

**COMPARATIVE STUDY OF EFFICACY OF INJECTION SCLEROTHERAPY  
VERSUS SURGERY AS PRIMARY MODALITY THERAPY IN TREATMENT  
OF PRIMARY VAGINAL HYDROCOELE**

**By**

**Dr. JAYAKARTHIK Y** M.B.B.S.

Dissertation submitted to

**BLDE UNIVERSITY, BIJAPUR.**

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In Partial fulfillment of the requirements for the degree of

**M.S**

in

**GENERAL SURGERY**

**Under the Guidance of**

**Prof M B Patil** M.S.

**DEPARTMENT OF GENERAL SURGERY**

**B. L. D. E. U'S**

**SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH**

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**B.L.D.E.U's**

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**Date:**

**Dr. JAYAKARTHIK. Y**

**Place: Bijapur**

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**Date:**  
**Place: Bijapur**

**DR. M B PATIL** M.S  
PROFESSOR  
DEPARTMENT OF GENERAL SURGERY,  
B.L.D.E.U's Shri. B. M. PATIL  
MEDICAL COLLEGE HOSPITAL &  
RESEARCH CENTRE,  
BIJAPUR

**B.L.D.E.U's**

**SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH  
CENTRE, BIJAPUR, KARNATAKA**

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**Prof Dr. TEJASWINI UDACHAN I M.S**  
PROFESSOR and HOD  
DEPARTMENT OF  
GENERAL SURGERY  
B. L. D. E. U's Shri. B. M. PATIL  
MEDICAL COLLEGE HOSPITAL  
& RESEARCH CENTRE  
BIJAPUR.

**Date:**

**Place: Bijapur**

**Dr. R.C.BIDRI M.D**  
PRINCIPAL  
B. L. D. E. U's Shri. B. M.  
PATIL MEDICAL COLLEGE  
HOSPITAL & RESEARCH  
CENTRE,  
BIJAPUR.

**Date:**

**Place: Bijapur**

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**Dr. JAYAKARTHIK .Y**

**Place: Bijapur**

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**Date:**

**Dr. JAYAKARTHIK .Y**

## ABSTRACT

**Introduction:** Hydrocoele is an abnormal collection of serous fluid in a part of processus vaginalis, usually the tunica. Primary/Idiopathic hydrocoele is defined as the one in which the cause is not known as its neither associated with disease of testis nor epididymis. Hydrocoele may be treated either by surgery or by aspiration sclerotherapy. Though surgery is a definitive treatment, the reason of injection treatment falling out of favour is ill-understood as studies have shown this technique to be efficacious, safe, cost-effective treatment modality in patients with idiopathic hydrocoele. This neglect, in part appears to be based on poor evidence presented to us by previous studies which show inconsistent results. Thus there appears to be a lacunae in our knowledge with regards to usage of Aspiration-sclerotherapy as the first line of management in select patients.

**Material and Methods:** Patients visiting surgical OPD as well as those admitted as in-patients for Primary vaginal Hydrocoele from May 2009 to May 2011 were considered in the study. Diagnosis of Primary hydrocoele is ascertained by detailed history taking and clinical examination. Those selected for sclerotherapy are treated on an out patient basis and those selected for surgery were admitted, investigated and operated. 30 patients were assigned to each of the groups(surgery group and sclerotherapy group)

**Results:** 70% of the cases of sclerotherapy achieved primary cure. Among the 30% recurrences, 13.33% achieved cure after 2<sup>nd</sup> session of sclerotherapy and 16.67% patients achieved cure after the 3<sup>rd</sup>. Initial pain was more in the sclerotherapy group where as edema was more in the Jaboulay's surgery group. All patients in sclerotherapy group were discharged on the same day while average duration of

hospital stay was 6 days in the surgery group. There was nearly 7 fold difference in the costs, sclerotherapy being cheaper when compared to surgery group.

**Conclusions:** Thus, sclerotherapy is highly effective, safe and economical procedure that permits one to avoid an operation, anesthesia and hospitalization in patients who are either not fit, don't desire for surgery. Its use is warranted in adults and particularly in the elderly.



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## **INTRODUCTION**

Primary vaginal hydrocele is defined as an abnormal collection of serous fluid in the tunica vaginalis

It is one of the commonest diseases occurring worldwide. The term hydrocele was first coined by Ambrose Parre (1501 – 1590) which is derived from the Greek word HydroKele(Hydro – water, Kele – Hernia)[Stedman dictionary 23<sup>rd</sup> edition]

Hydrocele is a common affliction in the tropical countries especially where filariasis is common. In India the highest incidence is seen along the coastal belt. Surgery has been the traditional treatment of choice for hydrocele which is simple and generally known. The scrotal swelling which worries the patient has led to various modalities of treatment for hydrocele.

There is variety of procedures for hydroceles. The surgery commonly used for hydrocele is radical operation in which the parietal layer of tunica vaginalis is completely removed. However the surgery for hydrocele has a significant morbidity rate. The complications expected of surgery are hematoma, infection, scrotal edema, torsion testis, epididymitis or testicular atrophy.

In addition there is associated risk of anesthesia and an average hospital stay for 5 days and a time off work of minimum 2 weeks.

It is appropriate to say that patient comes with a tennis ball for surgery and goes back with a cricket ball considering the size and weight.

The other method of treatment in the past was tapping. However in the present day its indications are a few. Besides, the sac usually refills and requires repeated tapping, which gradually becomes more and more hazardous because of thickening of the sac wall and a decrease in the translucency. (Rains and Mann, short practice of Surgery, 20<sup>th</sup> edition)

Another modality is aspiration of hydrocele fluid followed by injection of a sclerosant. It offers a useful alternative to the above 2 modalities of treatment.

The principles of sclerotherapy is not new and Lander and Leonhardt have reported that surgeons in the past as long as the 13<sup>th</sup> century have used instillation of sugar and ginger to produce sclerosis of cystic lesions of the scrotum. Sclerotherapy is known since ancient times. Celsus attempted to cure using boiled water, milk, protein, alcohol, phenol, sodium chloride and glycerin.

Since then many sclerosants have been tried like 2.5% phenol, portwine, quinine, urethane, 3% STDS, ethanolamine oleate, talc, antazoline, polidacanol and of late tetracycline with varied results.

## **AIMS AND OBJECTIVES OF THE STUDY**

To compare the results of Injection Sclerotherapy and Surgery for the management of idiopathic hydrocele with respect to

1. Time taken for the procedure
2. Post procedure complications
  - A. Pain
  - B. Hematoma
  - C. Scrotal edema
  - D. wound infection
  - E. Recurrence
3. Cost involved

## REVIEW OF LITERATURE

### History

Sushruta gave the first description of swellings of the scrotum in Indian literature 2500 years ago. He described them under the term Vridhi in his book which is replete with fascinating, detailed accounts of scrotal swelling (Sushruta Samhitha Ashya 1911)<sup>84</sup>

Acharya Charaka has also described it under the term Bradhna in his works.

