

**“A COMPARATIVE STUDY BETWEEN INGUINAL  
PPROACH OF HYDROCELE AND SCROTAL  
APPROACH OF HYDROCELE”**

**in**

**Govt. Kilpauk Medical College and Hospital.”**

Dissertation submitted to

**THE TAMILNADU DR. M.G.R.  
MEDICAL UNIVERSITY, CHENNAI**

*With partial fulfillment of the regulations for the award of the degree  
of*

**M.S (General Surgery)**

**Branch-I**



**Government Kilpauk Medical College  
Chennai**

**May -2020**

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# **BONAFIDE CERTIFICATE**

This is to certify that the dissertation entitled “**A COMPARATIVE STUDY BEETWEEN INGUINAL PPROACH OF HYDROCELE AND SCROTAL APPROACH OF HYDROCELE**” at Govt. Kilpauk Medical College Hospital is a bonafide work of Dr.VigneshwarTsubmitted to The Tamilnadu Dr. M.G.R Medical University in partial fulfillment of requirements for the award of the degree of M.S. BRANCH I (GENERAL SURGERY) examination to be held in MAY, 2020.

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## **DECLARATION BY THE CANDIDATE**

I hereby declare that this dissertation “**A COMPARATIVE STUDY BETWEEN INGUINAL PPROACH OF HYDROCELE AND SCROTAL APPROACH OF HYDROCELE**” at Govt. Kilpauk Medical College Hospital is a bonafide and genuine research work carried out by me in the Department of General Surgery, Government Kilpauk Medical and Hospital, Chennai-10, under the guidance of our Chief **Prof.Dr.R.LAKSHMANA KUMAR, MS.,** Government Kilpauk Medical College and Hospital.

This dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI** in partial fulfilment of the University regulations for the award of M.S degree (General Surgery) Branch I, examination to be held in MAY 2020.

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## **CERTIFICATE BY THE GUIDE**

This is to certify that the dissertation titled “**A COMPARATIVE STUDY BEETWEEN INGUINAL PPROACH OF HYDROCELE AND SCROTAL APPROACH OF HYDROCELE**” in the General Surgery Department at Govt. Kilpauk Medical College Hospital is a bonafide research work done by Dr. VIGNESHWAR. T, post graduate in M.S. General Surgery, Government Kilpauk Medical College & Hospital, Chennai-10 under my direct guidance and supervision in my satisfaction and in partial fulfillment of the requirements for the degree of **M.S. General Surgery**.

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The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "A COMPARATIVE STUDY BETWEEN INGUINAL APPROACH OF HYDOCELE AND SCROTAL APPROACH OF HYDROCELE" submitted by Dr. T. Vigneshwar, M.S Post Graduate, Dept of General Surgery, Government Kilpauk Medical College, Chennai-10.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

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# AIMS OF STUDY

## Aims of study:

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General surgeons perform hydrocele surgeries day to day. The rate of wound healing, time to return of activity, post op pain is very important in post-operative patients

### Major basic aims are:

1. To study difference between two approaches of hydrocele surgeries.
2. Complications associated with two approaches of surgeries.
3. Effective wound healing rate

Surgeries are performed on various patients admitted in ward for hydrocele. This study is to know whether the hydrocelectomy by inguinal or scrotal approach, which has minimal complication, less post op morbidity, short hospital stay, early return of activity, and which will be the conventional approach.

# **REVIEW OF LITERATURE**

## **HISTORICAL ASPECTS**

Hydrocele is known to occur in man since time immemorial. Indian surgeons have reported it as early as 5th century BC.

Hydrocele has been described in ancient Indian surgery by Sushruta (6<sup>th</sup> century BC), who stated that any swelling in the body is due to thridhosha (three faults), viz. vatha, pitta and kaffa.

According to Charaka the causes of diseases are:

- The excessive, deficient or wrongful administration of drugs.
- The climatic characteristics of heat and cold.
- The misuse of intelligence.
- Sushruta, the father of Indian surgery had written the details regarding hydrocele in his book “Sushruta Samhitha” about 2,500 years ago.
- Dupuytren described hydrocele enbissac in 1934 and the name abdomino scrotal hydrocele was proposed by Bickle in 1919.
- In 1907, Andrews described the bottle operation for treatment of Hydrocele.
- In 1955, salomon described the extrusion operation for hydrocele.

- In 1970, Lord PH described a blood less operation for spermatocele and epididymal cyst.
- In 1975, Moloney reported good results with sclerotherapy. It is performed as an outpatient procedure and thus, it is cost effective.
- In 1995 study done by Gunaydin G et al, Indicated that fluids within spermatoceles and epididymal cysts do not become infected under normal circumstances.
- Captain Edward gibbon (1737 – 1794), the english historian, best known for his “History of the Decline and fall of the Roman empire” was greatly embarrassed by Hydrocele. He died of secondary.
- Mathew Jaboulay (1860-1913) professor of surgery at lyons, france described the operation and partial excision and eversion of sac for hydrocele.
- Peter Lord (1964) described the plication operation for hydrocele

## **ANATOMICAL CONSIDERATIONS**

Anatomy of the hydrocele is the anatomy of the processus vaginalis which is obliterated in part or not at all.

The development of the processus vaginalis and the testis is as follows:

### **TESTIS**

The testis develops from the genital fold, which lies medial to the mesonephros and therefore in early fetal life, they lie in the upper part of the coelomic cavity behind the peritoneum and below the developing kidney.

Primitive testis is attached to the posterior abdominal wall through the mesoorchium (peritoneal fold) which carries blood vessels and nerves to the testis. The reflection of the mesoorchium attaches the testis to the mesonephros the transverse tubules of which form the vasa efferentia. The epididymis and vas deferens are developed from the wolffian duct by the 10th week of intra- uterine life. By this time the testis becomes attached to the lower ventral abdominal wall by a peritoneal fold (inguinal fold) in which lies the mesenchyme. This mesenchyme becomes fibromuscular by the 4th month. This gubernaculum of the testis gets attached to the lower pole of the testis above and to that part of the skin which later forms the scrotum below.

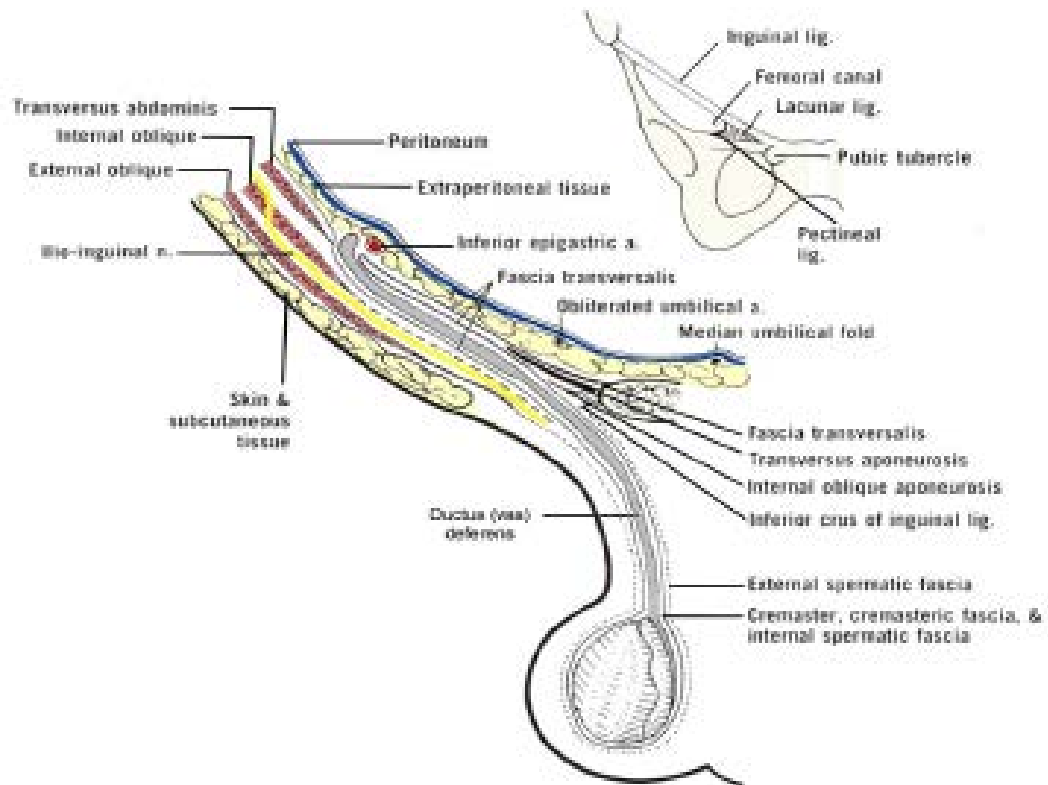


Fig.1: Abdomino-scrotal cross section showing layers

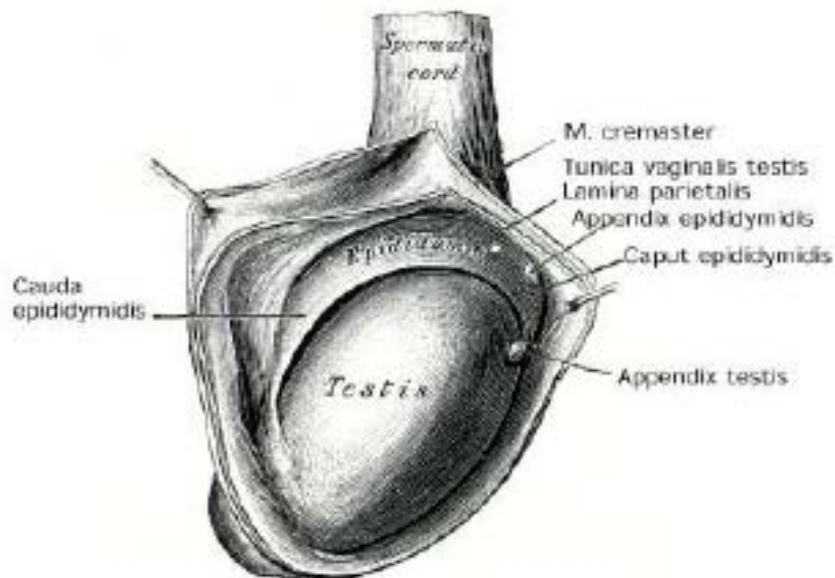


Fig.2: Anatomy of testis and its coverings

The outwardly growing gubernaculum takes with it a fold of peritoneum known as processus vaginalis and also prolongation of all layers of abdominal wall stated above.

This later comprises the thin layer of cord structures.

The tunica vaginalis forms a closed sac covering the front and most of the sides of the testis. This sac is somewhat longer than the testis itself, extending a little below it. The part of the tunica vaginalis above the testis lies primarily anterior to spermatic cord.

The cord constitutes the vas deferens, testicular vessels and nerve in loose connective tissue and the pampiniform plexus of veins. Around this the layers of the abdomen invested by the three coats viz. tunica vaginalis, tunica abdominalis and tunica vasculosa are present.

The tunica vaginalis is the lower part of the processus vaginalis of the peritoneum within the fetus prior to the descent of the testis from the abdomen into the scrotum. After the testis has reached the scrotum, the upper part of the processus that is from the deep inguinal ring to the upper testis contracts and undergoes obliteration.

