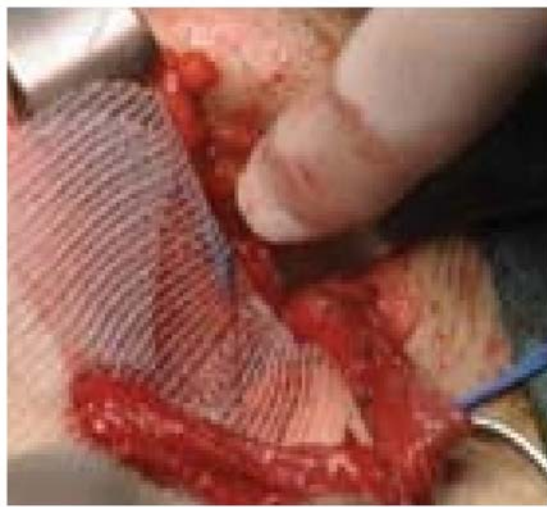
Step 4 – Close and position the mesh around the spermatic cord (cont.)



D. Apply the mesh

First apply the internal-inferior (gripping) side of the mesh on the pubic bone.

The mesh extends about 1 centimeter beyond the pubic bone.



E. Anchoring and additional fixation

It is often helpful to fix the mesh on the pubis with a single absorbable stitch of suture. This aids in positioning and may help avoid sliding of the mesh when applied as described above.



F. Working the mesh under the aponeurosis of the external oblique muscle, the external-superior (non-gripping) aspect of the mesh is pressed down for final placement.

Step 5 – Aponeurosis closure

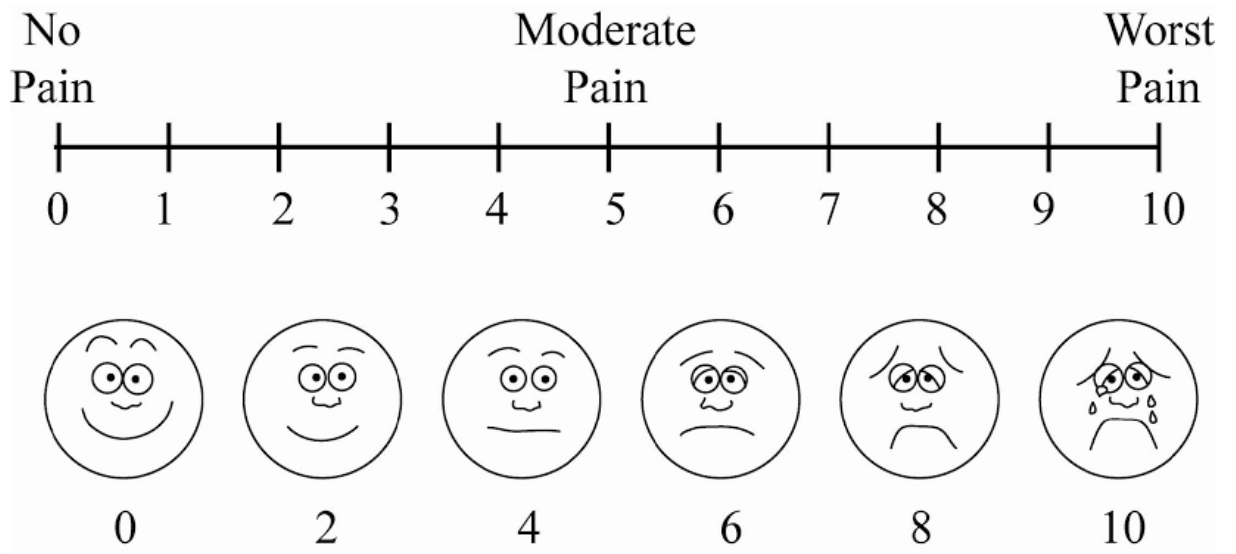


A. Anchoring the mesh to the tissue with the micro-grips is immediate and may not require any additional fixation.*



B. The aponeurosis of the external oblique muscle is closed in a pre- or retrofunicular manner according to the surgeon's preference.

Pain Visual Analog Scale



Pain was measured using the pain visual analog scale

Results are based on

- Intraoperative time
- Postoperative complications

1.pain

2.infection

3.recurrence

- Patient satisfaction

Investigations

- a. HB%, TC, DC, ESR.
- b. Blood urea, Serum creatinine, Blood sugar.
- c. Blood grouping and Rh typing.
- d. BT, CT.
- e. Urine routine examination.
- f. Screening for HIV, Hbs Ag and VDRL after informed consent
- g. Chest X-ray PA view.
- h. x ray abdomen erect
- i. CECT abdomen and pelvis

Statistical Analysis

Data were analyzed according to history, clinical examination and investigation. Data were entered in excel sheet and analyzed using SPSS v23. Frequencies and percentage analysis were done. Cross tabulation and Chi-square analyses were done to find the relationship and association between various variables.

Images from the procedure done

Right side

Left

RESULTS

The mean age of the participants in the Self-Retaining Mesh group is 35.7 years with a standard deviation of 6.93 years ranging between 21-47 years. The mean age of the participants in the Conventional Mesh group is 29.15 years with a standard deviation of 6.62 years ranging between 20-40 years. In Self-Retaining Mesh group, 50% (n=10) had right sided hernia while the rest 50% (n=10) had left sided hernia. In the Conventional Mesh group, 55% (n=11) had right sided hernia while the rest 45% (n=9) had left sided hernia.

In Self-Retaining Mesh group, 40% (n=8) had direct hernia while the rest 60% (n=12) had indirect hernia. In the Conventional Mesh group, 40% (n=8) had direct hernia while the rest 60% (n=12) had indirect hernia. The operative time was low in the Self-Retaining Mesh group with the maximum time reaching between 40-45 minutes for 45% of the participants (n=9). In the Conventional Mesh group, it was longer with maximum time reaching 65-70 minutes. The majority of them having operation time between 55-60 minutes (n=8, 40%).

Pain was higher among the Conventional Mesh group ($p < 0.05$). The incidence of post-operative infection was higher among the Conventional

Mesh group (n=5, 25%) compared to Self-Retaining Mesh group (n=2, 10%). None of them had recurrence in any of the groups

Age Distribution of the participants in Self-Retaining Mesh group

The following tables and figures show the age distribution among the two groups. The mean age of the participants in the Self-Retaining Mesh group is 35.7 years with a standard deviation of 6.93 years ranging between 21-47 years.

Age distribution of participants of Self-Retaining Mesh Group	In years
Mean	35.700
Median	37.500
Mode	40.0
Std. Deviation	6.9366
Minimum	21.0
Maximum	47.0