Celsus distinguished hydrocele from hernia by its translucency

Avicenna (980-1037AD) introduced a technique still useful today of differentiating enterocele and omentocele and between hernia and hydrocele by auscultation

The term hydrocele was introduced by Amboise Pare. The qualifying terms 'Idiopathic' 'Primary' 'Essential' and 'non tropical' were initially used interchangeably to denote a collection of sterile fluid in tunica vaginalis which is not associated with any pathology in the external genitalia and in the body as a whole.

Edward Gibbon, the English historian, best known for his "History of the decline and fall of Roman Empire" was greatly embarrassed by hydrocele. After getting it tapped for second time, it got infected and he died of infection. It was associated with a large hernia which was probably punctured.

Among the early workers were Morgagni(1766) and Boyer (1821) who stated that ruptured hydatid of the testis caused the collection of fluid in the tunica vaginalis.

Pott(1762) and Boyer(1821) observed that the testis was found to be normal in idiopathic hydrocele. Later on, Duputren (1834) and Marimom(1874)<sup>57</sup> confirmed their views and stated that hydroceles resulted from non testicular lesions, the changes in the testis and epididymis being secondary to hydrocele.

Dupuytren as well as Lister did some work on abdomino scrotal hydrocele<sup>11</sup>

The protein content of hydrocele was first assessed by Curling in 1834.

Larval form of Wuchereria Bancrofti was first demonstrated by Demarquay in 1863 in the hydrocele fluid of a man. The etiology of hydrocele is not known despite numerous theories that date back a few centuries.

Hawking (1940)<sup>16</sup> studied filariasis in East Africa and associated it with a high incidence of hospital admission for hydrocele and elephantiasis of the scrotum. Similarly Boyd<sup>10</sup> in 1947 found that secondary hydroceles resulted more commonly after the disease of the epididymis than that of testis

In 1951, Rinker and Allen<sup>70</sup> convincingly demonstrated the scarcity or absence of lymphatics in the parietal layer of tunica vaginalis in patients with hydrocele.

In 1962, a complement fixation test was described by Jachowski et al<sup>37</sup> to detect and confirm filarial etiology.



Chatterijee et al (1977)<sup>16</sup> conducted lymphangiographic studies in cases of filarial hydroceles and found that it resulted from obstruction to paraaortic lymph drainage from tunica vaginalis, epididymis and spermatic cord.

Simultaneous with the advance in knowledge of etiology and pathology, great progress was also made in the treatment of hydroceles. The older treatment consisted of repeated aspiration of hydrocele fluid or painting the scrotal skin with tincture of iodine in children. The various operations for hydrocele have also similarly evolved over the years. Volkman devised an operation, which consisted of incising the sac, swabbing the cavity with carbolic acid and sewing the edges of the sac to the skin (marsupialization).

Von Bergman practiced excision of the sac. The technique was modified and popularized by Winkelmann (1898) later on.

Matthew Jaboulay (1866-1913) was the first one who offered hope for cure by his popular operation of eversion of the sac, described in 1902.<sup>35</sup>

Andrews, E.W. devised the 'bottle operation' for hydrocele in 1907, which includes dissection and eversion of the sac.<sup>1</sup> Ozdilek devised 'window operation' for idiopathic hydrocele in 1957.<sup>65 92</sup>

Soloman A.A developed the extrusion operation for hydrocele in 1955 which<sup>97</sup> has no dissection or extrusion of the sac, which was modified later by Wilkinson in 1973.<sup>98</sup>

It was in 1964, that Peter H Lord described bloodless operation with eversion and placation of sac<sup>53</sup>

Pramod K Jhavar and Laman S sharam (1979) described the currently popular technique of minimal dissection for treatment of hydrocele<sup>77</sup>.

Kaye K.W. described spermatic cord block in urologic surgery in 1982<sup>44</sup>  
young, H.H (1940) described radical cure of hydrocele by excision of serous layer of sac<sup>100</sup>

Wright,1966 advocated midline scrotal incision that is thorough he raphe of the scrotum, since no major vessels are encountered in this area<sup>99</sup>.Despite of numerous refinements in operative technique, surgery for hydroceles carries a significant morbidity rate. Patients develop scrotal hematoma (0-17%), infection (2-10%) and recurrence (5-10%) (moloney, 1975)<sup>60</sup>.

Following are the procedures that have been tried to prevent scrotal hematoma.

Young (1940) enclosed the scrotum with a tight guause and abhesive bandage.

Cunningam devised a bandage, which depended on adhesion to the perineum for retention in situ, but excessive perspiration made it to fall, so colling<sup>18</sup> described four tailed adhesive perineal straps which affords support as well as compression to scrotem<sup>13</sup>

Jerome (1953) advocated the use of elastic bandage and scrotal support.

Croot (1944) suggested that the scrotum be anchored to the abdominal wall at the end of the operation.

Brukitt (1955) used plaster of paris scrotal supports to prevent postoperative scrotal hematoma.

Peter hernet lord (1964)<sup>53</sup> described a bloodless operation for the radical cure of hydrocele that distinet advantage over the other conventional procedures.

Another accepted modality of treatment of hydrocele is sclerotherapy was known, since ancient time for example, in Rome, celsus attempted to cure a hydrocele with saltpeter injection. Subsequently various other sclerosants have been used, such as water, milk, protein, Alcohol, phenol, iodine, sodium chloride and glycerine (Baretz review<sup>5</sup>. Most of these sclerosants were abandoned because of uncertain results, adverse reactions, in recent years, incapacitating pain or a considerable amount of secondary infection. In recent years, Thomas and Odell used 5% phenol amount 3% sodium tetradecyl sulphate and reported high incidence of pain after injection and a significant recurrence rate upto the tune of 50%<sup>89</sup> and resultant thickening of the wall of the sac which makes later surgery difficult. But Moloney<sup>60</sup>, Nash<sup>62</sup> and gupta<sup>28</sup> have reported good results by using phenol as a sclerosant.

Byne<sup>12</sup> and macfarlane<sup>55</sup> have reported good results, with minimal adverse reaction with the use of sodium tetradecyl sulphate.

Multiple other sclerosing agents have been used with similar success including quinine with ethanolomine oleate, was used exclusively in men more than 50 years. Ethanolamine oleate was used for occlusion of bleeding esophageal veins (Spence etal, 1985)<sup>81</sup> was later tried the usefulness of ethanolomine oleate as a sclerosant for hydrocele by Hellstrom stal, 1986<sup>32 33</sup>.