The lower part remains a closed sac. Hence it may be described as consisting of a visceral and a parietal layer. Sometimes the processus does not get obliterated and communicates with the abdominal cavity. The visceral

layer covers the lateral and medial surfaces and the inferior border of the testis, but leaves most of the posterior border uncovered. At the medial side of the posterior border it is reflected on to the medial aspect of the epididymis and then over its lateral aspect as far as its posterior border where it is reflected forwards to become continuous with the parietal layer.

The continuity between the parietal and visceral layer is established also at the upper and lower pole of the testis but at the upper pole the visceral layer covers the upper surfaces of the head of the epididymis before being reflected.

The parietal layer is more extensive than the visceral layer. It reaches below the testis and extends upwards some distance in front of the medial side of the spermatic cord. The inner surface of the tunica vaginalis is smooth and covered with a layer of mesothelial cells. The potential space between the visceral and parietal layers constitutes the cavity of the tunica vaginalis. The obliterated part of the processus vaginalis may frequently be seen as a fibrous thread in the anterior part of the spermatic cord. Sometimes this thread may be traced from the upper end of the inguinal canal where it is connected with the peritoneum down to the tunica vaginalis.

The tunica albuginea forms a fibrous covering for the testis. It is a dense membrane of bluish white fibrous tissue and is covered by the visceral layer of tunica vaginalis except at the head and the tail of the epididymis and



along the posterior border of the testis, where the testicular vessels and nerves enter the gland. It is applied to the tunica vasculosa and at the posterior border of the testis is projected to the interior of the gland forming an incomplete vertical septum called mediastinum testis. This extends from the upper to near the lower end of the gland and is wider above than below. From its sides and front numerous imperfect septa (septula testis) are given off and radiate towards the thread may be traced from the upper end of the inguinal canal where it is connected with the peritoneum down to the tunica vaginalis.

The tunica albugenia forms a fibrous covering for the testis. It is a dense membrane of bluish white fibrous tissue and is covered by the visceral layer of tunica vaginalis except at the head and the tail of the epididymis and along the posterior border of the testis, where the testicular vessels and nerves enter the gland. It is applied to the tunica vasculosa and at the posterior border of the testis is projected to the interior of the gland forming an incomplete vertical septum called mediastinum testis. This extends from the upper to near the lower end of the gland and is wider above than below. From its sides and front numerous imperfect septa (septula testis) are given off and radiate towards the surface of the testis, where they are attached to the deep aspect of the tunica albugenia.

They divide the testis incompletely into a number of cone shaped lobules. Filling each lobe are the sperm producing convoluted spermatiferous tissue and

less bulky interstitial gland tissue, which is endocrine in function producing the male sex hormone testosterone. The very numerous seminiferous tubules are essential structural units of the testis. Each if uncoiled is an average 50cm long and about 0.25cm in diameter. Such tubules have the form of a loop continuous at either end with a straight tubule. The straight tubules open into a network of channels lying in the mediastinum of the testis and named the rete-testis that continues into the afferent ductules of the testis.

The ductules open into the duct disposed in numerous coils to form the epididymis which is attached to the posterior surface of the testis. The duct of the epididymis is continuous with the thick walled vas deferens.

Tunica vasculosa is the vascular layer of the testis consisting of a plexus of blood vessels held together by delicate areolar tissue. It lines the tunica albugenia and clothes the septa and thus forms the investment to all the lobules of the testis.

### **Vessels**

The testicular arteries are two long slender vessels that arise from the front of the aorta, a little bellow the renal arteries and are distributed to the testis. The testicular veins arise from the testis and receive tributaries from epididymis. In the inguinal canal they form a convoluted plexus called the

pampiniform plexus. On the right side the testicular vein open into the inferior vena cava and on the left into the left renal vein at right angle.

The testicular veins are provided with valves. The nerves accompanying these vessels are derived from the tenth and eleventh thoracic segments of the spinal cord through the renal and aortic plexus.

Lymphatics of the testis run upwards in the spermatic cord and passes through the internal inguinal ring. They branch fanwise (behind and adherent to the post peritoneum) towards para aortic lymph nodes in the region of origin of the spermatic vessels. Above this level lymph drains into thoracic duct which extends through the mediastinum to the left supraclavicular fossa where it drains into the left innominate vein. Lymphatics from the medial side of the testis may run with the artery to the vas deferens and drain into the lymph nodes at the bifurcation of the common iliac artery.

## **SCROTUM**

### **Development**

The scrotum forms as a result of fusion of paired swelling on the anterior abdominal wall and therefore presents a median raphe which is continuous with the ventral raphe of the penis. At this raphe the skin of the scrotum is continuous from one side to the other and so is the continuous superficial fascia and dartos. The dartos from its deep sends a septum into the separate scrotal

sacs. Into each of these sacs descends an out pouching of abdominal wall the inguinal bursa. Each inguinal bursa is intimately related to the testis and often after the descent of the testis the two descend further into the scrotum.

The scrotum is a continuous pouch containing the testis and the lower part of the spermatic cord and placed below the pubic symphysis in front of the upper part of the thigh. It is divided on its surface into right and left portion by a ridge or raphe which is continuous forward to the undersurface of the penis and backward along the midline of the perineum to the anus. It consists of skin and dartos muscle together with external spermatic fascia, cremasteric fascia and internal spermatic fascia.

### **Skin**

The skin is very thin and brown in colour and thrown into folds or rugae. It is provided with scattered crisp of hairs, the roots of which are visible through the skin. It is provided with sebaceous glands whose secretion has a peculiar odour.

### **Dartos Muscle**

Dartos muscle is a thin layer of unstripped muscle fibers continuous around the base of the scrotum with the superficial fascia of the groin and the perineum. It sends inwards a septum that connects the raphe to the undersurface of the root of the penis and divides the scrotal pouch into

two cavities for the testis. The subcutaneous tissue of the scrotum is devoid of fat.

The outermost layer of fascia with the dartos, the external spermatic fascia arises from the lips of superficial inguinal ring. Like other fascial layers within the scrotum the external spermatic fascia is delicate and while it arises from and is continuous with the external oblique aponeurosis, it does not contain any aponeurotic fibers. Thus some authors would insist that it is a continuation not of the aponeurosis but the fascia instead.

Within the external spermatic fascia is the cremasteric muscle and fascia and in turn forming a similar sac around the testis is the internal spermatic fascia. This layer arises from the tip of the deep inguinal ring, representing therefore a continuation of the transversalis fascia into the scrotum and traversing the whole length of the inguinal canal.

The internal spermatic fascia especially that above the testis is said to contain considerable amount of smooth muscle.

## **Vessels**

The arteries supplying the scrotum are the external pudendal branches of femoral artery and scrotal branches from the inferior epigastric arteries. A twig from the testicular artery arises close to the superficial inguinal ring. These vessels anastomose with each other

and are capable of furnishing if collateral blood supply is interrupted. The veins follow the course of the corresponding arteries.

## **Nerve Supply**

Most of the nerve supply to the scrotum is through the posterior scrotal branches of perineal nerves. This is supplemented laterally by the perineal branches of the posterior femoral cutaneous nerves and anteriorly by the scrotal nerve from the ilioinguinal nerve and to a small degree by the genital branch of the genitofemoral [L1L2] which also supplies the cremasteric muscles.

It is to be noted that the anterior one third of the scrotum is supplied by the first lumbar segments of the spinal cord (ilioinguinal and genitofemoral nerves) whereas the posterior two thirds is supplied by the third sacral segment.

A spinal anesthesia consequently needs to be injected much higher up to anaesthetize the anterior rather than the posterior part of the scrotum.

## **Lymphatics**

Lymphatics of the scrotum are numerous constitute the longest group from the perineum. They pass medially and upwards to the superficial inguinal nodes.

## **PHYSIOLOGICAL CONSIDERATIONS**

### **Physiology of secretion**

Tunica vaginalis testis is an invaginated serous sac and like any other serous cavity in the body it has a visceral and parietal layer. These two layers are separated by a potential cavity. The opposed surfaces are smooth and glistening. The cavity contains a thin layer of fluid to reduce friction. The lining membrane is composed of a single layer of flattened endothelial cells supported by delicate areolar tissue. It forms a smooth glistening surface admirably apt to perform the function of preventing injury to the testis by constant rubbing with the medial aspect of the thigh. The thick fluid in the tunica vaginalis is kept in balance by the osmotic pressure, the colloid oncotic pressure of the blood. An increase in the intracapillary blood pressure or damage to the capillary endothelium increases the amount of fluid, which is of non-inflammatory origin and is called the transudate.

Normally the fluid from the sac is drained by lymphatics in the parietal layer of the sac as there being few or no lymphatics in the subserosa over the testis and the epididymis.

### **Hydrocele can be formed due to:**

- Excessive production of fluid in the sac.
- Defective absorption by the tunica vaginalis due to damage to the endothelial lining
- Interference in the drainage of the fluid by the lymphatic vessels of the cord.
- Connection with the peritoneal cavity.

### **ETIO-PATHOLOGY**

Hydrocele in the absence of a definite cause is known as Primary or Idiopathic Hydrocele. Secondary hydrocele is an effusion in the tunica vaginalis that accompanies certain affection of the epididymis or the testis.

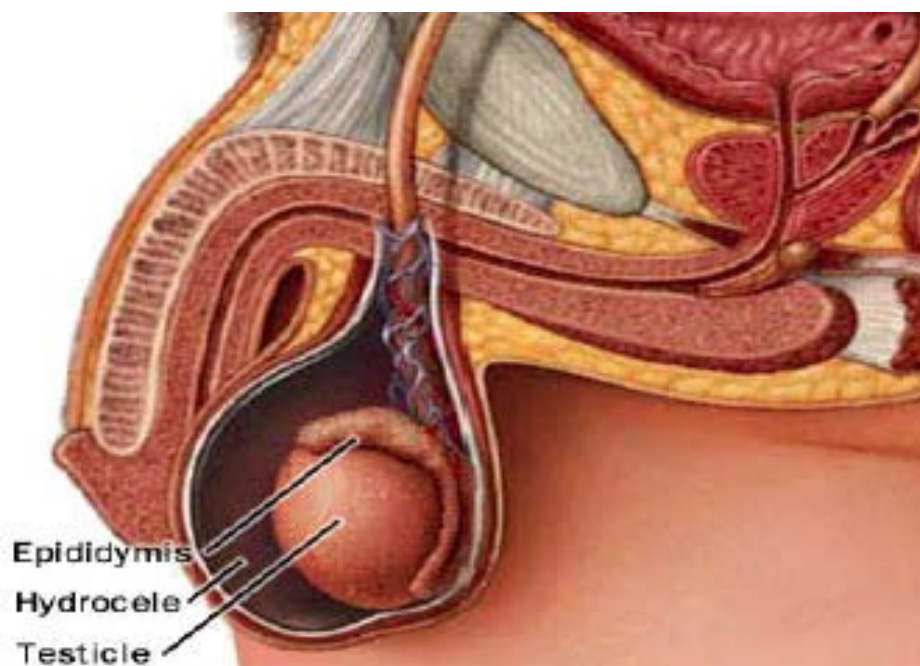


Fig.4 : Cross section of male reproductive organs with scrotal hydrocele



## **Primary Hydrocele:**

The etiology is unknown despite enquires and theories that date back to at least 250 years. Based on anatomical data three causes of hydrocele (excluding any direct cellular disorders) are noted.