Table 1: Age distribution of the participants in Self-Retaining Mesh Group

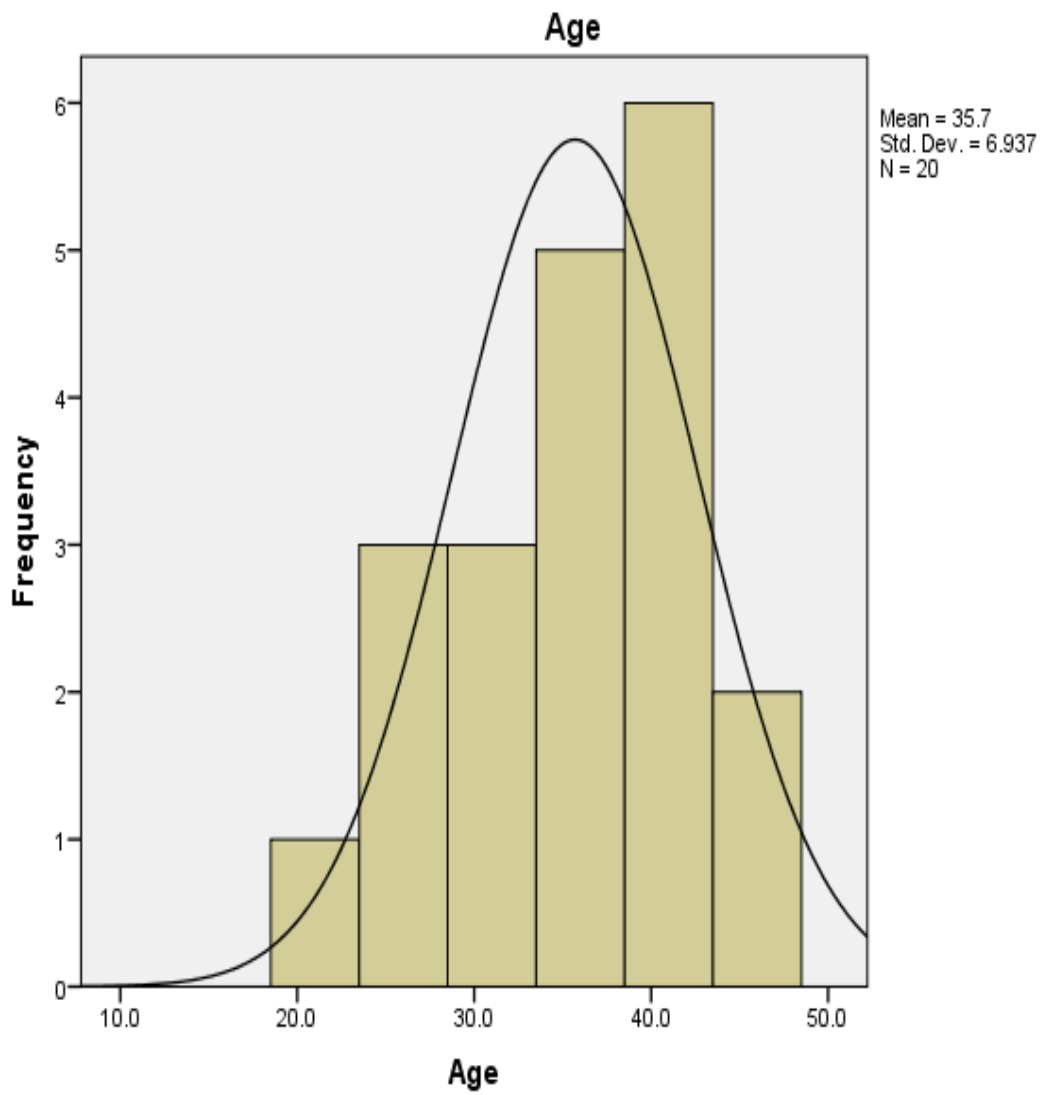


Figure 1: Age distribution of the participants in Self-Retaining Mesh Group

Age Distribution of the participants in Conventional Mesh group

The following tables and figures show the age distribution among the two groups. The mean age of the participants in the Conventional Mesh group is 29.15 years with a standard deviation of 6.62 years ranging between 20-40 years.

Age distribution of participants of Conventional Mesh Group	In years
Mean	29.150
Median	29.000
Mode	36.0
Std. Deviation	6.6275
Minimum	20.0
Maximum	40.0

Table 2: Age distribution of the participants in Conventional Mesh Group

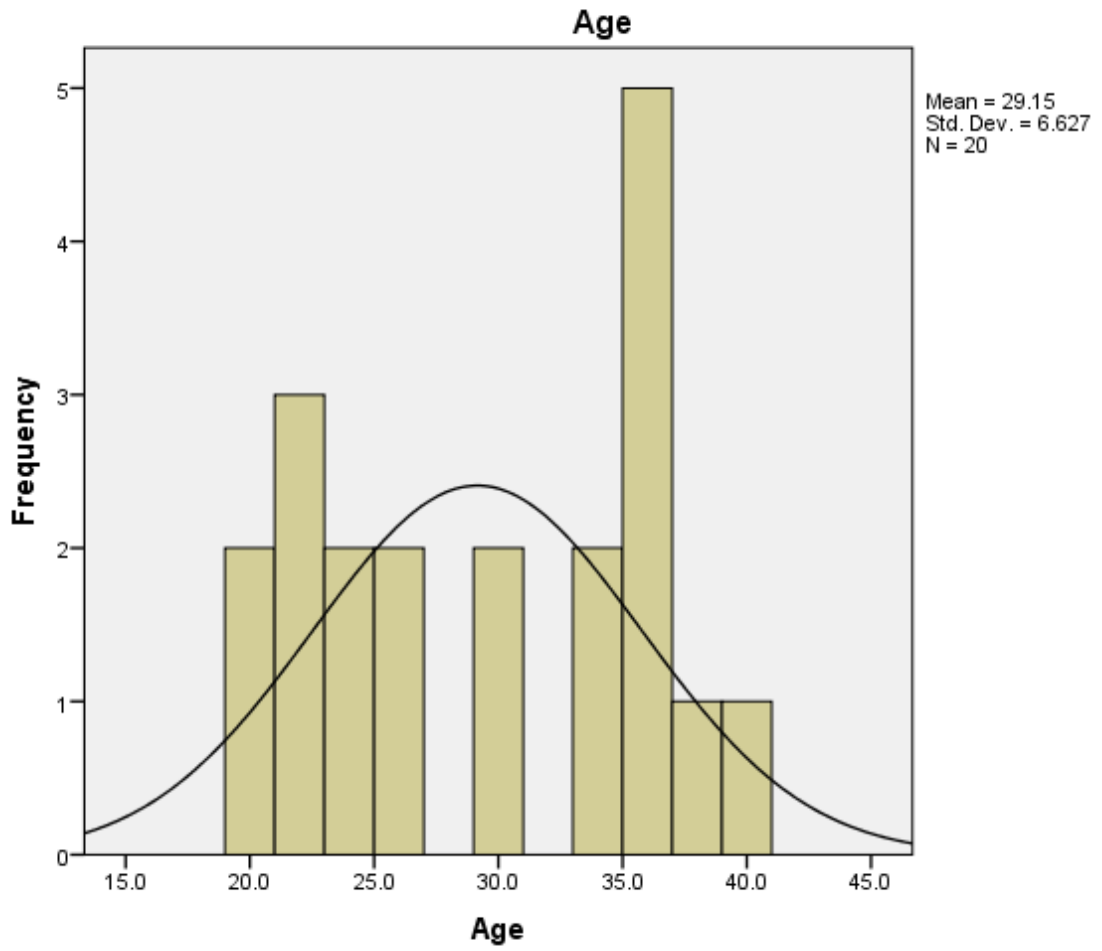


Figure 2: Age distribution of the participants in Conventional Mesh Group

Comparison of age between the two groups

The following tables and figures show the age distribution among the two groups. The mean age of the participants in the Self-Retaining Mesh group is 35.7 years with a standard deviation of 6.93 years ranging between 21-47 years. The mean age of the participants in the Conventional Mesh group is 29.15 years with a standard deviation of 6.62 years ranging between 20-40 years.

Age distribution	P-mesh	C-mesh	t-test (p-value)
Mean	35.700	29.150	2.80 P<0.005
Median	37.500	29.000	
Mode	40.0	36.0	
Std. Deviation	6.9366	6.6275	
Minimum	21.0	20.0	
Maximum	47.0	40.0	