In 1986, Lindskog<sup>52</sup> tried Antazoline, primarily known for its antihistamine properties, possesses a sclerosing capacity used for hydrocele but the results of a more extensive study (Von Rute, 1978)<sup>94</sup> were promising and were quoted by J.U. Rosen Etal<sup>34</sup>

In 1986 Thorup Etal used Tissel (fibrin glue)<sup>88</sup> and Larsen etal (1986)<sup>51</sup> with varied results of 0-38% cure rate.

It was also tried by Shirpa A (1998)<sup>77</sup> Takes K (1996)<sup>87</sup> Ceechi M (1997)<sup>15</sup> called fibrin adhesive sclerotherapy with variable results.

Purified mineral talc, free of asbestos is Hydrous Magnesium Silicate, which was successfully used for pleurodesis was also used as a sclerosant for hydrocele with good results by U.Yilmaz Etal<sup>92</sup>.

Polidacanol (ethoysclerol) was used as sclerosant by T. Sigurdsson etal<sup>86</sup> and Lars Lund etal<sup>49</sup> with good results. Polidacanol is a sclerosant widely used for sclerotherapy of varicose veins. It has also got local anaesthetic properties.

Urethane and Phenozoline was also tried as sclerosing agents.

The intensive search for a safer and less painful sclerosant led to the use of Tetracycline solution which is the part had been used to promote pleurodesis in Patients with recurrent malignant pleural effusion (Rubinson and Bolooki 1972)<sup>74</sup>. Kaye<sup>43</sup> Hu etal<sup>43</sup>, Hu etal<sup>41</sup> Bodker etal<sup>9</sup> and Anjani kumar aggarwal etal<sup>2</sup> have reported good results by using tetracycline as a sclerosant.

Tetracycline is an anti microbible, cheap easily available and sclerosing agent It probably works by virtue of its extremely low PH of tetracycline in solution (ranging from 2.0 to 3.5) rather than by direct tissue sclerosis (Rubinson and blolooki 1972) <sup>74</sup>.

Histological Examination of the aspirated fluid after tetracycline instillation shows a clear pattern of events in the hydrocele sac (Hu etal 1984) <sup>41</sup>. Initially there is an inflammatory reaction with a prominent Eosinophil and lymphocyte response. This probably explains the initial increase in fluid after injection which is seen in most cases and also due to irritative effects of the sclerosnt which slowly sisappears over 3-4 weeks (Mac farlane, 1983) <sup>54</sup>.

At a later stage fibrinous material in deposited developing chronic pachy vaginalitis (Hu etal, 1984) <sup>41</sup> between the two layers of the tunica vaginalis which finally gets obliterated. Results have been reported with the use of tetracycline sclerotherapy in that few years by mohanty etal (1991) <sup>59</sup> and Anjaini Kumar aggarwal etal (1997)<sup>2</sup>.

A new method for aspiration of hydroceles was devised in 1971 by Ralph J Veenema etal that is use nitration with a stilet <sup>72</sup>.Injection sclerotherapy with Hydrocortisone, Hyaluronidase also tried but of less benefit.

## **SURGICAL ANATOMY**

The coverings of the hydrocele from without inwards is

1. Skin
2. Dartos muscle
3. External spermatic fascia
4. Cremasteric fascia
5. Internal spermatic fascia
6. Parietal layer of tunica Vaginalis

The scrotum is an outgrowth from the abdomen containing testis, epididymis and a part of the spermatic cord. It represents a fusion of the paired swellings on the anterior abdominal wall and thus has a median raphe which is continuous with that of the penis. The two sacs are divided by a septum sent by the dartos muscle.

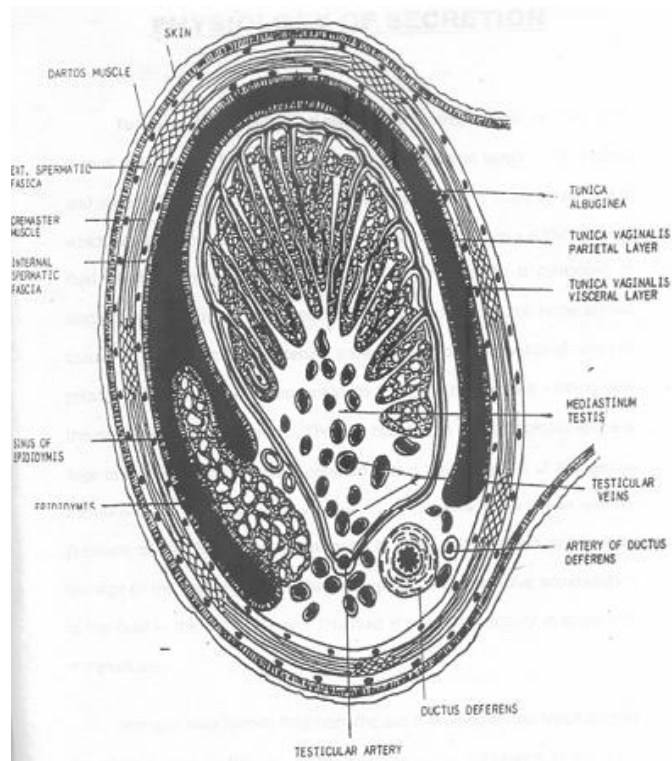
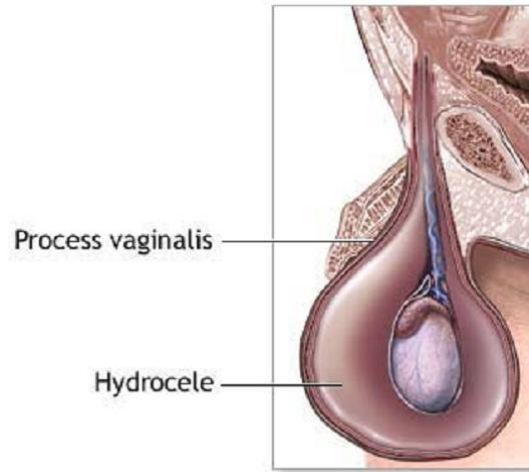
The skin is delicate with some amount of translucency which makes the hair roots visible. The folds are formed by the underlying contraction of the dartos muscle. The skin has appendages as those seen elsewhere but has a peculiar smell of its secretions.

The dartos muscle is a thin layer of unstriped muscle fibers continuous around the base of the scrotum with superficial fascia of the groin and the perineum. It sends inwards a septum which divides scrotal pouch into cavities for testis. The dartos is closely united to the skin externally but is separated from the subjacent layers by delicate areolar tissue upon which the dartos can slide with ease. The skin contains no fat is highly vascular.

As the spermatic cord passes along the inguinal canal to the scrotum , it acquires three coverings.

The external spermatic fascia is a thin layer and at the external ring, it becomes continuous with the fascial aponeurosis of the external oblique. The cremasteric fascia is derived from the bundle of cremasteric muscle.