### **They are as follows:**

1. Nervous
2. Vascular
3. Lymphatics

Increased nervous stimulation probably leads to excessive endothelial reaction (so would increase vascularity) but not of sufficient amounts to produce a hydrocele. Most authors are satisfied with a simple explanation such as “an imbalance between formation and reabsorption of fluid within the tunica vaginalis”. This imbalance is primarily resorptive impairment was proven by OZDILEK who injected indigocarmine into the sac of patients with hydrocele and compared the resorptive time with that of controls in producing renal excretion of the dye.<sup>29</sup> Wallace reviewed the historical and contemporary ideas on the subject and said that it was the result of lymphatic obstruction and that the two most probable underlying causes were

1. A low grade inflammatory lesion of epididymis.
2. Traumato scrotum.

Wirsbury White has noted that epididymitis is commonly seen in cases of hydrocele and considers these lesions as a part of a generalized process throughout the genital tract and to be due to infection. Considerable evidence has accrued in favour of absorption from being via the lymphatic system rather than the blood capillaries.

1. Although spermatic veins contain no valves, raised intra-abdominal pressure, ascites and heart failure are not associated with hydrocele.
2. The very slow accumulation of fluid after tapping rules out a vascular mechanism.
3. The urinary excretion of the dye injected into the tunica vaginalis is slower than would be expected absorption were from the blood capillaries and absorption is found to be even slower from primary hydrocele.

The entry of proteins into the hydrocele has been studied by IV. Radiolabelled human serum albumin (I131 RIHSA) and results compared with the entry of titrated water and these findings contrasted with the transport of protein into the normal tunica of patients undergoing herniorrhaphy. Theory of lymphatic drainage impairment as the cause of primary hydrocele in adults is against the overproduction theory.

Rinker and Allen (1952) convincingly demonstrated the scarcity or absence of lymphatics in the parietal layer of the sac, in contrast with abundance of lymphatics in normal vaginal sacs.<sup>8</sup> It is presumed to be due to non-specific inflammation of the epididymis or testis involving the tunica vaginalis. This inflammation may be chronic from the beginning or acute/subacute which later becomes chronic. It is not always possible to demonstrate the cause or even the presence of an inflammation in a majority of hydroceles.

### **Secondary hydrocele**

These are due to:

1. Virus: Mumps virus rarely causes secondary hydrocele.
2. Gonococcal: In the pre-antibiotic era gonococcal epididymo orchitis was commonly met with and was the commonest predisposing factor for the development of hydrocele. In the present antibiotic era this is a rarity.
3. Tubercular: Tubercular epididymo orchitis causes an accumulation of fluid in tunica vaginalis. The underlying pathology is demonstrable in the globus major or as a nodule in the cord.
4. Syphilitic: Syphilitic gumma may occur within the testes, which cause syphilitic orchitis, which in turn causes collection of fluid into the tunica vaginalis.

5. Filarial hydrocele or chylocele<sup>17</sup>: This accounts for 80% of cases in tropical countries. In most instances neither are microfilaria detected in the nocturnal blood sample nor is a history of filariasis elicited. Usually hydrocele follows repeated attacks of filarial funiculitis and develops rapidly or gradually and can be large or small. Frequently they are bilateral. The presence of chyle proves filarial origin. Adult worms of *Wucheria bancrofti* have been found in the epididymis removed by surgery. Filarial elephantiasis of the scrotum may supervene in a small proportion of cases. Adhia et. al. proved filariasis as the cause in 74 out of 128 cases.
6. Guinea worm: rarely causes hydrocele.
7. Malignancy of the testis: A secondary hydrocele is seen in 10% of cases. Hydrocele is usually small, the underlying neoplasm is usually palpable
8. Post herniorrhaphy hydrocele: This appears after an operation for inguinal hernia in 0-2% of cases possibly due to damage to the 18 lymphatic vessels of the tunica vaginalis which pass to the testis along the spermatic cord.
9. Hydrocele of hernial sac: Neck of the hernial sac becomes plugged with omentum and occluded by adhesions, resulting in hydrocele.

10. Myxedema and hydrocele: Hydrocele was associated with myxedema and resolved with thyroxine therapy.
11. Trauma: Operations/other trauma like a direct kick, wearing of a truss or surgery like hernia repair or varicocele may result in hydrocele.
12. As an isolated complication of prostatectomy, vasectomy with prostatectomy earlier in the first stage has very much reduced the incidence of this complication that was fairly common before the above procedure became routine.
13. Meconium Peritonitis: Two cases have been reported where intestinal perforation and meconium peritonitis (BJS 1964) occurred in utero was self-limiting but presented with scrotal enlargement at birth. In neither of these cases were the symptoms related to alimentary tract. The essential requirements for presentation of hydrocele due to meconium peritonitis are the presence of meconium in the bowel and perforation of the bowel and the presence of a patent processus vaginalis at the time of perforation.
14. CSF Hydrocele as a complication of migration or extrusion of peritoneal end of ventriculo-peritoneal shunt has been rarely reported.
15. Hydrocele as a first manifestation of para testicular rhabdomyosarcoma.

16. Hydrocele associated with testicular metastasis of CA rectum.

Any inflammation of the testis or the epididymis may spread to the tunica vaginalis and give rise to an acute hydrocele. Inflammation of the epididymis is much more likely to behave this way, rather than testicular inflammation. Two common infection producing acute hydrocele are gonorrhoea and tuberculosis, which involve the epididymis rather than the testis. Chronic hydrocele may represent the after effect of the acute form but in most cases it occurs insidiously and no satisfactory explanation can be assigned.

**Fluid:**

The fluid accumulation depends upon the duration of the condition. In the acute form, it is moderate in amount, collects rapidly and is of varying turbidity being frankly purulent in some cases. It contains flakes, fibrin and numerous leukocytes. In chronic cases the fluid collects slowly so as to produce enormous distention of the scrotum. It is clear thin and watery, yellow in colour, odourless and neutral in reaction. Specific gravity varies between 1.016 and 1.026.

The concentration of inorganic ions reflect that of ECF and osmolality that of plasma.

It contains NaCl and carbonates. The protein content is slightly lower than that of plasma, particularly the alpha and gamma globulin which have a larger molecule than albumin. It contains 6% albumin and also

fibrinogen but does not coagulate spontaneously. But few drops of blood stirred into a large quantity of hydrocele results in firm clotting of the whole solution.

Occasionally it may present a shimmering appearance due to the presence of cholesterol crystals and tyrosine crystals. In some cases loose bodies may occur due to deposition of salts which become covered with fibrin. Endothelial cells, leukocytes, cholesterol crystals and sometimes spermatozoa make up the microscopic picture.

In early cases of filarial hydrocele the fluid is similar to that found in primary hydrocele. In chronic cases the fluid, on prolonged standing develops a film of chyle on the surface. This is rich in cholesterol and is derived from the rupture of lymph varix into the tunica. Microfilaria may be found occasionally. In long standing chylocele dense adhesions form between the scrotum and its contents and in a small percentage of cases filarial elephantiasis supervenes.

On chemical analysis, particularly with regard to protein content review of literature suggests that most workers regard the accumulation of fluid to be a result of transudation rather than exudation with the osmotic pressure similar to that of plasma, though others have refuted this. Others feel that the highly albuminous character of the fluid indicates that it is not merely transudate. In most cases the epididymis is somewhat congested edematous and thickened while in others the prostate is often enlarged and the bladder neck

inflamed. Based on these observations some authorities regard hydrocele as secondary to low grade infection of the entire genital system.

**Sac:** The sac may be thin or thick depending upon the acuteness of the condition. In chronic cases especially those subjected to repeated tapping an extra-ordinary thickening may occur, the wall may become as hard as cartilage and calcareous plates may be deposited in it. Fibrinous adhesions may cause partial obliteration of the sac, dividing it into compartments. The hydatid of Morgagni may be considerably elongated and a causal relationship between this and recurrence of hydrocele has often been suggested but the idea is without adequate foundation, for such enlargement many times may be found with but any accompanying hydrocele.

Microscopic examination of the sac may show chronic inflammatory changes of different degrees of severity in a thin walled sac. Focal or diffuse and perivascular round cell infiltration may be present. In more severe lesions eosinophilic infiltration may be seen.

**Epididymis:** The epididymis is hardly normal. It is chronically inflamed, with loss of surface lustre. It is hypertrophic or atrophic or indurated or sclerotic. The appearance of epididymis is important from etiological point of view as it is supposed to be the starting point of inflammation.

**Effects on the testis:** Effects on the testes may be nil. However when the pressure has been severe and prolonged there may be thickening of



the surrounding fibrous tissue with flattening or atrophy of the gland. The atrophy could be also due to obliteration of the blood supply by widening of the mesoorchium of the testis. In some cases when the pressure is removed the testis may return to its original size. Hematocele is due to trauma or an underlying pathology of the testis. Blood may be fluid or clotted in long standing cases, where it is difficult to distinguish from malignant lesion of testis.

# CLASSIFICATION OF HYDROCELE

## A] Etiological

- (i) Congenital
- (ii) Acquired
  - a. Primary or Idiopathic
  - b. Secondary due to diseases of testis
  - c. Acute or Chronic

*Eg.:* Filariasis, tubercular, mumps, syphilitic, testicular malignancy, traumatic (post-operative as is operations for hernia, varicocele, orchidopexy)

## B] Anatomical

- (i) Vaginal hydrocele
- (ii) Congenital hydrocele
- (iii) Infantile hydrocele
  - Interstitial hydrocele
  - Abdomino-scrotal hydrocele
- (iv) Funicular hydrocele
- (v) Encysted hydrocele of the cord
- (vi) Hydrocele of hernial sac
- (vii) Hydrocele of canal of nuck

(viii) Diffuse hydrocele of cord

(ix) Hydrocele of the testis

## **1. VAGINAL HYDROCELE**

Vaginal hydrocele is the collection of serous fluid in the potential space of the tunica vaginalis. Depending upon the change of the form of the tunica vaginalis it is further classified into:

- Vaginal per se
- Bilocular hydrocele
- Hour glass hydrocele
- Multilocular hydrocele

## **2. CONGENITAL HYDROCELE**

Different authors have used different nomenclature. Ian Aird (1956) used the term “Communicating Hydrocele”. Browne named it “Fluid inguinal hernia”. It is the persistent patent processus vaginalis maintaining its intra peritoneal connection above with the tunica vaginalis below. Fluid accumulates from within the peritoneal cavity.

## **3. INFANTILE HYDROCELE**

This type does not necessarily appear in infants as the name suggests. The tunica and the processus vaginalis distended upto the internal inguinal ring, but the sac has no connection with the general peritoneal cavity.

**A) Interstitial hydrocele:** is the inter-parietal layer bulge of the upper part of infantile hydrocele which is represented by a similar swelling down in the scrotum, both swellings being in communication.