Table 3: Age comparison between two groups

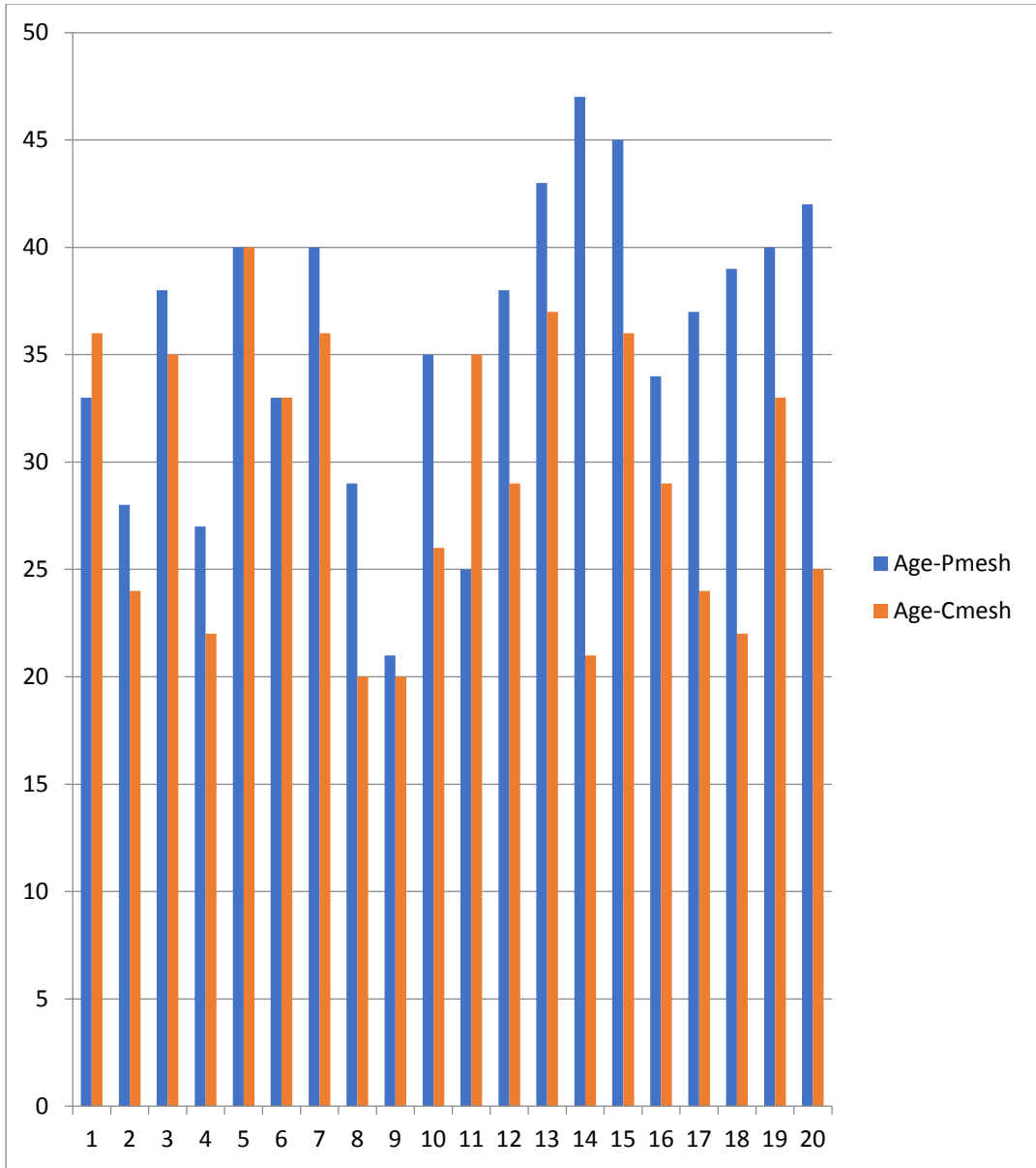


Figure 3: Age comparison between two groups

Side of the Hernia

The following tables and figures show the side of hernia among the two groups. In Self-Retaining Mesh group, 50% (n=10) had right sided hernia while the rest 50% (n=10) had left sided hernia. In the Conventional Mesh group, 55% (n=11) had right sided hernia while the rest 45% (n=9) had left sided hernia.

Self-Retaining Mesh side	Frequency	Percent
Right	10	50.0
Left	10	50.0
Total	20	100.0

Table 4: Side of Hernia in Self-Retaining Mesh

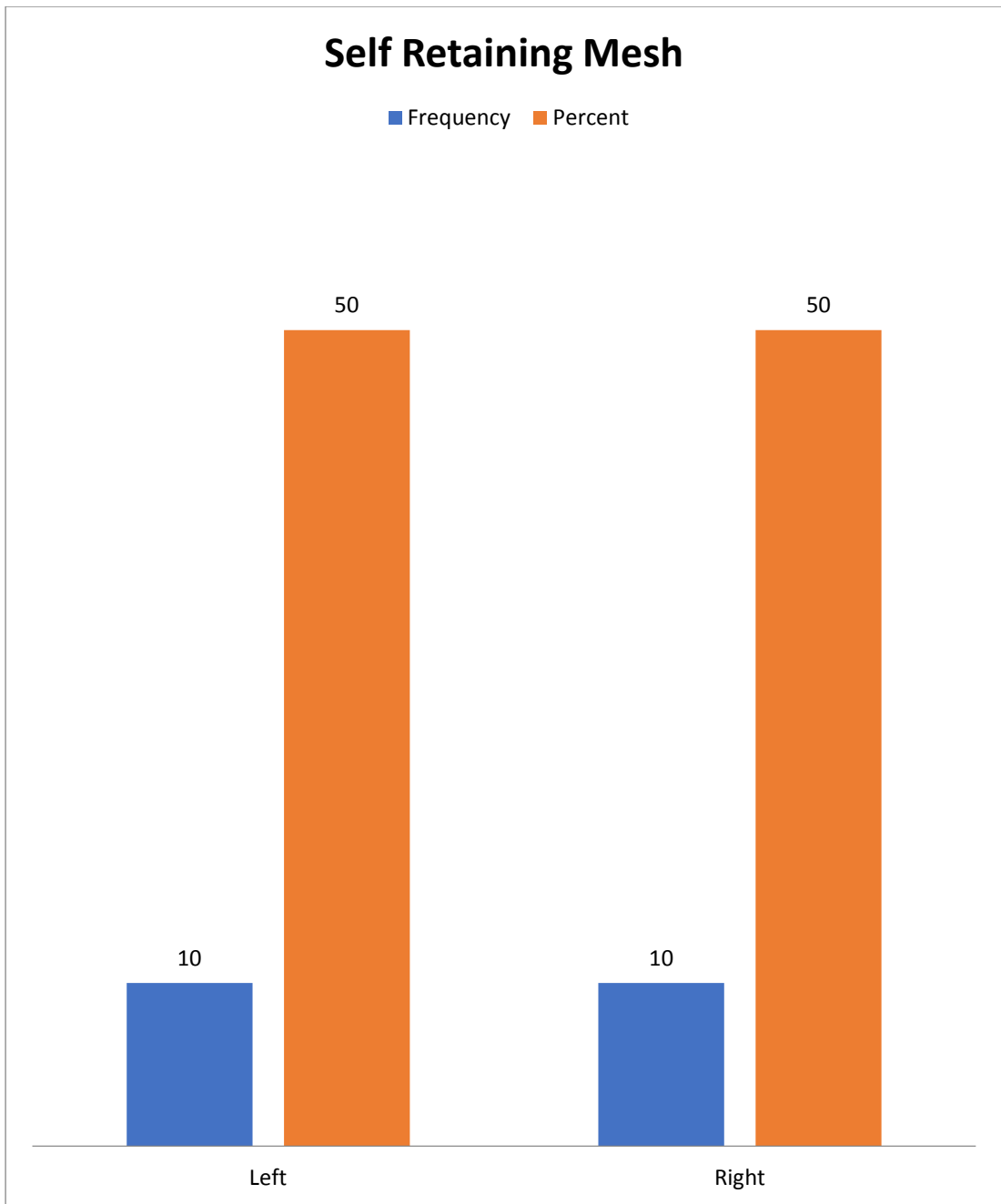


Figure 4: Side of Hernia in Self-Retaining Mesh

	Frequency	Percent
Conventional Mesh		
side		
Right	11	55
Left	9	45
Total	20	100.0