The internal spermatic fascia is a thin membrane, often difficult to separate from the other layers and from the cord and testis, which it encloses. It is continuous at the deep inguinal ring with fascia transversalis



The arteries supplying the layers of scrotum are the superficial and deep external pudendal branch of the internal pudendal and the cremasteric branch from the inferior epigastric artery. The veins follow the course of the corresponding arteries. The lymphatics are numerous and pass medially and upwards into inguinal lymph nodes.

The nerves are - inguinal and genital branch of genitofemoral supplying the anterior one – third skin of the scrotum. The posterior two thirds are supplied by posterior scrotal branches of the perineal nerves and posterior branches of posterior femoral cutaneous nerve (both from the third sacral segment). It is to be noted that the anterior one third of the scrotum is supplied by the last lumbar segments of the spinal cord where as the posterior two third is supplied by the third sacral segment.

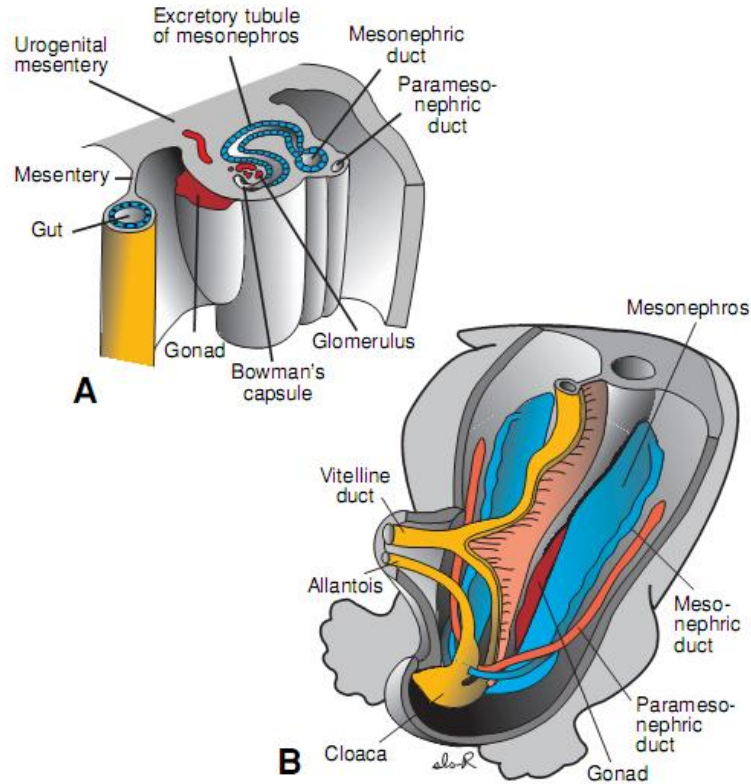
Spinal anesthesia consequently needs to be injected much higher up to anaesthetize the anterior rather than posterior part of scrotum.

It is important to recapitulate the development of the testis in order to understand the anatomy of the processus vaginalis properly.

### **Testis development :**

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 kidneys. The primitive testis is attached to the posterior abdominal wall by a mesentery, the mesorchium, which carries blood vessels and nerves to the testis. A reflection of mesorchium attaches the testis to the mesonephros, the transverse tubules of which form vasa efferentia.



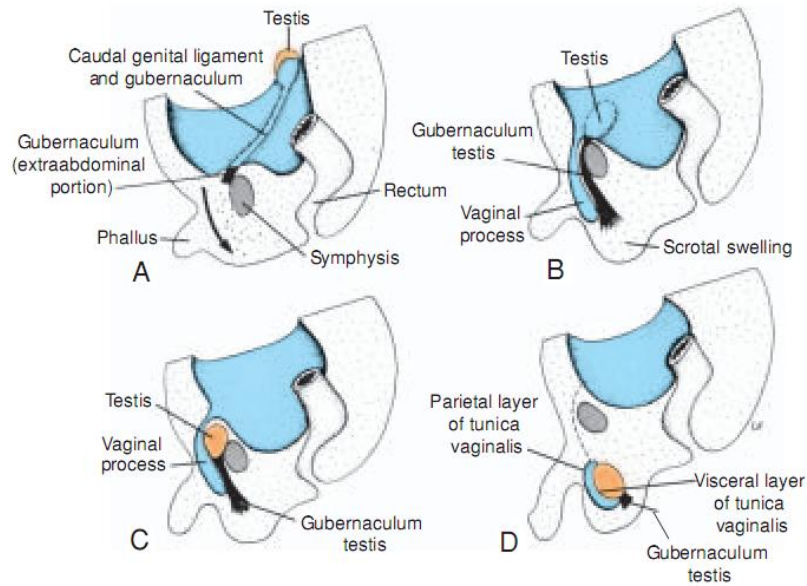


**A.** Transverse section through the urogenital ridge in the lower thoracic region of a 5-week embryo showing formation of an excretory tubule of the mesonephric system. Note the appearance of Bowman's capsule and the gonadal ridge. The mesonephros and gonad are attached to the posterior abdominal wall by a broad urogenital mesentery. **B.** Relation of the gonad and the mesonephros. Note the size of the mesonephros. The mesonephric duct (wolffian duct) runs along the lateral side of the mesonephros.

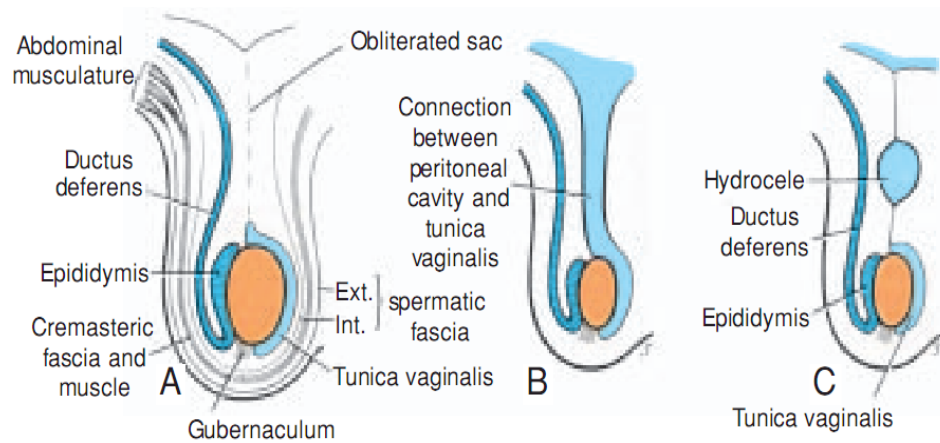


Scanning electron micrograph of a mouse embryo showing the genital ridge (*arrow*) and mesonephric duct (*arrowheads*). *K*, kidneys.