**B) Abdomino-scrotal hydrocele:** also known as Hydrocele-en-isac/ Hydrocele magna/ Bilocular hydrocele. Hydrocele of the tunica vaginalis is common in India, but the abdomino-scrotal variety is seen rarely and there is no clear explanation for its pathogenesis.

The condition was first reported by Duputryn (1834) who suggested that it is an upward extension of a scrotal hydrocele. This seems unlikely because then the condition would be far more frequent (incidence 0.1%-0.3%). He called it hydrocele-en-bisac. Buckle (1919) named it Abdomino-scrotal hydrocele.

Jacobson (1893) (quoted by Lord 1950) suggested that an infantile hydrocele extending on to the internal inguinal ring seems plausible. But it does not explain how it grows extra-peritoneally. Obliteration of the processus vaginalis is open to the same objection. A bottleneck mechanism at the external ring mentioned by Cabot (1936) does not appear to be a satisfactory explanation.

The key to the etiology is this is a hydrocele in the inguinal canal. If this extends into the internal ring it will be nipped every time the patient strains,

by the normal slide valve mechanism of the canal, a portion of the sac containing the fluid is pinched like a fluid filled balloon results in a forced explanation of the pinched portion around the peritoneum. Since such a combination of circumstances is uncommon, it explains the relatively rare occurrence. It occurs as a result of pinching of the hydrocele at the internal ring getting caught in the slide valve mechanism of the canal while straining. This is irrespective of the presence of a scrotal hydrocele.

**Etiology:** Duputryn suggested that vaginal hydrocele may on increased distention, push its way up through the inguinal canal and assume an abdominal position.

**Types:**

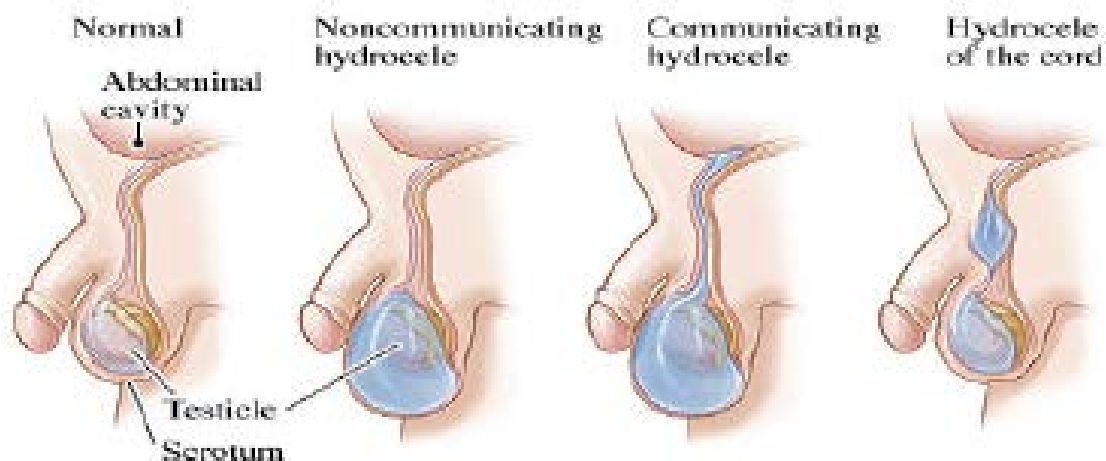


Fig.5 : Different types of hydrocele

1. Complete Abdomino-scrotal hydrocele

(i) Direct type

(ii) Indirect type Incomplete

2. Abdomino-scrotal hydrocele

(i) Direct type

(ii) Indirect type

Diagnosis of Abdomino-scrotal hydrocele can be made by  
ultrasound examination

**4. FUNICULAR YDROCELE**

This differs from the infantile type where in this type of hydrocele communicates with peritoneal cavity.

**5. ENCYSTED HYDROCELE OF CORD**

It is an accumulation of fluid in that part of the processus vaginalis which is obliterated at the level of the internal ring above and its communication is lost with the tunica vaginalis below.

**6. HYDROCELE OF CANAL OF NUCK**

McCune (1948) reported one case. It occurred in females, the cyst being in relationship with the round ligament. Unlike hydrocele of the cord, this is wholly or partially in the inguinal canal.

## **7. HYDROCELE OF HERNIAL SAC**

It is an accumulation of fluid in the hernial sac, the orifice of which is obliterated by omental protrusion. The contents of such a hernial sac are only fluid.

## **8. HYDROCELE OF TESTIS**

It is localized accumulation of fluid under the tunica albugenia. This fluid does not communicate with the potential vaginal sac.

Dr. Chintan Nambiar, Madras as quoted by S.S. Anand suggested the following classification of hydrocele:

- (i) Vaginal
- (ii) Abdomino-vaginal (congenital)
- (iii) Funiculo-vaginal (infantile)
- (iv) Funicular
- (v) Abdomino-funicular

In abdomino-funicular type fluid is present in the whole of the funicular process, extending above to the lower end of the inguinal canal and below the upper pole of the tunica vaginalis. This variety is not called a hydrocele. Previously the swelling extends to the top of the testis without communicating with the tunica vaginalis, but communicating with the peritoneal cavity.

## **Based on the etiology hydrocele may be classified as Primary or Secondary**

And further classified as acute or chronic.

Acute hydrocele is usually secondary to the inflammation of the testis or the epididymis. It may however occur as a result of trauma to the structures with secondary inflammation. Gonorrhoea and syphilis may be the cause of acute hydrocele that develops rapidly. Acute epididymitis and orchitis from any other cause may also be associated with symptomatic hydrocele. An acute secondary hydrocele usually clears up with the subsidence of its activating cause. However some persist and become chronic.

Symptoms are usually absent, the accompanying epididymitis or orchitis causing pain or distress. Plastic exudates and changes may follow finally obliterating the vaginal sac.

Occasionally tapping may be necessary to relieve tension or to control pain. This is especially true in traumatic cases. Acute asymptomatic hydroceles rarely necessitate any modification in the treatment of the underlying cause. Hydroceles complicating the orchitis of mumps, meningitis, typhoid fever, variola or other systemic disease rarely are large enough to justify operation. Post herniorrhaphy hydrocele is a secondary hydrocele that appears after a hernia operation in 0.1% of cases in which there is no evidence of



hydrocele pre-operatively. Possibly this is due to damage of lymphatic vessels of the tunica vaginalis which pass with those of the testis along the spermatic cord. The chronic symptomatic hydrocele complicating syphilis, tuberculosis, neoplasia and chronic pyogenic lesions are to be differentiated from idiopathic ones.

McKay, Fowler and Barnett (1958) produced evidence that all hydroceles other than the secondary types were due to incomplete obliteration of the processes vaginalis.

### **ROLE OF SCROTAL ULTRASOUND:**

Ultrasound of the scrotum can detect intrascrotal masses with a sensitivity of nearly 100%. It plays a major role in the evaluation of scrotal masses because of its accuracy of 98 to 100% in differentiating intratesticular and extratesticular pathology. This distinction is important in patient management because most extratesticular masses are malignant. All intratesticular masses should be considered potentially malignant until proven otherwise.

A direct contact scan is most commonly performed, but a water bath approach may also be employed. The patient is examined in supine position A7.5 MHZ or 10 MHZ transducer is commonly used because it provides increased resolution of the scrotal contents. Sonographically the normal testis has homogenous granular echotexture composed of uniformly distributed

medium level echoes. The tunica albuginea is not usually visualized as separate structure. The septula testis may be seen as linear echogenic or hypoechoic structure. The epididymis is normally isoechogenic or slightly more echogenic than the testis.

Intratesticular cysts have sonographic characteristics of benign simple cysts occurring in other organs. They are well defined, anechoic lesions with thin, smooth walls and posterior acoustic enhancement. Epidermoid cysts are generally well defined, solid hypoechoic masses. The mass typically has an echogenic capsule. Testicular abscess demonstrates, an enlarged testicle containing a predominantly fluid filled mass with hypoechoic or mixed echogenic areas. Sonography plays an important role in the evaluation of hydroceles. They are characteristically anechoic collections with good sound to transmission surrounding the anterolateral aspects of the testis. The fluid provides an excellent acoustic window for imaging the testis, however to medium level echoes from fibrin bodies or cholesterol crystals may occasionally be visualized moving freely within a hydrocele. Both hematoceles and pyoceles contain internal septations and loculations.

Thickening of the scrotal skin and calcifications may be seen in chronic cases.

Spermatoceles and epididymal cysts appear identical on ultrasound anechoic, well circumscribed masses with no or few internal echoes loculations and septations are commonly seen.

## **OPERATIONS**

### **Premedicaion**

Sedation with diazepam 10mg im. On the previous night followed by morphine 0.25g and atropine 0.001gm half hour before operation is desirable in adults and old patients. In children only atropine is used.

### **Anaesthesia**

1. Nitrous oxide plus oxygen is the anaesthesia of choice
2. Spinal anaesthesia can also be administered.
3. Local infiltration with 2% xylocaine so as to block spermatic cord and the line of incision.

### **LORD'S PLICATION OPERATION**

Peter Herent Lord, FRCS, surgeon, High Wycombe, England and Karger Verlaz, Basel, Switzerland evolved an operation in which there is no direct mobilization of the tunica vaginalis . The hydrocele is entered directly and plication is performed.

**Procedure:**

An incision of one and half inches is made on the anterior aspect of the scrotum avoiding the superficial vessels. The incision is extended through the skin and dartos but not through the tunica vaginalis. Hemostasis is secured through diathermy or by ligation. To further control the oozing the wound edges including all the tissues to the tunica are grasped by Allis forceps. The hydrocele is then emptied by incision the sac.

The testis is evaginated through the scrotal incision which results in turning the sac inside out. Since the sac is not dissected from the scrotal covering, the maneuver is bloodless.

Using '00' chromic catgut with an atraumatic needle interrupted gathering or plication sutures small bites being taken at 1 cm intervals are inserted from the cut edges of the sac to the junction of the epididymis and testis. Depending upon the size of the hydrocele 8-10 such sutures are inserted in series. This step pleats the sac obliterating the subcutaneous tissue between the scrotal incision and opening in the tunica vaginalis.

## **SIMPLIFIED MINIMAL DISSECTION**

It has been quoted that tissue handling and dissection during hydrocele operation proportionately increase oozing of blood from the scrotal coverings with resultant tissue edema and hematoma formation. Hence the minimal dissection was devised.

### **Steps of Operation:**

The scrotum is scrubbed well on dilute antiseptic detergent example savlon and then wiped clean with ether, it is finally painted with spirit acriflavine.

### **Incision**

The scrotum is held with its skin stretched by the assistant, 4cm incision made avoiding subcutaneous vessels.

### **Evacuation of the sac:**

The sac with all the fascial layers together is picked up with two tissue forceps and emptied with a trocar and cannula. The same holes is then extended on either side avoiding visible blood vessels. Through the opening polar delivery of testis is done.

### **Creation of space in the scrotum:**

To lodge the testis, with its everted sac back into the scrotum, a testis size space is created between the scrotal subcutaneous layers outside and the testicular fascial layers on the inside. This is easily done by introducing the two index fingers to do blunt separation of tissues and make room just enough to allow a tight fit of testis when reloaded in the scrotum.