Table 5: Side of Hernia in Conventional Mesh

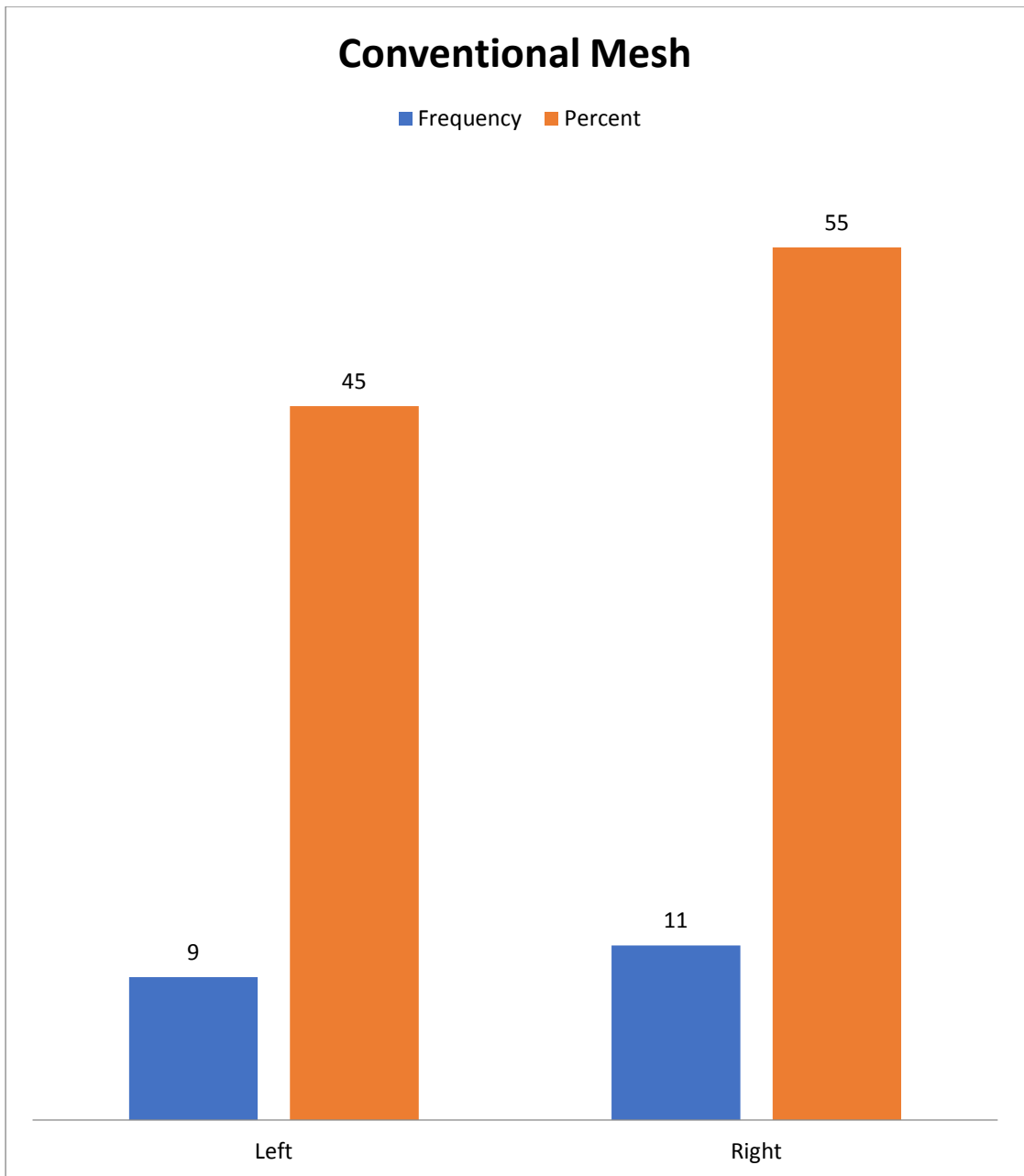


Figure 5: Side of Hernia in Conventional Mesh

Type of the Hernia

The following tables and figures show the type of hernia among the two groups. In Self-Retaining Mesh group, 40% (n=8) had direct hernia while the rest 60% (n=12) had indirect hernia. In the Conventional Mesh group, 40% (n=8) had direct hernia while the rest 60% (n=12) had indirect hernia.

Self-Retaining Mesh	Frequency	Percent
Type of Hernia		
Direct	8	40
Indirect	12	60
Total	20	100.0

Table 6: Type of hernia Self-Retaining Mesh

Conventional Mesh	Frequency	Percent
Type of Hernia		
Direct	8	40
Indirect	12	60
Total	20	100.0

Table 7: Type of hernia Conventional Mesh

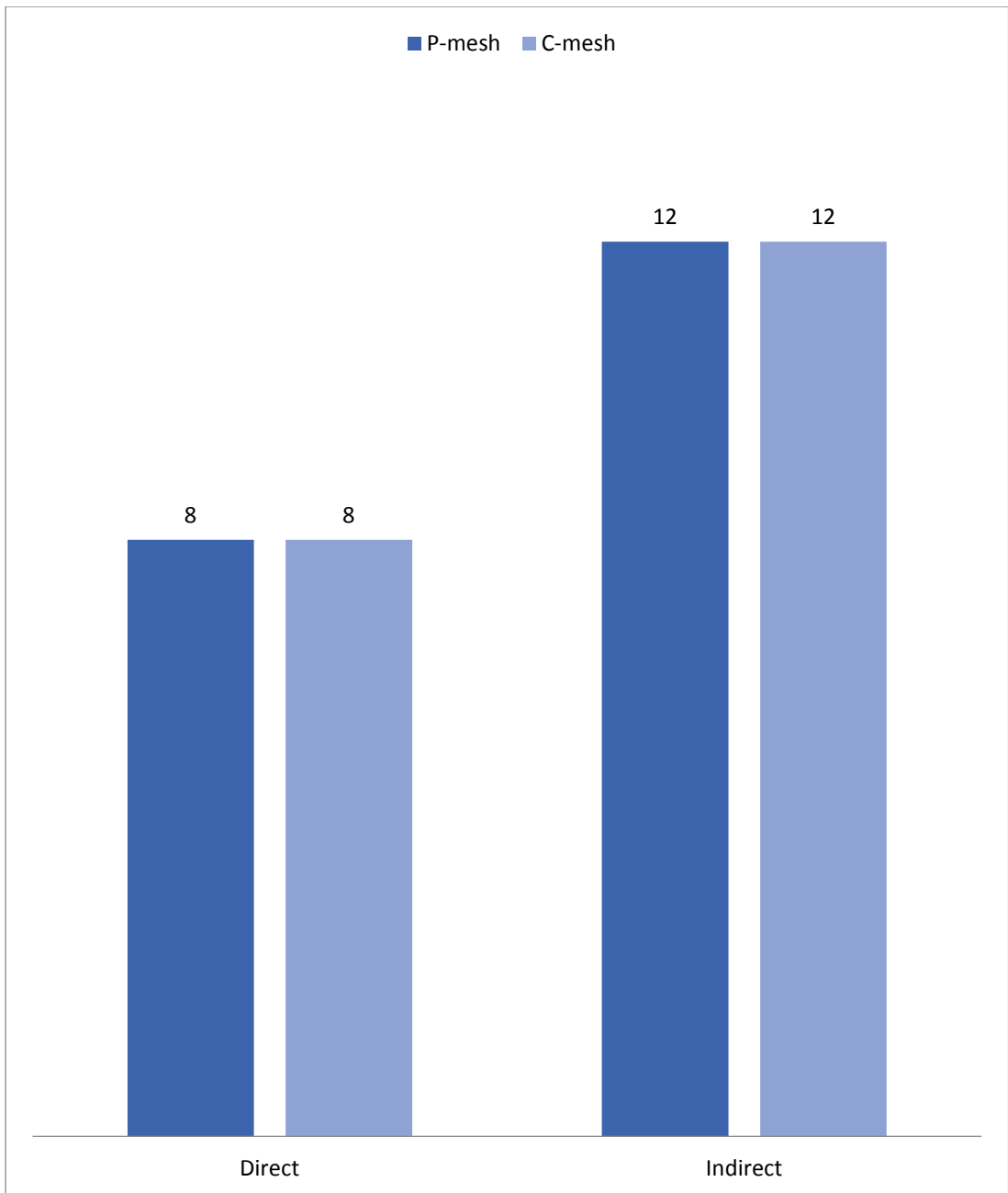


Figure 6: Type of hernia

Operative Time

The following tables and figures show the operative time among the two groups. The operative time was low in the Self-Retaining Mesh group with the maximum time reaching between 40-45 minutes for 45% of the participants (n=9). In the Conventional Mesh group, it was longer with maximum time reaching 65-70 minutes. The majority of them having operation time between 55-60 minutes (n=8, 40%).