The epididymis and vas deferens are developed from the wolffian duct by the 10<sup>th</sup> week of intrauterine 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 which later becomes fibromuscular. This is the gubernaculum which gets attached to the lower pole of testis above and below to that part of the skin which later on forms the scrotum. The outwardly growing gubernaculum testis takes with it a fold of peritoneum known as processus vaginalis. After the testis has reached the scrotum, the upper part of processus vaginalis that is from the deep inguinal ring to within a short distance of the testis contracts and undergoes obliteration and forms a fibrous cord. The rudiment of processus inguinalis fails to undergo obliteration and maintains its patency.



The lower part of the processus vaginalis that is tunica vaginalis remains as a closed sac, which invests the surface of the testis and its reflected on to the internal surface of the scrotum. Hence the two layers of the tunica are known as the visceral layer and the parietal layer respectively. It covers the testis over its anteromedial and lateral aspect but leaves most of its posterior surface uncovered. The most common form of hydrocele occurs due to collection of fluid between these two layers of the vaginalis.

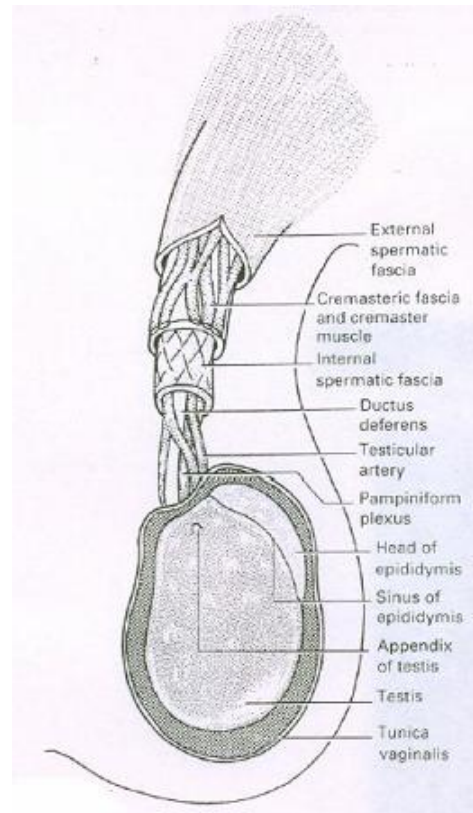


The testis is oval in shape and is flattened from side to side. It hangs obliquely so that its lower pole is nearer to the mid line. The epididymis, which is crescent in shape, is attached to the posterior border of the testis and overlaps its lateral surface.

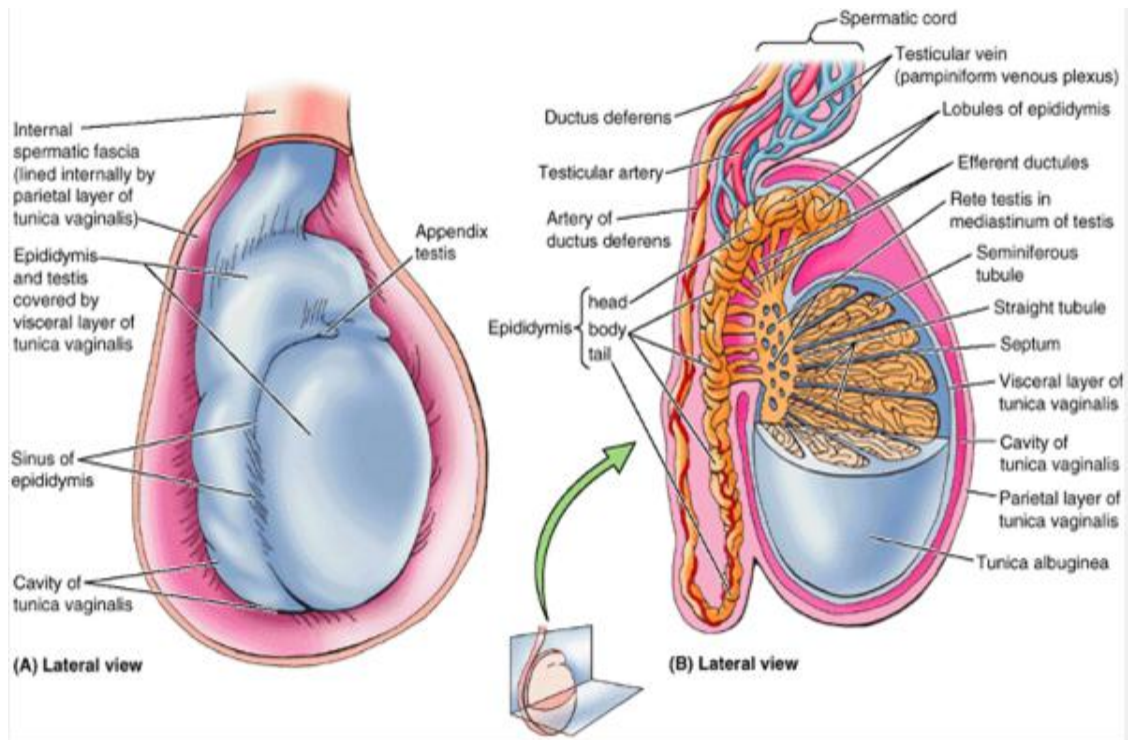
The tunica albuginea is the fibrous covering of the testis. It is a dense membrane of bluish white color. At the posterior border of the testis it is projected into the interior of the testis forming an incomplete vertical septum called the mediastinum testis. From its front and sides numerous incomplete septa are given off which radiate towards the surface of the testis and divide it 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 50 cm long and about 0.25 cm in diameter. Such tubules have the form of loop continuous at either end with a straight tubule. The straight tubules open in to a network of channels lying in the mediastinum of the testis and named the rete testis which 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 albuginea and clothes the septa, and thus forms the investment to all lobules of the testis.

The spermatic cord extends from the deep inguinal ring to the testis where the structures of its components converge to the postero superior pole of the testis. It is composed of arteries, veins, nerves, lymphatics, vas deferens and some areolar tissue.