### **Reloading of testis**

The testis with its everted sac is put back into the new space in the scrotum very carefully.

### **Wound closed in layers:**

Complications like hematoma and sepsis are remarkably low, sutures are not used inside the scrotum thus saving on operation time and reducing an infection factor hence reducing hospital stay.

## **POST OPERATIVE COMPLICATIONS AND THEIR PREVENTION**

Mostly operations are successful and the patients recover soon and go home. In certain number of instances, however complications develop. The complication will prolong the stay in hospital. The complications associated with both these procedures are:

As the effect of the Anesthetic passes off the patient begins to feel the pain of operation. It will be relieved by sedation in the right time. Faulty reposition of the testis (torsion of testis) will cause agonizing pain. If the pain is persisting re-exploration is indicated and the testis should be repositioned. If the testis is totally infarcted it should be removed. Pain will also be present in massive haematoma and in infected wound after 3 days.

**Fever:** - The temperature is often 1 or 2 degrees, even after clean surgery up to 3 days, this is aseptic traumatic fever. If the fever is persisting beyond this period it is due to the sepsis in the wound.

1. **Haematoma:** This is a common post-operative complication because of following factors.

- a) Inadequate / imperfect haemostasis
- b) Oozing from small vessels will be more often spinal anaesthesia wears off immediately after heavy spinal anaesthesia blood pressure falls.

Hence bleeding points are few. Though haemostasis is secured with care, after the effect of anaesthesia is worn off, the blood vessels of the testis which arise from the aorta directly, bleed profusely and cause haematoma along with its complications.

- c) Testis is covered by loose scrotal layers: It usually manifests with a sensation of pressure or pain in the scrotum (Shortly after the anaesthetic effect wears off). Scrotum will be big in size and firm in consistency. The

haematoma can be prevented by meticulous haemostasis and scrotal support. Drain can be used if tissue dissection has been extensive. It will eventually reabsorb. Persisting haematoma is treated with evacuation of the clot.

### **Skin Edema:**

It is due to abnormal increase in interstitial fluid following tissue, dissection and disruption of scrotal lymphatics, can be prevented by careful dissection and gentle handling of Tissues. Treatment consists of scrotal support and antifilammatory drugs.

### **2. Infection**

Infection is a major cause of postoperative morbidity. The hallmark of developing infection is fever usually associated with leukocytosis. An increase in the pulse-rate occurs. The local signs of wound infection consists of pain, swelling erythema and soaking of the dressing.

a) Stitch abscess: This is usually seen about 6th or 7th postoperative days. It is localized suppuration in relation to one of the stitches, localised blister will be formed. If the stitch is removed thick blood stained is removed thick blood stained pus will come out.



b) Superficial infection: - The wound becomes red, swollen and the stitches are buried in the Oedematous skin. Treatment includes regular dressing of wound and antibiotics.

c) Deep infection or disruption of wound: - This is severe type of infection involving all the layers of scrotum. The wound is gaped and the testis is seen. Treatment includes regular dressing of wound, debridement, antibiotics and secondary suturing.

Infection can be prevented by shaving the scrotum and cleansing it with savlon preoperatively and use of antibiotics.

## **Surgical Therapy**

Surgical therapy can be divided into three approaches: inguinal, scrotal, and sclerotherapy. For more information on surgery in children, see Pediatric Hydrocele and Hernia Surgery.

### **Inguinal**

The inguinal approach, with ligation of the processes vaginalis high within the internal inguinal ring, is the procedure of choice for pediatric hydroceles (typically, communicating). If a testicular tumor is identified on testicular ultrasonography, an inguinal approach with high control/ligation of the cord structures is mandated. In a study by Saka et al, 69 patients with hydrocele underwent either laparoscopic percutaneous extraperitoneal closure

(40 patients) or open repair (29 patients), and the safety and efficacy of the two approaches were compared. There were no significant differences in length of operation, anesthesia, or complications for the two procedures; and no recurrences were observed for either procedure.

In addition, the authors reported on the features of the internal inguinal ring (IIR) found in cases of hydrocele and in cases of inguinal hernia treated during the study period. In the cases of hydrocele, 59.1% of the IIRs were narrow patent processus vaginalis (PPV) with a peritoneal veil; for patients with inguinal hernia, 92% of the IIRs were widely opened PPV. Peng et al reported the successful use of minilaparoscopic procedures in 125 boys (age range, 12-68 months) with multiple peritoneal folds in the hydrocele sac orifice. Modified single-port, double-needle, minilaparoscopic surgery in which an Endo Close needle was used to spread the peritoneal folds and facilitate circular extraperitoneal suturing produced outcomes comparable to those with a two-port laparoscopic procedure, during which a 3-mm grasping forceps was used to grasp the folds around the internal inguinal ring. The authors suggest that the modified single-port technique is safe, effective, and more cosmetically appealing for the management of complicated pediatric hydroceles. Wang et al reported success with single-site laparoscopic percutaneous extraperitoneal closure of the internal ring in 483 children with hydrocele. Their technique, which uses an epidural and spinal needle, required a median operation time of

18 minutes (range, 10-30 min) and no patient developed intraoperative or postoperative complications.

## **Scrotal**

The scrotal approach, with excision or eversion and suturing of the tunica vaginalis, is recommended for chronic noncommunicating hydroceles. This approach should be avoided upon any suspicion for underlying malignancy. In contrast, Alp et al report that the scrotal approach is an effective alternative for the treatment of communicating hydrocele in pediatric patients. In their study of 43 boys (46 testicular units) treated with the classic inguinal approach and 27 boys (30 testicular units) treated with a scrotal approach, operative time was significantly lower in the scrotal group ( $P < 0.0001$ ), the early minor complication rate did not differ between the two groups, no major complications noted, and none of the patients had hydrocele recurrence after a mean follow-up of 6 months.

## **Sclerotherapy**

An additional adjunctive, if not definitive, procedure, is scrotal aspiration and sclerotherapy of the hemiscrotum using tetracycline or doxycycline solutions. Recurrence after sclerotherapy is common, as is significant pain and epididymal obstruction, making this treatment a last resort in poor surgical candidates with symptomatic hydroceles and in men in whom fertility is no longer an issue. A review by Taylor et al of aspiration and sclerotherapy

treatment for hydroceles in aging men concluded that sodium tetradecyl sulphate (STDS) is the sclerosing agent with the best cure rate after a single injection and rates of adverse effects. Cure rates with STDS were 76% after a single aspiration and injection and 94% after multiple treatments. Patient satisfaction rates at a mean of 40 months were 95%. Complication rates were generally low and much lower than those seen with surgical repair. Lund et al, in a study of 76 patients with hydrocele testis, found that aspiration and sclerotherapy with polidocanol is an effective treatment with a low recurrence rate. In this prospective, double-blind, randomized study, 36 patients given polidocanol (group 1) were compared with 41 patients given placebo (group 2). Recurrence after the first treatment was seen in 16 (44%) of the polidocanol patients and in 32 (78%) of the placebo patients. Recurrence after re-treatment with polidocanol in both groups was seen in four patients (25%) in group 1 and in 14 patients (44%) in the former placebo group. The overall success rate of treatment in group 1 was 89%.

## **Preoperative Details**

Preoperative considerations are minimal because outpatient treatment is the routine. Nothing by mouth (NPO) provisions are age- and institution-dependent. Proper provisions for postoperative transportation and observation are arranged prior to surgery.

## **Intraoperative Details**

Intraoperative considerations during inguinal repair include meticulous attention to spermatic cord structures. A "no-touch" approach to the reactive testicular vessels and delicate vasa helps minimize complications. Excessive dissection around the testicular vessels may result in thrombophlebitis of the pampiniform plexus. The distal processus is spatulated widely to provide free drainage of scrotal fluid. The proximal processus is ligated above (deep to) the internal inguinal ring. Failure to identify a patent processus during inguinal exploration should prompt a thorough reexamination of the cord structures and partial or complete excision of the hydrocele or needle aspiration of only the hydrocele prior to closing.

During scrotal approaches, excision of redundant tunica vaginalis (with or without eversion) and suturing of the reflected tunica behind the epididymis results in a postoperative testis that is more easily and more reliably examined. Care must be taken to not injure the vas or epididymis during this procedure. A running hemostatic suture around the line of excision is helpful for assuring hemostasis. Plication of the sac (Lord Procedure) is another technique useful for management of large hydroceles. Electrocautery fulguration of the edge of the excised tunica vaginalis promotes scarring and decreases recurrence while decreasing operative time.

Unexpected findings may be dealt with, as appropriate, either for the scrotal approach or by converting to an inguinal approach (eg, testicular tumors). If a testicular tumor is encountered, biopsy with frozen section and orchiectomy with resection of the spermatic cord up to the internal ring is warranted if tumor is confirmed. Placing a drain in the dependent portion of the scrotum is prudent for large hydroceles. A nonsuction drain such as a Penrose can be removed within the first 24-48 hours after surgery. If a drain is not used, expect a large hematoma and significant edema. Often, this enlargement is worse than the original problem, although it is almost always transient.

### **Postoperative Details**

Children undergoing inguinal herniorrhaphies for repair of communicating hydroceles generally recuperate with minimal discomfort and exceedingly few restrictions. Tub baths are to be avoided for 5-7 days. The wounds of diaper-aged children are sealed with tissue adhesive or occlusive dressing. No activity restrictions are required, and nonnarcotic analgesics are used minimally.

Patients undergoing scrotal approaches benefit from supportive dressings in a scrotal support or athletic supporter. Rest and avoidance of vigorous activity help minimize discomfort. Showers may be resumed within 24-48 hours. Occasional doses of synthetic or semisynthetic narcotics may help relieve

postoperative discomfort. Adult patients should be counseled that the hydrocele may transiently reaccumulate for a month or so postoperatively owing to edema.

## **Follow-up**

At least one postoperative follow-up visit is recommended. For small infants, patients with chronic recurring hydroceles, or patients with unsuspected intraoperative findings, more protracted follow-up evaluations may be warranted biweekly, monthly, or every 2-3 months to ensure complete recovery and normal testicular size and architecture.

## **Complications**

Complications are largely avoided with meticulous dissection and gentle tissue handling. In addition, extensive dissection should be avoided, as it increases the risk for nerve damage, vascular damage leading to testicular atrophy, and postoperative hematomas.

**Injury to spermatic cord structures:** The vas or testicular vessels may be injured in 1-3% of inguinal approaches. Some testicular shrinkage has been described in nearly 10% of children undergoing inguinal hernia repair.

**Recurrence:** Recurrence of the hydrocele after inguinal approaches is most often reactive in nature and usually resolves within several months. Rarely, aspiration or scrotal surgery is warranted.

Bleeding/scrotal hematoma: Either poor intraoperative hemostasis or excessive cord dissection (with inguinal approaches) may result in postoperative bleeding. Hematomas typically resolve over time. If the patient has evidence of ongoing bleeding or is extremely symptomatic, exploration and hematoma evacuation is warranted.

Ilioinguinal/genitofemoral nerve injury: These nerves may be entrapped or divided during inguinal approaches. The injury may be temporary or permanent.