Operative time Self- Retaining Mesh	Frequency	Percent
35-40	1	5.0
30-35	2	10.0
35-40	8	40.0
40-45	9	45.0
Total	20	100.0

Table 8: Operative time for Self-Retaining Mesh

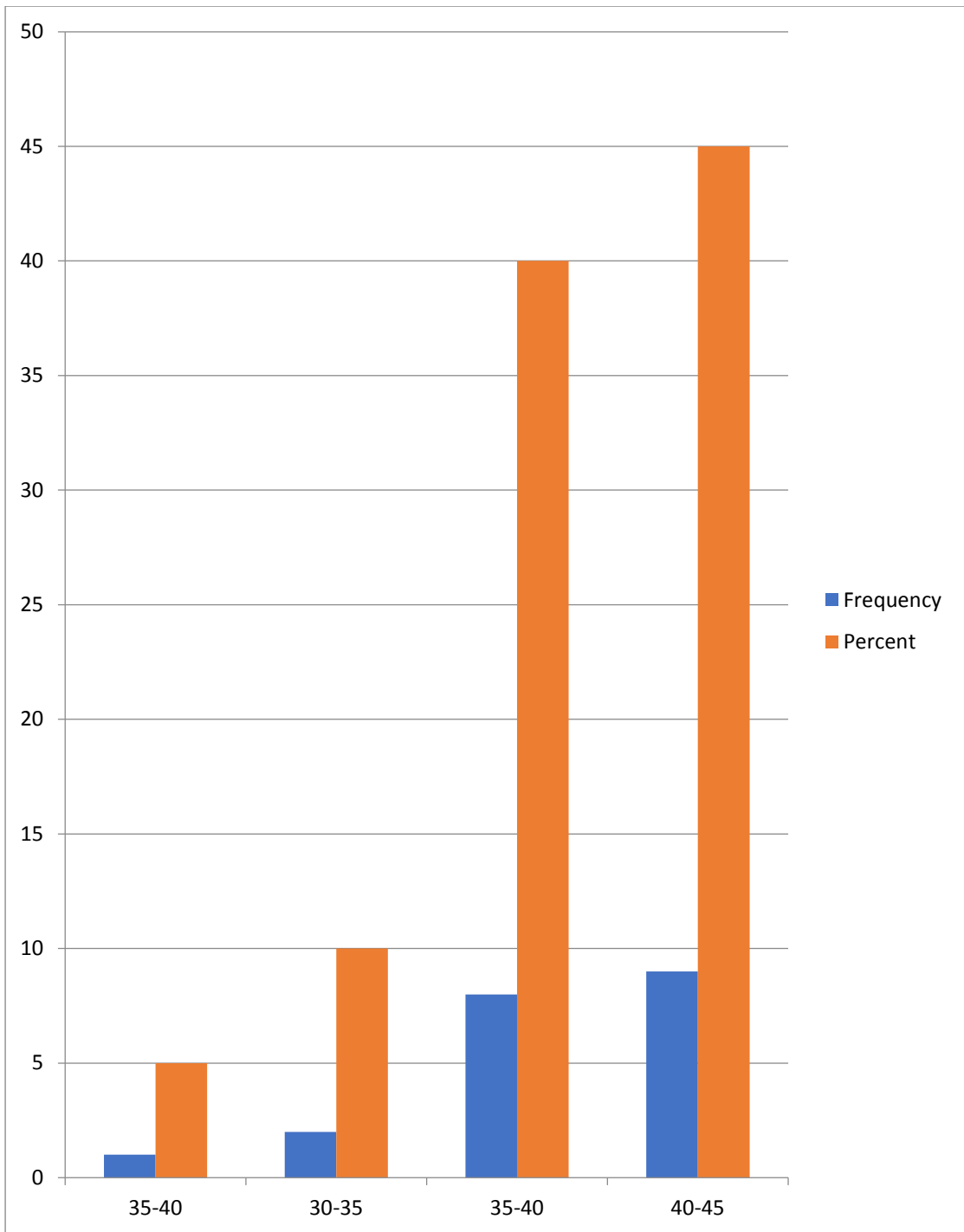


Figure 7: Operative time for Self-Retaining Mesh

Operative time	Frequency	Percent
Conventional Mesh		
45-50	2	10.0
45-55	1	5.0
50-55	4	20.0
50-60	1	5.0
55-60	8	40.0
60-65	2	10.0
65-70	2	10.0
Total	20	100.0

Table 9: Operative time for Conventional Mesh

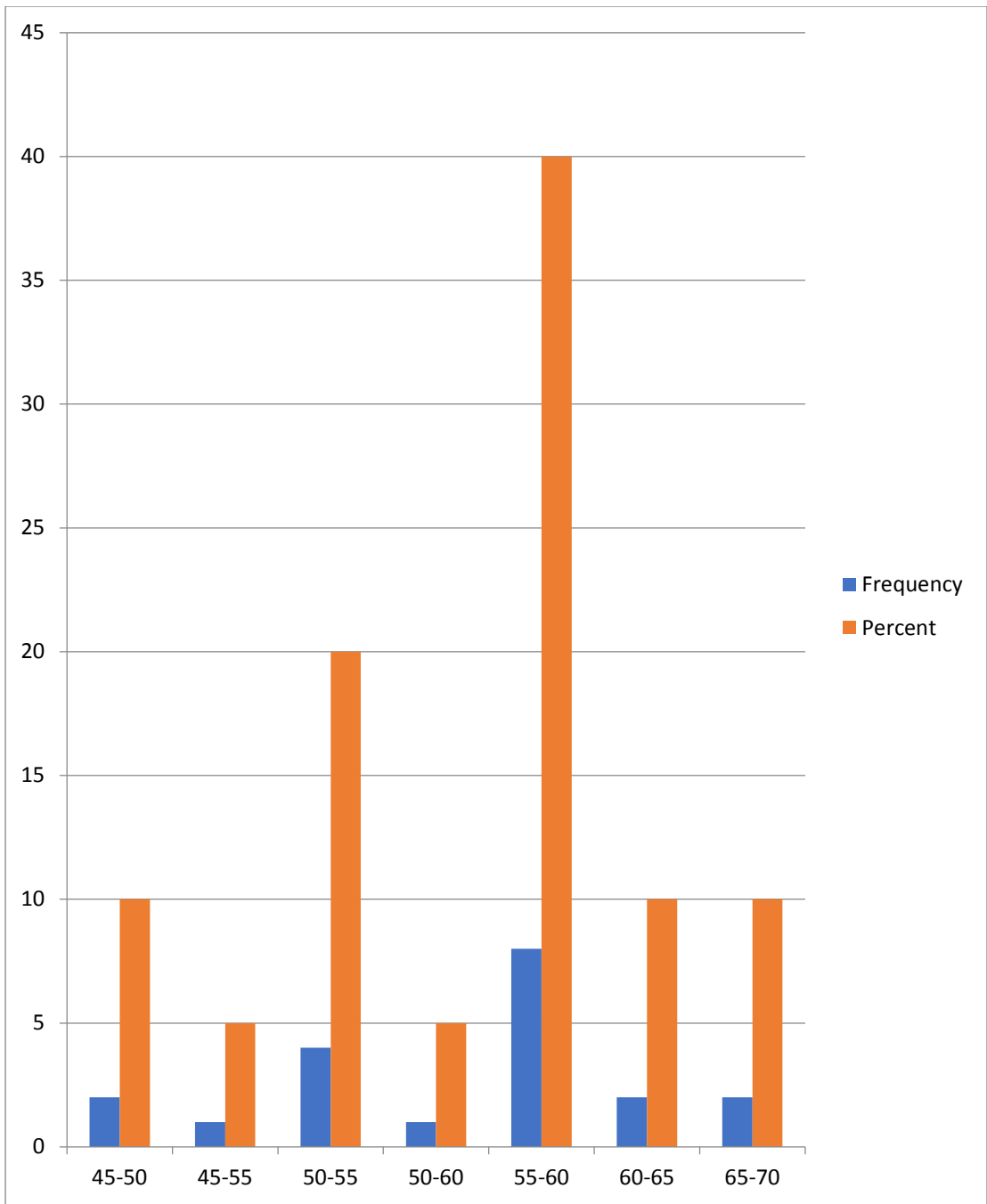


Figure 8: Operative time for Conventional Mesh

	Operative time Self-Retaining Mesh	Operative time Conventional Mesh	Chi-Square test P-value
35-40	5.0		4.12 P<0.005 Highly Significant
30-35	10.0		
35-40	40.0		
40-45	45.0		
45-50		10.0	
45-55		5.0	
50-55		20.0	
50-60		5.0	
55-60		40.0	
60-65		10.0	
65-70		10.0	