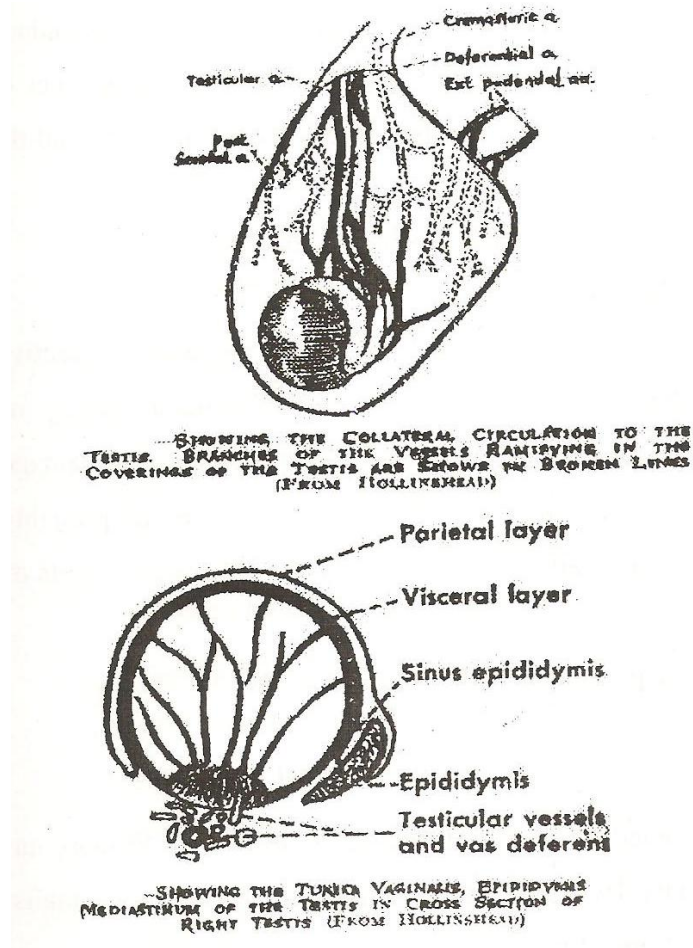
The arteries are the testicular artery, cremasteric artery and the artery to vas deferens. They supply the respective structure and free anastomosis takes place in the scrotal layers between the scrotal and testicular vessels. The tearing of these minute anastamotic vessels during dissection into the layers of the sac is the main cause for postoperative hematoma.



The vein emerges from the back of the testis, and receives tributary from the epididymis. They unite and form a convoluted plexus, the plexus pampiniformis, which forms the chief mass of the cord. The venous network coalesces together to form two veins, which enter the abdomen through the deep inguinal ring. These again unite to form a single vein, which opens on the right side into the inferior vena cava and on the left side into the renal vein. The nerves accompanying these vessels are derived from the 10<sup>th</sup> and the 11<sup>th</sup> thoracic segments of the spinal cord through the renal and aortic plexus.

Lymphatics of the testis run upward in the spermatic cord and passes through the internal inguinal ring. They branch fan wise (behind and adherent to the posterior 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 in to the left innominate

vein. Lymphatics from the medial side of the testis may run with the artery to vas deferens and drain into the lymph nodes at the bifurcation of the common iliac artery. It consists of superficial and deep lymphatic. The former commencing on the surface of the tunica vaginalis and the latter in the substance of testis and epididymis.



### 3) PHYSIOLOGY

Tunica vaginalis covering the testis is an invaginated serous sac like any other serous cavity in the body. It has a visceral and a 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 membranes are 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 and colloid oncotic pressure of the blood. An increase in intra capillary BP or damage to the capillary endothelium increase 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.

So hydrocele or excessive accumulation of fluid occurs due to

- Excessive production of fluid in the sac.
- Defective absorption of hydrocele fluid by the tunica vaginalis. Defective absorption appears to be the more common cause of the common variety of primary hydrocele, but the reasons for defective absorption are obscure. Damage to the endothelial lining cells by a low grade infection seems to be the probable explanation.
- Interference with the drainage of the fluid by the lymphatic vessels of the cord.
- By communication with the peritoneal cavity as in the congenital variety.



#### **4) 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 affections of the epididymis or the testis.

##### **Primary Hydrocele**

The etiology is unknown, despite enquiries 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) Lymphatic

They are certain proposed explanations for the accumulation of fluid in tunica vaginalis sac.

Rinker and Allen <sup>70</sup> convincingly demonstrated the scarcity or absence of lymphatic in the parietal layer of the hydrocele sac, in contrast with the abundance of lymphatic in the normal vaginal sac. It is presumed to be due to non-specific inflammation of the epididymis or testis involving tunica vaginalis. This inflammation may be chronic from the beginning or acute / subacute when later it becomes chronic. It not always possible to demonstrate the cause or even the presence of inflammation in a majority of hydroceles.

Increased nervous stimulation probably leads to excessive endothelial reaction (so would increased 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 primary resorptive impairment was proven by OCDILEC who injected indigo carmine in to the sac of patients with hydrocele and compared the resorptive time with that of controls in producing renal excretion of the dye. Fluid collects because of failure of lymphatic absorption. Later the sac wall thickens and prevents further absorption. It is not known why this lymphatic system alone is destroyed so as to cause a hydrocele. It is probable that a low grade or chronic non-specific inflammatory lesion of the epididymis or testis involving the tunica vaginalis. It is not always possible to demonstrate the cause or even the presence of an inflammation in majority of hydroceles.

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 of the epididymis
- 2) Trauma to the scrotum.

Wirsbury white has noted that epididymitis is commonly seen in cases of hydrocele and considers these lesion as part of a generalized process throughout the genital tract and due to infection. Considerable evidence has accrued in favor 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 rule out a vascular mechanism.
- 3) The urinary excretion of the injected dye in to the tunica vaginalis is slower than would be expected if assumed that absorption were from the blood capillaries and absorption is found to be even slower from primary hydroceles.

The entry of protein into the hydrocele has been studied by I.V radiolabelled Human serum albumin (1131 RIHSA) and result compared with the entry of titrated water and these findings contrasted with the transport of protein into the normal tunica patients undergoing herniorrhaphy. Theory of lymphatic drainage impairment as the cause of primary hydrocele in adults is against the overproduction theory, which holds well.

### **Secondary Hydrocele**

They may be acute or chronic. The condition tends to subside following the resolution of the inciting event.

Barring filarial hydroceles, secondary hydroceles rarely attain a large size and the underlying pathology can be made out in a majority of cases. The common causes are:

## 1) **Filarial Hydrocele or chylocele**

The incidence is high in filarial endemic areas that are 80% of cases in tropical countries. In most instances neither microfilaria detected in nocturnal blood sample nor is a history of filariasis elicited. Initially there is epididymoorchitis and fluid is an inflammatory exudate, its absorption is prevented by the fibrotic changes in the sac. Later on, as lymphatic obstruction progress, the fluid increases in amount. Usually hydrocele follows repeated attacks of filarial funiculitis and develops sometimes rapidly or gradually. It can be small or large hydrocele.

Dadapat and Mohapatra have listed certain criteria to incriminate filariasis as an etiological factor for hydrocele <sup>21</sup>. They are:

- a) Demonstration of microfilaria in hydrocele fluid or adult worms in the tunica vaginalis testis.
- b) Chyle in hydrocele

### **Relative criteria:**

- 1) History of filariasis
- 2) Thickened scrotal skin and lymphorrhoea or other filarial affections
- 3) Thickening of cord
- 4) Lymph varix of cord
- 5) Lymphatic dilatation in different tissues
- 6) Increased fibrosis of scrotal subcutaneous tissue
- 7) Calcium or / and cholesterol deposits in tunica or increased fibrosis and chronic inflammatory cell infiltration.

- 8) Microfilaraemia
- 9) Adult worms in lymph nodes
- 10) Eosinophilia (10%) in peripheral blood.