Wound infection: Postoperative wound infections are quite uncommon, particularly in children. Wound infections should be managed with antibiotics and, if necessary, opening the wound.

## **Outcome and Prognosis**

Inguinal repairs of communicating hydroceles are exceedingly successful, with a less than 1% recurrence rate. If a unilateral approach is completed, the small but recognized risk for a metachronous hydrocele or inguinal hernia developing remains, but the rate is likely less than 10%. Likewise, recurrence after tunica excision is also uncommon. Future and Controversies many surgeons have begun to advocate routine diagnostic laparoscopy of the contralateral groin in patients (particularly children) with unilateral hernias. The premise is that unsuspected contralateral hernias are repaired prior to clinical recognition. However, many more patent processus are being ligated than true



hernias are being repaired. Whether an increased use of this technique will reduce the incidence of hydroceles in older children or adults remains to be seen. Furthermore, whether utilization of this intraoperative modality is of any utility in inguinal hydrocele repairs is open for debate. Medical management, or, more importantly, prevention of patent processus vaginalis, has been theorized as possible after full elucidation of the intricate molecular processes that control fetal cell migration, proliferation, and adherence. Although the idea of preventing hydroceles or indirect hernias is interesting, it is far from being applicable in clinical medicine.

## **DECLARATION**

I, Dr. T. VIGNESHWAR, M.S., General Surgery, 3<sup>rd</sup> year post graduate at Government Kilpauk Medical College and Hospital, I am applying for the Ethical Committee Clearance Certificate for the project titled “**A COMPARATIVE STUDY BEETWEEN INGUINAL PPROACH OF HYDROCELE AND SCROTAL APPROACH OF HYDROCELE**”, under the guidance of Prof. Dr. R.LAKSHMANA KUMAR, Professor of Surgery, Government Kilpauk Medical College and Hospital.

**Dr . VIGNESHWAR. T**  
Post Graduate in General Surgery,  
Department of General Surgery,  
Government kilpauk Medical  
College  
& Hospital.

I will guide **Dr. T. VIGNESHWAR, M.S.**, General Surgery post graduate in the project mentioned above without compromising ethical principle and patient care.

## MATERIALS AND METHODS

- ❖ Study design randomized : RETROSPECTIVE OBSERVATIONAL STUDY
- ❖ Study period : SEPTEMBER 2018 to SEPTEMBER 2019
- ❖ Study area : Govt. Kilpauk Medical College, Chennai
- ❖ Study population : Patients who was admitted for elective surgical procedures in Department of General Surgery in GKMCH, Chennai.
- ❖ Sample size : 100, based on statistical analysis.

The study includes a sample size of 100 patients in GOVTKILPAUK medical college hospital between September 2018 to SEPTEMBER 2019. Patient's operated for elective surgical procedures who was followed up in post-operative wards. The patients was followed up on day 2, 3, 4, 5 until the date of discharge and a careful inspection of the surgical wound site was done to look for any redness, bruising, warmth over and around the wound and sutured site and development of any serous or bloody discharge or pus from the operated site. Patients complaints was recorded as per questionnaire and patients asked to answer the questionnaire as per proforma. All patients was be given IV antibiotics and anaelgesics. Daily cleaning and dressing was done. In case infection pus culture or wound culture was be sent. All the patients included in the study sample was followed up and the time taken to return to their daily normal routine activity was noted.

This statistical study will finally show how many patients in the study population in each group was have normal healing, early return to work, post op pain, how many people was develop, bruising, development of hemoserous discharge or pus, induration, hematoma formation from the wound site, and finally the statistics of the Number of patients in each group will be studied.

TITLE OF STUDY : “A COMPARATIVE STUDY  
BEETWEEN INGUINAL  
APPROACH OF HYDROCELE  
AND SCROTAL APPROACH OF  
HYDROCELE”

**INCLUSION CRITERIA:**

- Patients aged more than 18.
- Patient gave consent for study
- Patient gave consent for surgery
- Patients admitted for elective surgery in KMCH
- Patients with Unilateral Primary vaginal hydrocele.

**EXCLUSION CRITERIA:**

- Patients with co-morbid conditions like immune compromised patients, patients on cancer chemotherapy, immunotherapy and on long term steroids.
- Patients with suspected clinical or ultrasonographic findings of testicular tumor.
- History of scrotal or inguinal surgery.
- Non transilluminated hydrocele, multi locular and recurrent hydroceles.

## **JUSTIFICATION OF THE STUDY**

General surgeons perform hydrocele surgeries day to day. The rate of wound healing, time to return of activity, post op pain is very important in post-operative patients

### **Major basic aims are:**

1. To study difference between two approaches of hydrocele surgeries.
2. Complications associated with two approaches of surgeries.
3. Effective wound healing rate

Surgeries are performed on various patients admitted in ward for hydrocele. This study is to know whether the hydrocelectomy by inguinal or scrotal approach, which has minimal complication, less post op morbidity, short hospital stay, early return of activity, and which will be the conventional approach.

## **METHODOLOGY**

The study includes a sample size of 100 patients in Govt. Kilpauk Medical College Hospital between September 2018 to September 2019. Patients operated for elective surgical procedures who was followed up in post-operative wards. The patients was followed up on day 2, 3, 4, 5 until the date of discharge and a careful inspection of the surgical wound site was done to look for any redness, bruising, warmth over and around the wound and sutured site and development of any serous or bloody discharge or pus from the operated site. Patients complaints was recorded as per questionnaire and patients asked to answer the questionnaire as per proforma. All patients was be given IV antibiotics and analgesics. Daily cleaning and dressing was done. In case infection pus culture or wound culture was be sent. All the patients included in the study sample was followed up and the time taken to return to their daily normal routine activity was noted.

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## OBSERVATION AND DATA ANALYSIS

Table 1: Gender distribution of study participants:

Group	Number	Percentage
Group A	50	50.0
Group B	50	50.0
<b>Total</b>	100	100.0

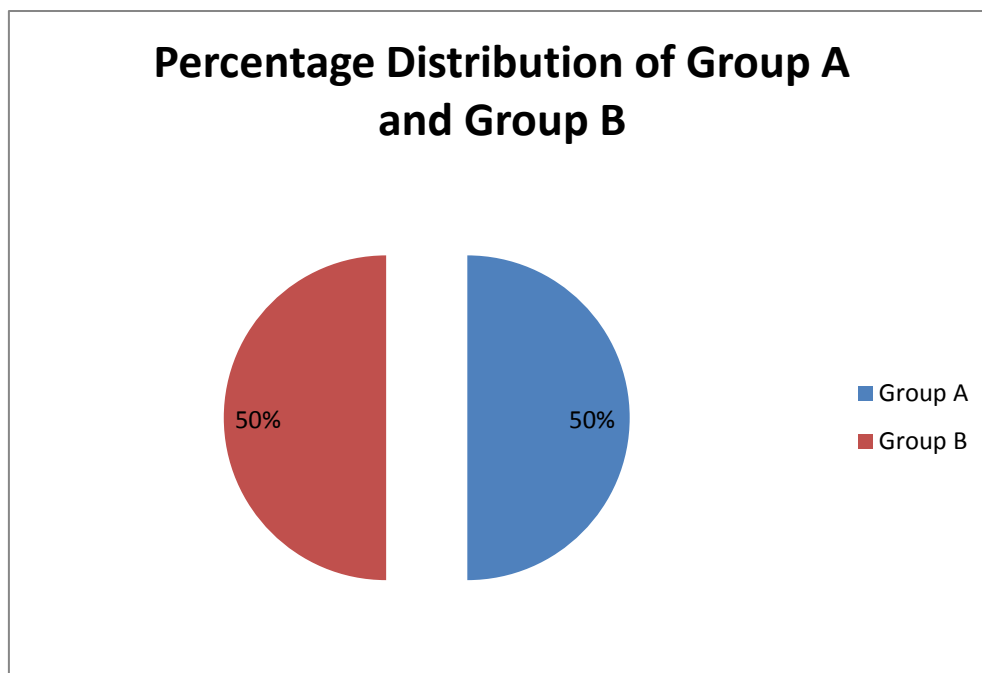
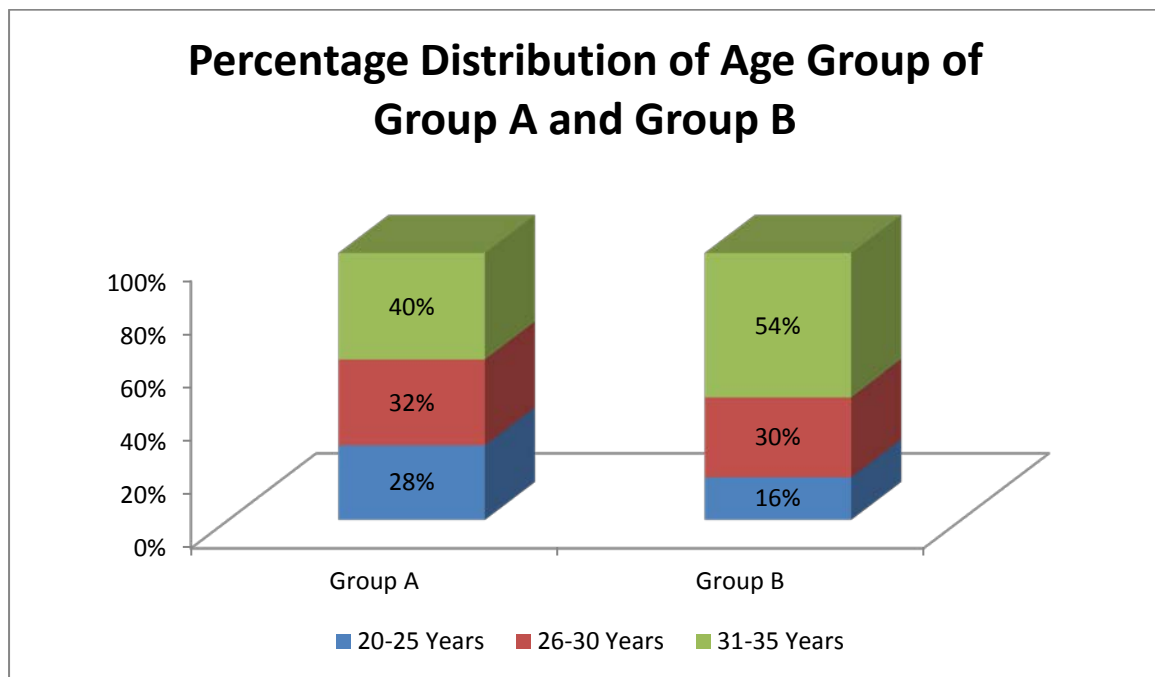


Table 2: Age distribution of study participants:

	Group A		Group B		total	
<b>Age categories (yrs)</b>	No	%	No	%	No	%
20-25 Years	14	28%	8	16%	22	44%
26-30 Years	16	32%	15	30%	31	62%
31-35 Years	20	40%	27	54%	47	94%
total	50	100%	50	100%	100	100%



Mean age of the participant is 28.42 and standard deviation is 4.06 for Group A and Mean age of the participant is 29.7 and standard deviation is 3.6 Group B.