Table 10: Operative time comparison

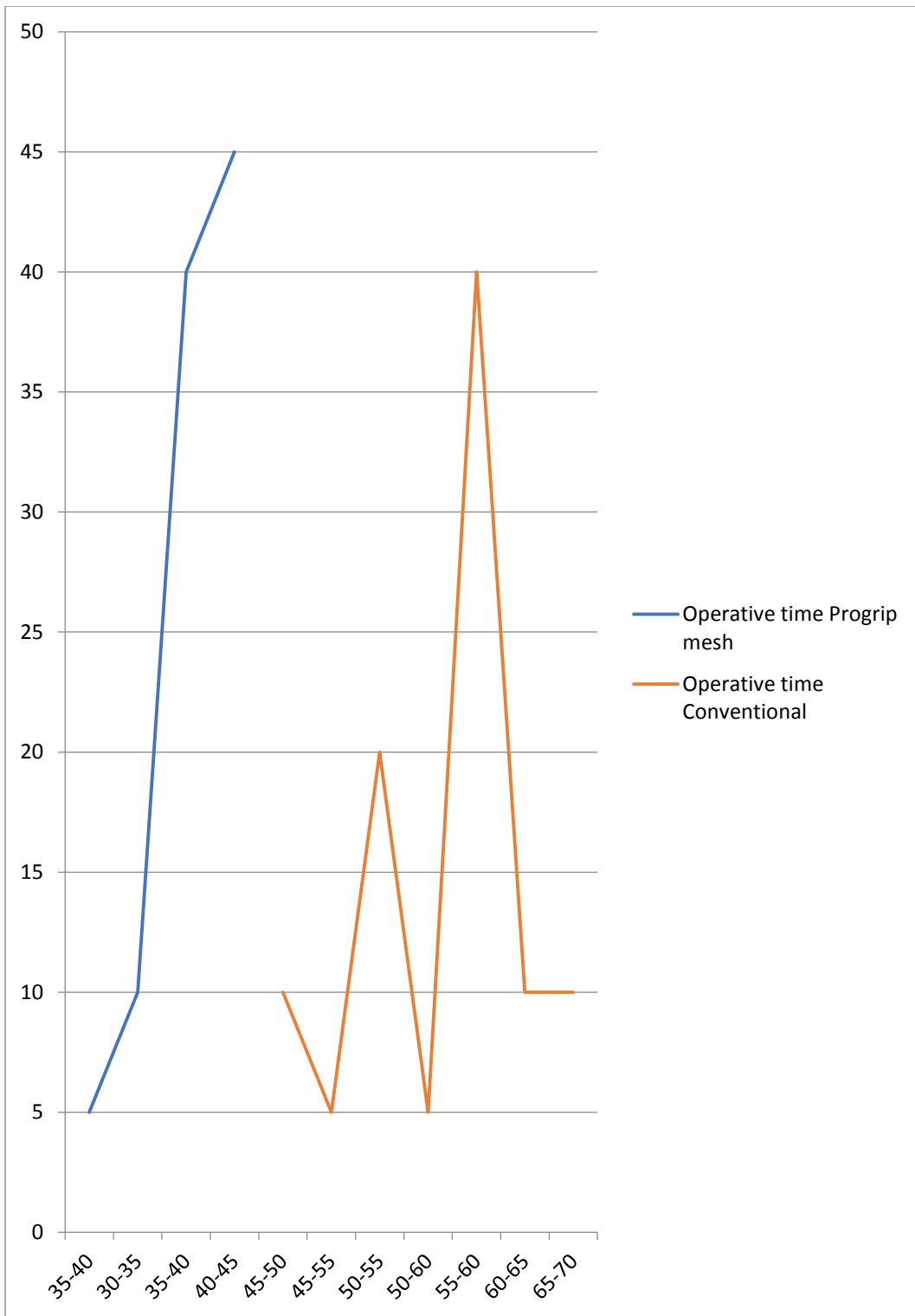


Figure 9: Operative time comparison

Post operative pain

The following tables and figures show the post operative pain among the two groups. Pain was higher among the Conventional Mesh group ($p < 0.05$).

Post Operative Pain- Self-Retaining Mesh	Frequency	Percentage
Mild	16	80
Moderate	4	20
Severe	-	-

Table 11: Post operative pain- Self-Retaining Mesh

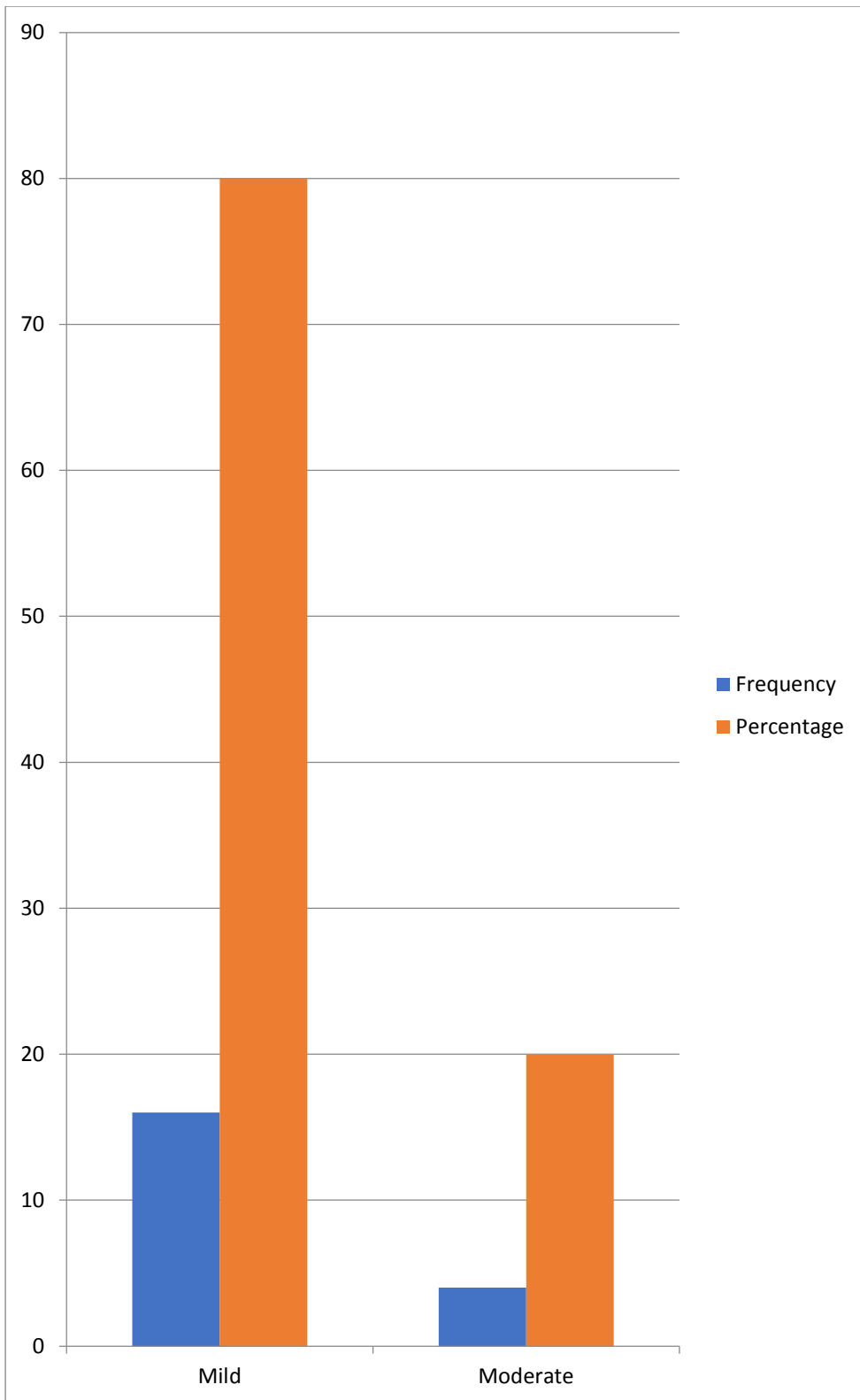


Figure 10: Post operative pain- Self-Retaining Mesh

Post Operative Pain- Conventional Mesh	Frequency	Percentage
Mild	5	25
Moderate	11	55
Severe	4	20