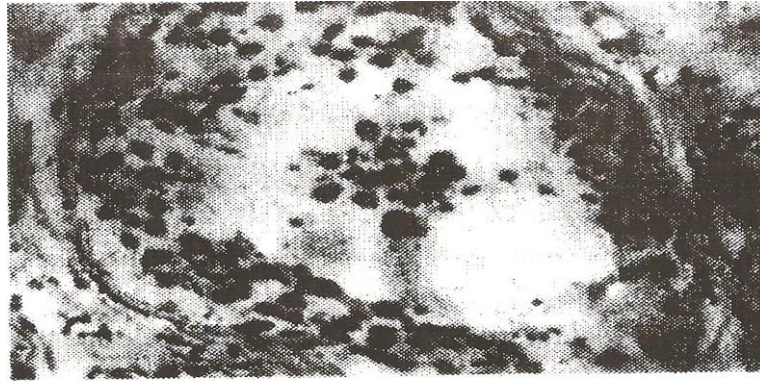
*Microfilaria in hydrocele fluid × 450*

Accordingly hydroceles may be classified into four groups

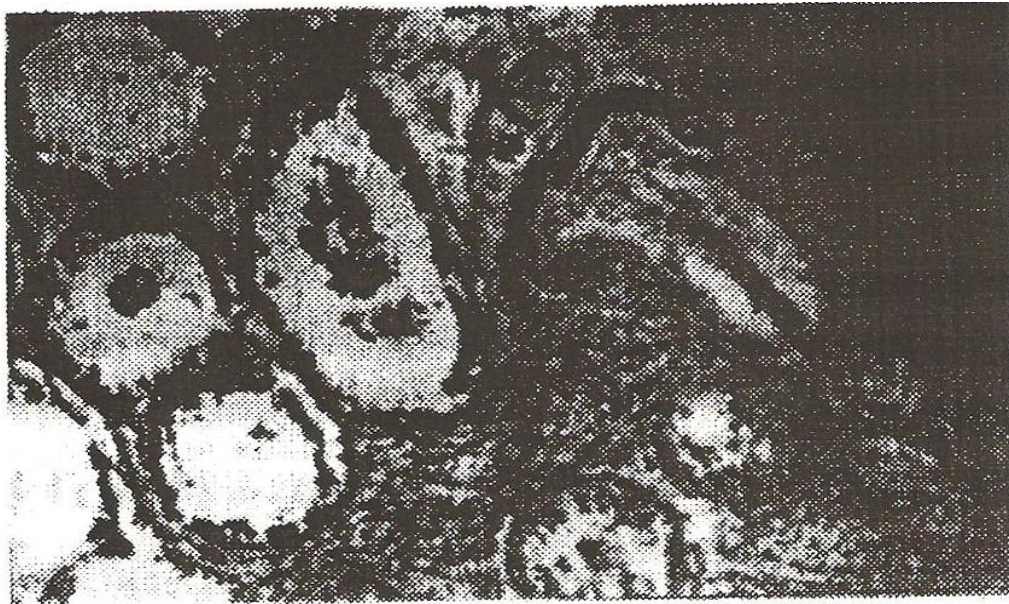
- a) **Definite filarial etiology** with one or both absolute criteria
- b) **Highly suggestive**, with more than five relative criteria
- c) **Suspicious of filarial origin**, with three or five selective criteria.
- d) **Non filarial** with less than three selective criteria.

According to Manson Bahr, 1950<sup>56</sup> absence of microfilaria in the peripheral smear does not rule out filariasis and in filarial hydroceles the fluid may not be clear straw colored which may or may not contain microfilaria.

In about 65% of cases of CN Dedhia et al, 1982<sup>17</sup> testicular morphology was affected to a varying degree of severity from an arrest of spermatogenesis at various levels and even testicular atrophy.



*Histopathological changes in the testis (original magnification x 400). Thickening of the basement membrane of the seminiferous tubules and partial arrest of spermatogenesis at the spermatocyte level are seen. There is evidence of partial arrest of spermatogenesis.*



*Histopathological changes in the testis (original magnification x 100). Interstitial fibrosis, thickening of the basement membrane of the tubules and complete arrest of spermatogenesis at the spermatogonia level are seen. One tubule shows partial arrest.*

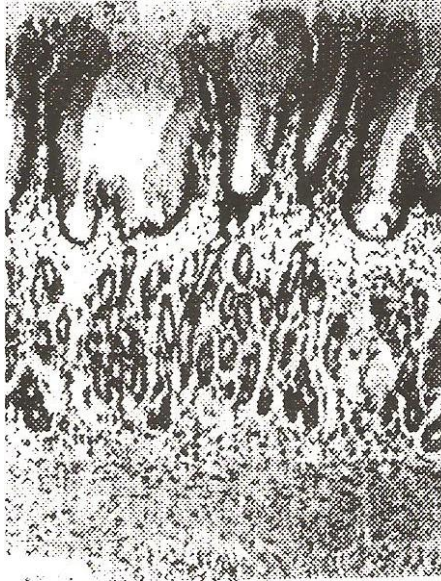
A study <sup>72</sup> conducted says it is possible to obtain reliable and valid estimates of the community burden of lymphatic filariasis using the prevalence of hydrocele as a diagnostic index.

- 1) Tubercular hydrocele the underlying pathology is usually demonstrable in the globus major or as a nodule in the cord. On examination the cord is craggy and testicular sensation is present. The fluid collection is generally-small and the sac is lax. Intratunical rifampicin injection cases <sup>70</sup>.
- 2) Malignancy of the testis: A secondary hydrocele is seen in 5-10% of cases Hydrocele is usually small; the underlying neoplasm is usually palpable Aspiration of the hydrocele should be avoided because positive cytological results and needle track seeding have been reported in hydroceles associated with testicular tumors (Orecklin, 1974) <sup>64</sup>.
- 3) Trauma: Operations /other trauma like a direct kick, wearing of a truss or surgery like hernia or varicocele repair may result in hydrocele.
- 4) Virus: Mumps virus rarely causes secondary hydrocele.
- 5) Gonococcal hydrocele: 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.
- 6) Syphilitic hydrocele: It is rare in present days and it is secondary to orchitis.
- 7) Guinea Worm: Rarely causes hydrocele.
- 8) Post-herniorrhaphy hydrocele: This appears after an operation for inguinal hernia in 0.2% of cases possibly due to damage to the 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 (Br Med Jr, Feb 1976): Hydrocele was associated with myxedema and resolved with thyroxine therapy.
- 11) Meconium peritonitis: Two cases have been reported (Br Jr of surgery Dec 1964), where intestinal perforation and meconium peritonitis occurring in utero, was self limiting, but presented with scrotal enlargement at birth. In neither of these cases were the symptoms related to the 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.
- 12) Hydrocele as a first manifestation of paratesticular rhabdomyosarcoma.
- 13) Hydrocele associated with testicular metastasis of carcinoma rectum <sup>3</sup>. A case of asymptomatic cecal carcinoma, presenting as a testicular mass with hydrocele was reported by John B. Moore et al 1980 <sup>38</sup>. Price and Mostofi <sup>66</sup> have reported a 30% incidence of hydrocele in metastatic testicular tumor of an intra abdominal primary site.
- 14) VP shunt hydrocele: CSF hydrocele as a complication of migration or extrusion of peritoneal end of Ventriculo-peritoneal shunt has been rarely reported (Neurosurgery review 1991, 14(2) - 141(3)) and also in 6 Patients who had VP shunts showed hydrocele due to patent processus vaginalis. It is possible that CSF alters the absorbing properties of the peritoneum and also prevents closure of the processus vaginalis <sup>42</sup>.