Table: 3 Distribution of study participants based on the duration of stay:

Independent Samples t test						
	Group	N	Mean	Std. Deviation	Std. Error Mean	t Value
Group	Group A	50	4.1600	.99714	.14102	8.448**
	Group B	50	5.9800	1.15157	.16286	

\*\*p<0.001

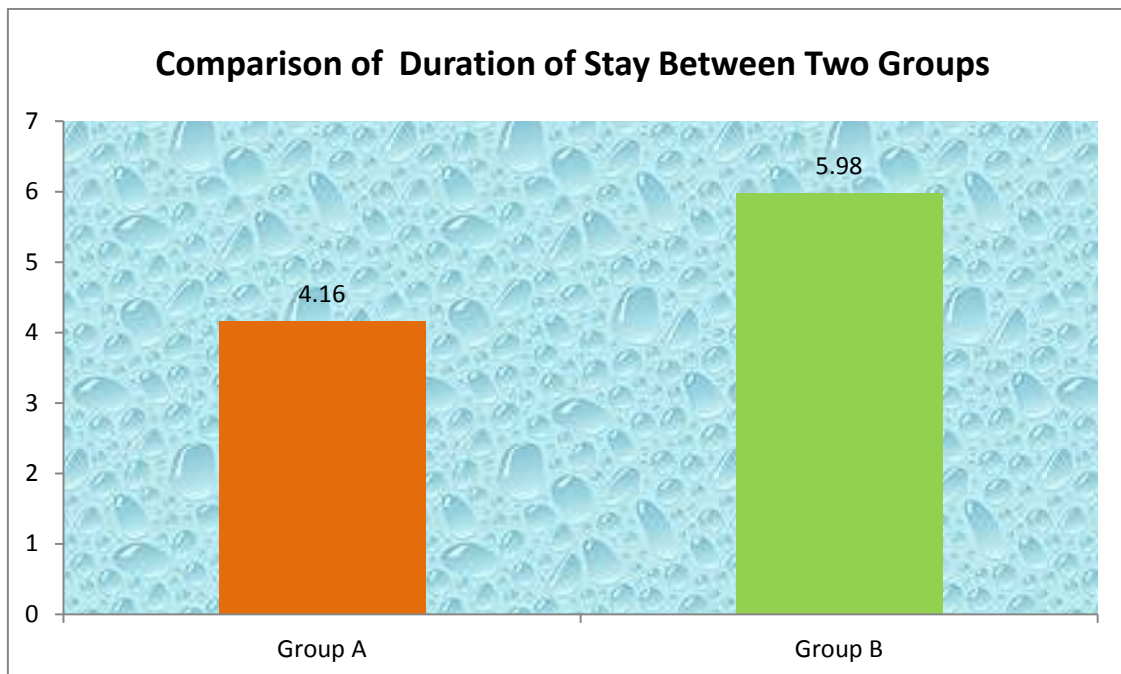


Table 4: Comparison of Wound infection (seroma/Discharge)

	Yes		No		Total	
	No	%	No	%	No	%
Group A	10	30%	40	60%	50	50%
Group B	23	70%	27	40%	50	50%
Total	33	100%	67	100%	100	100%

Pearson Chi square =7.644\*\* p<0.001

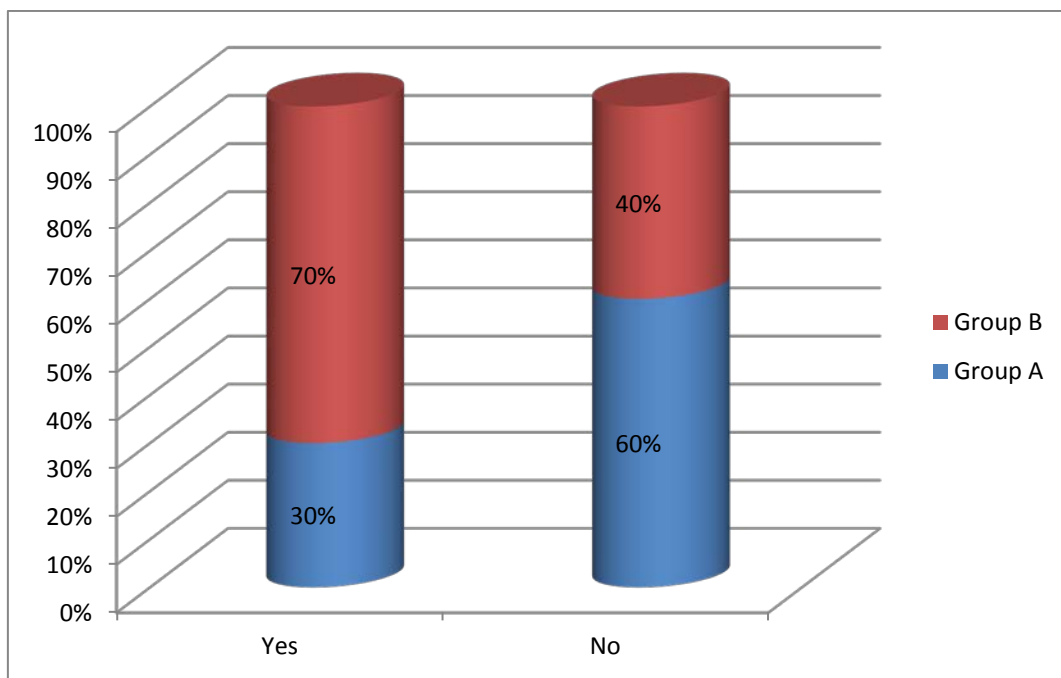
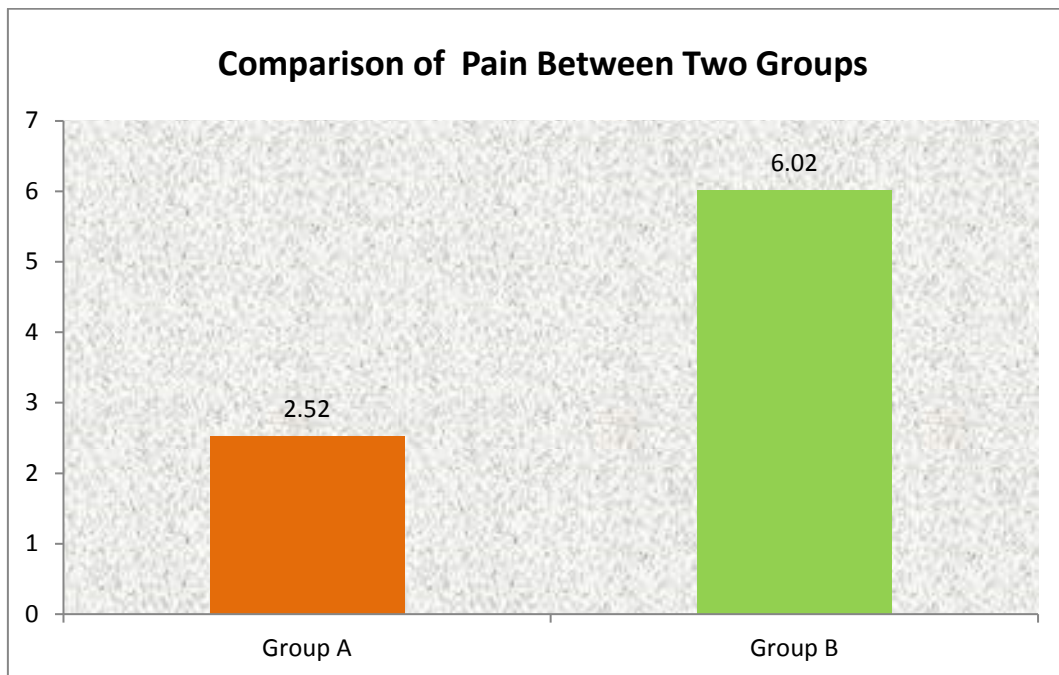


Table 5: Comparison of Pain between two groups

Independent t test						
	Group	N	Mean	Std. Deviation	Std. Error Mean	Test
Pain	Group A	50	2.5200	.50467	.07137	25.694**
	Group B	50	6.0200	.82040	.11602	



## CONCLUSION

In this study **ACOMPARATIVE STUDY BEETWEEN INGUINAL APPROACH OF HYDROCELE AND SCROTAL APPROACH OFHYDROCELE** with a study population of 100 patients in Government Kilpauk Medical College with 50 inguinal and 50 scrotal approach patients several significant factors in wound healing, return of activity, post-operative pain were assessed and its statistical significance were applied by chi square test and P value.

These factors were taken and its association

Post-operative stay duration: more for scrotal approach compared to inguinal approach Post-operative pain: more for scrotal approach than with inguinal approach.

Return of activity: early return of activity for inguinal approach than for scrotal approach. Wound discharge: less in inguinal approach compared to scrotal approach.

Duration of surgery: more duration for inguinal approach compared to scrotal approach. All the above mentioned factors has statistically significant P value.

## BILIOGRAPHY

1. Hydrocelectomy through the inguinal approach versus scrotal approach for idiopathic hydrocele in adults Adel Lasheen Department of General Surgery, Al-Azhar
2. University Hospitals, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.
3. Comparative study of inguinal versus scrotal approach in idiopathic vaginal hydrocele Ishan Prafulla Agnihotri, S. C. Jain, Manish M. Swarnkar\*
4. Comparative study of inguinal versus scrotal approach in Idiopathic Vaginal Hydrocele. Article March 2018 DOI: 10.18203/2349-2902.isj20181131

# ANNEXURE

## STUDY PROFORMA

### Data collection form

- ID/NAME of the patient:
- Sex :                      Date:
- Investigator name:
- Time:

### Pre-operative data

- Date of birth:
- Smoking history (current smoker ( Y or N )):
- Medical history (COPD, diabetes, cardiac disease)

### Intra op details

- Type of operation:
- Type of anaesthesia:
- Length of incision:
- Blood loss:
- Operation duration:
- Antibiotic prophylaxis:
- Suture material:
- Use of any prosthesis/mesh
- Pain medication:
- Disease, TB:
- Preoperative long term corticosteroids:

## **POST-OPERATIVE DATA**

Duration of stay in Ward :

Surgical site infection :

Bleeding from wound :

Fever :

Wound gaping and discharge :

Post op follow up :  
during each visit once a week in first post op  
month and biweekly from second post op month

Activities of daily living :

Return to occupation :

## **INFORMED CONSENT FORM**

- Subject identification number for this trial

\_\_\_\_\_

- Title of the Project : A PROSPECTIVE STUDY OF SOUTHAMPTON WOUND GRADING SYSTEM IN POST OPERATIVE WOUNDS

- Name of the Principal Investigator \_\_\_\_\_

Tel. No. \_\_\_\_\_

- I have received the information sheet on the above study and have read and / or understood the written information. I have been given the chance to discuss the study and ask questions. I consent to take part in the study and I am aware that my participation is voluntary. I understand that I may withdraw at any time without this affecting my future care. I understand that the information collected about me from my participation in this research and sections of any of my medical notes may be looked at by responsible persons (ethics committee members / regulatory authorities). I give access to these individuals to have access to my records. I understand I will receive a copy of the patient information sheet and the informed consent form. \_\_\_\_\_

Signature / Thumb Impression of subject

Date of signature



Name of the subject in capitals

---

Signature / Thumb Impression of  
legally accepted representative

Date of signature

- (The legally acceptable representative signature should be added if the subject is a minor or is unable to sign for themselves. The relationship between the subject and the legally acceptable representative should be stated. The impartial witness signature should be added if the subject / legally acceptable representative is unable to read or write and consent should be obtained in his presence.)
- 

- Name of legally acceptable  
representative in capitals. : \_\_\_\_\_

Relationship in capitals : \_\_\_\_\_

- Signature of the person conducting  
the informed consent discussion : \_\_\_\_\_

Date of Signature : \_\_\_\_\_

- Name of the person conducting  
the Informed consent discussion  
in capitals : \_\_\_\_\_

• Signature of impartial witness : \_\_\_\_\_

Date of signature : \_\_\_\_\_

• Name of the impartial witness : \_\_\_\_\_  
in capitals

## CONSENT FORM IN NATIVE LANGUAGE

சுயஓப்புதல்படிவம்

ஆய்வுசெய்யப்படும்தலைப்பு“ A RANDOMISED PROSPECTIVE CLINICAL STUDY ON TWO PORT VS THREE PORT LAPAROSCOPIC APPENDICECTOMY IN GOVT KILPAUK MEDICAL COLLEGE AND HOSPITAL

பங்குபெறுபவரின்பெயர் :

பங்குபெறுபவரின்வயது :

பங்குபெறுபவரின்எண் :

மேலேகுறிப்பிட்டுள்ளமருத்துவஆய்வின்விவரங்கள்எனக்குவிளக்கப்பட்டது. நான்இவ்வாய்வில்தன்னிச்சையாகபங்கேற்கிறேன்.