Table 12: Post operative pain-Conventional Mesh

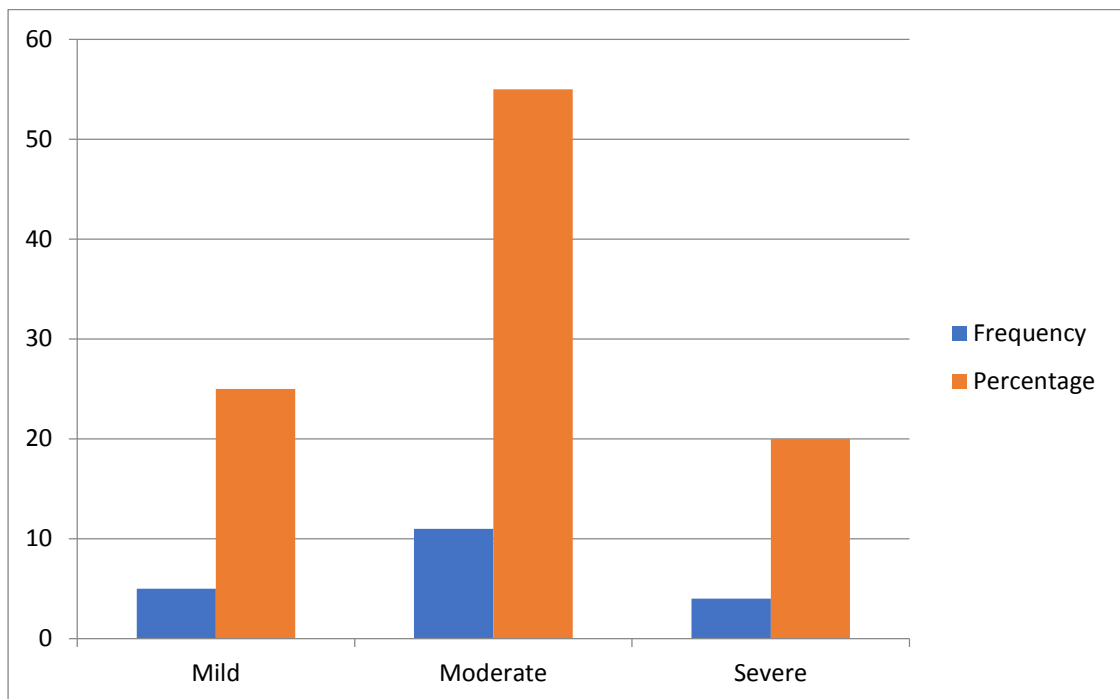


Figure 11: Post operative pain- Conventional Mesh

	Post Operative Pain- Self- Retaining Mesh	Post Operative Pain- Conventional Mesh	Chi-Square p-value
Mild	80	25	3.12 P<0.05 Significant
Moderate	20	55	
Severe	-	20	

Table 13: Comparison of Post-operative pain

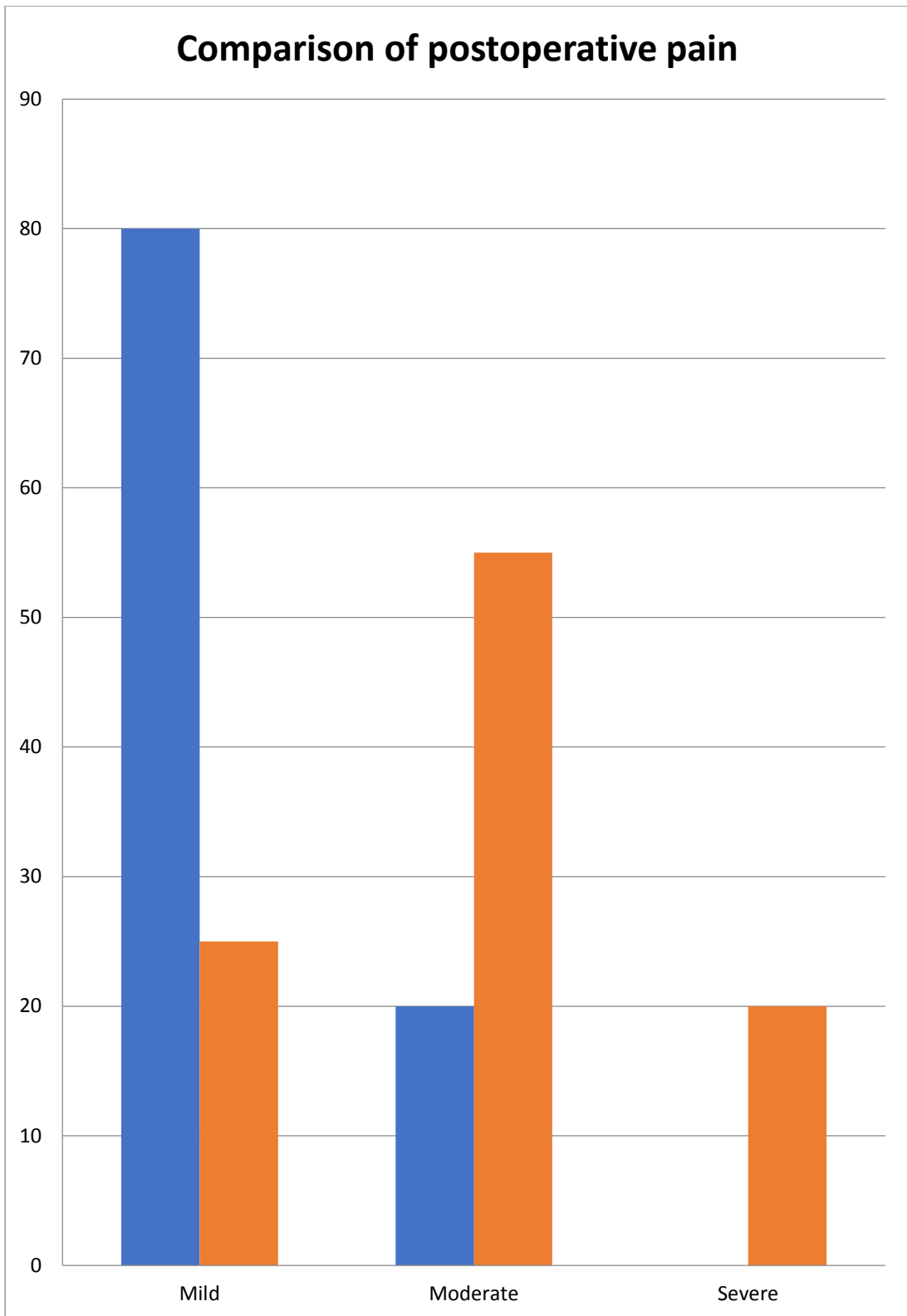


Figure 12: Comparison of Post-operative pain

Post operative infection

The incidence of post-operative infection was higher among the Conventional Mesh group (n=5, 25%) compared to Self-Retaining Mesh group (n=2, 10%).

Self-Retaining Mesh Group	Frequency	Percentage
Post operative infection		
Nil	18	90
Minimal	2	10

Table 14: Post-operative infection in Self-Retaining Mesh group

Conventional Mesh Group	Frequency	Percentage
Post operative infection		
Nil	15	75
Minimal	5	25

Table 15: Post-operative infection in Conventional Mesh group

Recurrence

None of them had recurrence in any of the groups

Discussion

The mean age of the participants in the Self-Retaining Mesh group is 35.7 years with a standard deviation of 6.93 years ranging between 21-47 years. The mean age of the participants in the Conventional Mesh group is 29.15 years with a standard deviation of 6.62 years ranging between 20-40 years. In Self-Retaining Mesh group, 50% (n=10) had right sided hernia while the rest 50% (n=10) had left sided hernia. In the Conventional Mesh group, 55% (n=11) had right sided hernia while the rest 45% (n=9) had left sided hernia.

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Since the beginning of the modern surgery, the hernia repair has undergone several modifications and in the last decade has accelerated due to the addition of specialised hernia clinics and introduction of tension free repair and laparoscopic repair. This has led to the replacement of traditional suture based repair with the tension free mesh repair. This is known as "hernioplasty". In the recent days, mesh repair is gaining more predominance over suture repair in many countries. In 1986, Lichtenstein came up with his own open mesh repair technique for treating inguinal hernias.

The primary choice of repair in unilateral primary groin hernias is the Lichtenstein technique. In spite of the low rate of morbidity and long term prognosis, chronic inguinal pain is reported in a high number of cases. It ranges between 12% and 53%. Though chronic post operative pain is seen as a primary outcome of the surgery, yet it affects the social and personal life of the patients in 6% of the patients. Considering the global rate of 20 million hernia repairs, around 1 million lives are being complicated by chronic post operative pain in cases of simple hernia repair.