எந்தகாரணத்தினாலோஎந்தசட்டசிக்கலுக்கும்உட்படாமல்நான்இவ்வாய்வில்இருந்துவிலகிக்கொள்ளல்லாம்என்றும்அறிந்துகொண்டேன்.

இந்தஆய்வுசம்பந்தமாகவோ,

இதைசார்ந்துமேலும்ஆய்வுமேற்கொள்ளும்போதும்இந்தஆய்வில்பங்குபெறும்மருத்துவர்என்னுடையமருத்துவஅறிக்கைகளைபார்ப்பதற்குள் அனுமதிதேவையில்லைஎனஅறிந்துகொள்கிறேன்.

இந்தஆய்வின்மூலம்கிடைக்கும்தகவலையோ,

முடிவையோபயன்படுத்திக்கொள்ளமறுக்கமாட்டேன்.

இந்தஆய்வில்பங்குகொள்ளஓப்புக்கொள்கிறேன்.

இந்தஆய்வைமேற்கொள்ளும்மருத்துவஅணிக்குஉண்மையுடன்இருப்பேன்என்றும்உறுதியளிக்கிறேன்.

பங்கேற்பவரின்கையொப்பம்:

இடம் :

தேதி :

ஆய்வாளரின்கையொப்பம்:

## MASTER CHART

Sl.No	Name	Age	Surgery	Group	Pain in days	Duration of Stay (Days)	Induration	Discharge	Operative Time(min)
1	Raja	23	Elective	Group A	3.00	4.00	No	Yes	45
2	Devarajan	28	Elective	Group A	3.00	5.00	Yes	No	55
3	Vinayagam	30	Elective	Group A	2.00	4.00	No	No	60
4	Raja	28	Elective	Group A	3.00	5.00	No	No	55
5	Palanivelan	32	Elective	Group A	2.00	5.00	No	No	50
6	Dhanarajan	29	Elective	Group A	2.00	3.00	No	Yes	50
7	Rangaraj	34	Elective	Group A	2.00	4.00	No	No	45
8	Ravichandran	23	Elective	Group A	3.00	4.00	No	No	55
9	Ravivarman	28	Elective	Group A	2.00	4.00	No	No	55
10	Durairaj	30	Elective	Group A	3.00	4.00	No	Yes	50
11	Mathi	28	Elective	Group A	3.00	4.00	yes	No	60
12	Natraj	32	Elective	Group A	2.00	5.00	No	No	60
13	Govindan	29	Elective	Group A	3.00	5.00	No	No	55
14	Vasanth	34	Elective	Group A	3.00	3.00	No	No	45
15	Kalarayarasan	23	Elective	Group A	2.00	3.00	No	No	50
16	Karthikeyan	28	Elective	Group A	3.00	3.00	No	No	55
17	Narayanan	23	Elective	Group A	3.00	5.00	No	Yes	50
18	Boopathi	28	Elective	Group A	3.00	5.00	No	No	55
19	Arumugam	30	Elective	Group A	2.00	5.00	No	No	50
20	Vignesh	28	Elective	Group A	3.00	5.00	No	No	45
21	Nagaranan	32	Elective	Group A	2.00	4.00	yes	No	50
22	Saravanan	29	Elective	Group A	2.00	3.00	No	No	55
23	Pushparaj	34	Elective	Group A	2.00	3.00	No	Yes	50
24	Aadityan	23	Elective	Group A	2.00	3.00	No	Yes	55
25	Raju	28	Elective	Group A	3.00	3.00	yes	No	55
26	Sambath	30	Elective	Group A	2.00	4.00	No	No	45
27	Krishnan	28	Elective	Group A	2.00	4.00	No	No	60
28	Anbu	34	Elective	Group A	3.00	5.00	No	No	45
29	Agilan	23	Elective	Group A	3.00	5.00	No	Yes	55
30	Nandakumar	28	Elective	Group A	2.00	5.00	No	No	55
31	Paramesh	29	Elective	Group A	3.00	5.00	No	Yes	55
32	Patchiappan	34	Elective	Group A	3.00	3.00	No	No	55
33	Veerappan	23	Elective	Group A	3.00	3.00	No	No	50
34	rjun	28	Elective	Group A	3.00	5.00	No	No	50
35	Arjunan	30	Elective	Group A	2.00	5.00	yes	Yes	60

36	Ranganan	28	Elective	Group A	3.00	5.00	No	No	45
37	Aswini	34	Elective	Group A	2.00	4.00	No	No	55
38	Prasanth	23	Elective	Group A	2.00	4.00	No	No	60
39	Mariappan	28	Elective	Group A	3.00	3.00	No	No	55
40	Loganathan	23	Elective	Group A	2.00	3.00	No	No	60
41	Jagan	28	Elective	Group A	2.00	5.00	yes	No	45
42	Subramani	30	Elective	Group A	2.00	4.00	No	No	45
43	Mathivanan	28	Elective	Group A	3.00	4.00	No	No	55
44	Janardhan	32	Elective	Group A	2.00	3.00	No	Yes	50
45	Sarangabani	29	Elective	Group A	3.00	3.00	No	No	45
46	Varghese	34	Elective	Group A	3.00	4.00	No	No	45
47	Devan	23	Elective	Group A	3.00	7.00	No	No	45
48	Agastin	28	Elective	Group A	2.00	7.00	No	No	50
49	Bathrinath	30	Elective	Group A	3.00	3.00	No	No	55
50	Vijaykumar	26	Elective	Group A	2.00	4.00	No	No	55
51	Gopal	22	Elective	Group B	5.00	7.00	No	Yes	35
52	Barathy	25	Elective	Group B	6.00	5.00	No	No	30
53	Mohanana	33	Elective	Group B	7.00	7.00	yes	Yes	35
54	Kamalakannan	30	Elective	Group B	7.00	7.00	No	No	40
55	Yakoop	21	Elective	Group B	5.00	5.00	No	No	35
56	Prasanna kumar	28	Elective	Group B	7.00	7.00	No	No	35
57	Gopinathan	27	Elective	Group B	5.00	7.00	No	Yes	30
58	Yesupatham	25	Elective	Group B	5.00	7.00	No	Yes	30
59	Kannan	22	Elective	Group B	5.00	7.00	No	Yes	35
60	Agilesh	26	Elective	Group B	6.00	7.00	yes	Yes	35
61	Janakiraman	33	Elective	Group B	5.00	7.00	No	No	40
62	Ajjith	30	Elective	Group B	5.00	5.00	No	No	35
63	Meganathan	30	Elective	Group B	5.00	6.00	No	No	35
64	Basha	34	Elective	Group B	5.00	6.00	yes	Yes	30
65	Panneerselvam	35	Elective	Group B	5.00	7.00	No	No	35
66	Velayudhan	31	Elective	Group B	6.00	6.00	No	Yes	40
67	Magesh	32	Elective	Group B	6.00	7.00	No	No	40
68	Kannappan	30	Elective	Group B	7.00	5.00	yes	Yes	45
69	Saravanan	30	Elective	Group B	6.00	5.00	No	No	35
70	Sugumar	21	Elective	Group B	7.00	4.00	No	No	30

71	Kuppan	28	s	Group B	5.00	7.00	No	No	30
72	Ramasamy	27	Elective	Group B	7.00	4.00	No	No	40
73	Sagayam	25	Elective	Group B	6.00	7.00	No	Yes	45
74	Athithyan	22	Elective	Group B	6.00	4.00	No	No	35
75	Kanniappan	26	Elective	Group B	7.00	7.00	No	Yes	30
76	Vijayakumar	33	Elective	Group B	5.00	4.00	yes	No	35
77	Subramani	30	Elective	Group B	6.00	7.00	No	Yes	35
78	Ravi	30	Elective	Group B	5.00	6.00	No	Yes	40
79	Vinoth	34	Elective	Group B	6.00	7.00	No	Yes	45
80	Kumar	35	Elective	Group B	7.00	4.00	yes	No	35
81	Tasthageer	31	Elective	Group B	6.00	5.00	No	No	30
82	Maran	30	Elective	Group B	5.00	6.00	yes	Yes	35
83	Narayanaswamy	21	Elective	Group B	7.00	7.00	No	No	30
84	Kishore	28	Elective	Group B	7.00	7.00	No	Yes	30
85	Sundar	27	Elective	Group B	7.00	4.00	yes	No	35
86	Naresh	25	Elective	Group B	6.00	7.00	No	Yes	35
87	Vishwanathan	22	Elective	Group B	6.00	7.00	No	Yes	45
88	Shankar	26	Elective	Group B	5.00	5.00	yes	No	40
89	Vikram	33	Elective	Group B	6.00	7.00	No	No	40
90	Shanmugam	30	Elective	Group B	7.00	5.00	yes	No	35
91	Vinothan	30	Elective	Group B	7.00	4.00	No	Yes	45
92	Parameshwaran	34	Elective	Group B	6.00	6.00	No	Yes	40
93	Devaraj	35	Elective	Group B	7.00	7.00	yes	No	45
94	Mohan	31	Elective	Group B	6.00	4.00	No	No	35
95	Nagoormeeran	30	Elective	Group B	7.00	7.00	No	No	30
96	Arunagiri	34	Elective	Group B	7.00	6.00	yes	Yes	35
97	Manjunathan	35	Elective	Group B	6.00	7.00	No	Yes	30
98	Janakaraj	31	Elective	Group B	6.00	6.00	No	No	35
99	Saravanan	30	Elective	Group B	5.00	6.00	yes	Yes	30
100	Subramani	30	Elective	Group B	7.00	5.00	No	No	35