The reasons for the post operative pain are; surgical expertise, presence of pain pre-operatively, surgical technique and mesh fixation. Post introduction of tension-free techniques, nerve entrapment in suture, scar

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It is unwise to ignore the impact of Lichtenstein's repair. Since its advent, various modifications have been introduced and has been revolutionary in nature. It has been useful in reducing the morbidity risk and can also be used in patients who are otherwise unsuited for the traditional methods. Also the recovery in the post-operative period and low post-operative

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One of the most commonly reported sign post operatively is chronic pain that can be attributed to the fixation techniques used which has led to several modifications of the technique. The modifications began with the introduction of nonabsorbable sutures, absorbable sutures, usage of glue and has today come to self-fixating systems. It was launched by Covidien as ProGrip™ mesh in 2008. It is being used in inguinal and incisional hernia repairs. ProGrip™ is known to offer better comfort after surgery. It also gives the physicians the ability to accurately position and secure the mesh within a short span of 60 seconds. This may help in the reduction of overall surgery time. The polyester mesh is macroporous and contains resorbable polylactic acid (PLA) micro-grips on one side. This helps to quickly secure the mesh without the need for sutures, fibrin glue, tacks or any form of fixation.

Self-Retaining Mesh is better than the conventional Mesh methods.

Summary and Conclusions

A study among patients suffering from inguinal hernia comparing between traditional methods and mesh repair reveals the following;

1. The mean age of the participants in the Self-Retaining Mesh group is 35.7 years with a standard deviation of 6.93 years ranging between 21-47 years.
2. The mean age of the participants in the Conventional Mesh group is 29.15 years with a standard deviation of 6.62 years ranging between 20-40 years.
3. The operative time was low in the Self-Retaining Mesh group with the maximum time reaching between 40-45 minutes for 45% of the participants (n=9).
4. In the Conventional Mesh group, it was longer with maximum time reaching 65-70 minutes.
5. The majority of them having operation time between 55-60 minutes (n=8, 40%).
6. Pain was higher among the Conventional Mesh group ($p < 0.05$).

7. The incidence of post-operative infection was higher among the Conventional Mesh group (n=5, 25%) compared to Self-Retaining Mesh group (n=2, 10%).
8. None of them had recurrence in any of the groups
9. Self-Retaining Mesh is better than the conventional Mesh methods.

Limitations

Following limitations were found in the study;

- 1) The sample size is very small which makes it hard for the generalisation of results
- 2) The study is from a single center which affects the generalizability
- 3) Logistic and funding limitations affects the long term follow up of the study

Future Recommendations

- 1) The study should be replicated for a larger sample size
- 2) Randomised control trial is required for generalising the study
- 3) Future studies should be multicentric and long term

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PATIENT CONSENT FORM

STUDY TITLE: “COMPARATIVE STUDY OF CONVENTIONAL MESH VERSUS SELF RETAINING MESH IN LICHTENSTEINS INGUINAL HERNIA REPAIR”

STUDY CENTRE: DEPARTMENT OF GENERAL SURGERY,GMKMCH,SALEM

PARTICIPANT NAME : _____ **AGE :** _____ **SEX:** _____

I.P. NO : _____

I confirm that I have understood the purpose of surgical/invasive procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during and after medical/ surgical procedure. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study for various surgical/invasive procedures and their outcomes.

Time : _____ **Signature / Thumb Impression of patient**

Date : _____

Place : _____ **patient's name :** _____

Signature of the investigator:_____

Name of the investigator :_____

Proforma

Name:

Address:

Age/Sex:

Religion:

O.P No:

I.P No:

D.O.A:

Time & Date Of Operation:

D.O.D:

B. Chief Complaints:

C.Past History:

DM : Yes/ No

TB :Yes/ No

Epilepsy

Malaria

Previous Surgery

Jaundice

Cirrhosis

D. Personal History:

Smoker

Alcoholic

Drug Addiction

E. Initial Assessment Of Patient

1. Vitals:

Pulse :

BP :

RR :

Temperature :

2. General Signs:

Pallor :

Tongue:

Skin :

Icterus:

Cyanosis:

F. Systemic Examination:

CVS:

8. Blood:

RBS

Blood Urea

Ser.Creatinine

Chest X Ray Pa View:

Abdomen & Pelvis USG

Pre-operative Diagnosis:

Operative procedure:

POST-OPERATIVE PERIOD/COMPLICATIONS:

- Intra- Operative time :
- Post operative pain :
- Surgical site infection :
- Patient satisfaction :

LICHTENSTEIN HERNIOPLASTY DONE USING CONVENTIONAL MESH

S.No	NAME	AGE	IP NO	SIDE	DIRECT/INDIRECT	OPERATIVE TIME	POST OP PAIN	POST OP INFECTION	RECURRENCE
1	KARUPASAMY	36	11244	LT	DIRECT	45-50	MILD	--	--
2	THAMARAI SELVAN	24	11161	RT	INDIRECT	50-55	MOD	MINIMAL	--
3	MOHAN	35	9295	RT	DIRECT	50-55	MOD	--	--
4	CHANDRASEKAR	22	31578	LT	INDIRECT	50-60	MOD	MINIMAL	--
5	MURUGESAN	40	32160	RT	DIRECT	45-55	MILD	--	--
6	SENTHIL	33	37173	LT	INDIRECT	55-60	MOD	--	--
7	MURUGAN	36	38905	RT	DIRECT	55-60	MOD	--	--
8	BALAKUMAR	20	41162	RT	INDIRECT	55-60	MOD	--	--
9	SURYA	20	1820	LT	INDIRECT	50-55	MILD	--	--
10	VIGNESH	26	45193	RT	INDIRECT	60-65	SEVERE	MINIMAL	--
11	KARUPASMY	35	61777	LT	DIRECT	65-70	SEVERE	MINIMAL	--
12	KARTHI	29	84094	RT	INDIRECT	45-50	MILD	--	--
13	ANNADURAI	37	39884	RT	DIRECT	55-60	MOD	--	--
14	UDHAYANITHI	21	49387	RT	INDIRECT	55-60	MOD	--	--
15	KAMAL	36	53448	LT	DIRECT	55-60	MOD	--	--
16	SAKTHISIVAN	29	57802	LT	INDIRECT	50-55	MILD	--	--
17	PARTHIBAN	24	65903	RT	INDIRECT	65-70	SEVERE	MINIMAL	--
18	THANGARASU	22	68065	LT	INDIRECT	55-60	MOD	--	--
19	NAGARAJAN	33	65051	LT	DIRECT	60-65	SEVERE	--	--
20	GOWTHAM	25	70282	RT	INDIRECT	55-60	MOD	--	--

LICHTENSTEIN HERNIOPLASTY DONE USING SELF RETAINING MESH

S.No	NAME	AGE	IP NO	SIDE	DIRECT/INDIRECT	OPERATIVE TIME	POST OP PAIN	POST OP INFECTION	RECURRENCE
1	VARADHARAJ	33	37331	RT	DIRECT	40-45	MILD	--	--
2	PRABAKARAN	28	70892	LT	INDIRECT	35-40	MILD	--	--
3	MAHALINGAM	38	48187	RT	DIRECT	35-40	MILD	--	--
4	VINOTH	27	45847	RT	INDIRECT	40-45	MILD	--	--
5	NAGARAJ	40	12645	RT	DIRECT	30-35	MILD	--	--
6	SIVAKUMAR	33	62345	RT	INDIRECT	35-40	MILD	--	--
7	MARIYAPPAN	40	62459	LT	DIRECT	40-45	MOD	--	--
8	SAKTHIVEL	29	57502	LT	INDIRECT	35-40	MILD	--	--
9	EZHILARASAN	21	68141	RT	INDIRECT	30-35	MILD	--	--
10	SULTHAN	35	44237	RT	INDIRECT	40-45	MOD	MINIMAL	--
11	RAGUPATHI	25	35308	LT	DIRECT	35-40	MILD	--	--
12	GUNASEKARAN	38	73818	RT	INDIRECT	40-45	MILD	--	--
13	AMEER	43	67665	LT	DIRECT	35-40	MILD	--	--
14	PALANISAMY	47	67709	LT	INDIRECT	40-45	MILD	--	--
15	VENKATESAN	45	70852	RT	DIRECT	40-45	MILD	--	--
16	SELVAM	34	395264	LT	INDIRECT	35-40	MILD	--	--
17	MARIMUTHU	37	412357	LT	INDIRECT	40-45	MOD	MINIMAL	--
18	VENKATESH	39	23983	LT	INDIRECT	35-40	MILD	--	--
19	SUBRAMANI	40	19648	LT	DIRECT	35-40	MOD	--	--
20	CHINNAPPAN	42	85142	RT	INDIRECT	40-45	MILD	--	--