- 15) Hydrocele can also occur as a complication of continuous ambulatory peritoneal dialysis <sup>65</sup>.
- 16) Hydrocele was observed during the follow-up period or remission period of Hodgkin's disease and it was believed post irradiation fibrosis of the lymphatic pathology was the cause in hydrocele formation <sup>67</sup>.
- 17) Hydrocele can occur as a complication following internal spermatic vein ligation (Palomos method) in management of varicocele, which looks probably due to lymphatic obstruction <sup>85</sup>.
- 18) Patients with genital infection with salmonella can have hydrocele <sup>47</sup>.
- 19) Hydrocele can be associated with Kawasaki disease as one of the atypical presentation <sup>75</sup>.
- 20) It can also present as recurrent hydrocele in patients with familial Mediterranean fever <sup>27</sup>.
- 21) A unique case of heterotopia of gastric tissue in scrotum associated with hydrocele was reported <sup>54</sup>.



- 22) Secondary hydrocele risk of a clinically evident contra lateral hydrocele or hernia after unilateral hydrocele repair in approximately 7% <sup>50</sup>.

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 infections 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 varies according underlying chronicity 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 color, odorless and neutral in reaction. Specific gravity varies between 1.016 and 1.026.

The concentration of inorganic ions reflects that of ECF and an osmolarity that of plasma. It contains sodium chloride 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 a few drops of blood stirred into a large quantity of hydrocele results in firm clotting of the whole solution. Occasionally it may present as shimmering appearance due to the presence of cholesterol and tyrosine crystals. In some cases loose bodies may occur due to the deposition of salts, which become covered with fibrin- that is calculi in hydrocele <sup>61</sup> and cholesterol granuloma of tunica vaginalis simulating an intrascrotal tumor on ultrasonography <sup>26</sup>. Endothelial cells, Leukocytes, cholesterol crystal 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 longstanding 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 the accumulation of fluid, it was found 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

a transudate. In most cases the epididymis is somewhat congested edematous and thickened while in other 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 repeat tapping, an extraordinary 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 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 without 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 lesion eosinophilic infiltration may be seen.

### **EPIDIDYMIS:**

The epididymis is hardly normal. It is chronically inflamed, with loss of surface luster. It is hypertrophic or atrophic or indurated or sclerotic. The appearance of the 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 testis 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 mesorchium 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 maybe fluid or clotted in long standing cases, where it is difficult to distinguish from malignant lesions of the testis.

### **EFFECT ON SPERMATOGENESIS**

Big hydrocele of the tunica vaginalis testis of long duration impairs spermatogenesis and may lead to sub fertility or infertility. The longer the duration of the hydrocele and the larger its size, the greater the pressure effect and pathological change [MC Dandapat et al, 1990] <sup>20</sup>.

Arrest of spermatogenesis at spermatocyte level or due to seminiferous tubules fibrosis or hyalinization [I.A. Saifee et al, 1980] <sup>24</sup>.

The hydrocele pressure over the testis, which is the pressure exerted by fluid (hydrocele) once testis surpasses the pressure of blood vessels within the scrotum, proving that the pressure of a fluid as a mechanical factor plays an important role in the malfunction of spermatogenesis as well as in hypoxemic hypoxia of the testis <sup>88</sup>.

The pathogenesis of hydrocele as quoted by one of the journals from USSR states an imbalance of serous fluid exudation and absorption follows as a consequence of lymph stasis and venous congestion, its collection starts in the vaginal sac, which is

accompanied by an increase in the hydrocele volume and an elevation of its hydrostatic pressure, with this micro circulatory abnormalities deteriorate as a result of impaired vascular wall permeability, which causes a change in the composition of the serous fluid and an increase in its viscosity. The elevated hydrostatic pressure results in higher viscosity of the serous fluid vice versa. Finally, this thermodynamic self-developing system will convert to a new equilibrium state with the established viscosity pressure, temperature that ensures a balance of flows Dzhabusynor et al, 1990)<sup>23</sup>.

## **5. CLASSIFICATION**

### **A) Etiological**

- a. Congenital
- b. Acquired
  - i. Primary or idiopathic
  - ii. Secondary due to disease of testis/epididymis.
    - Acute
    - Chronic.

### **B) Anatomical (Jacobson)**

- 1) Hydrocele of testis
  - a) Within the tunica vaginalis
    - Vaginal hydrocele
    - Congenital hydrocele
    - Infantile hydrocele
  - i. Interstitial hydrocele
  - ii. Abdomino scrotal hydrocele

- Inguinal hydrocele

- Funicular hydrocele

b) Encysted hydrocele of testis and epididymis.

- 2) Hydrocele of cord
  - a. Diffuse
  - b. Encysted
- 3) Any of above, complicated by hernia
- 4) Hydrocele of the hernial sac
- 5) Hydrocele of Canal of Nuck

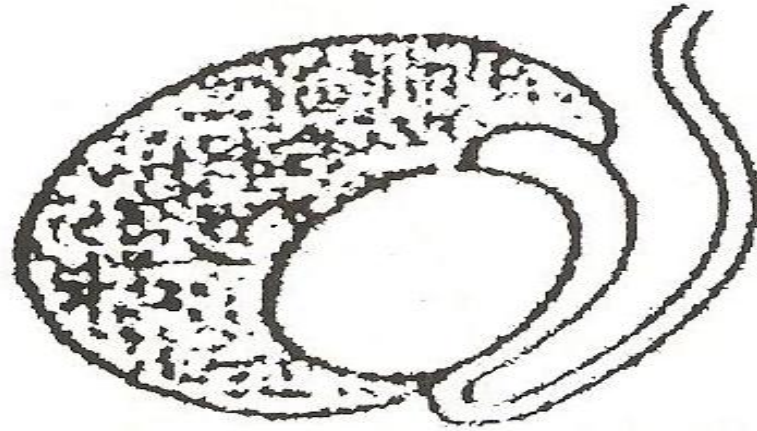
## **DEFINITION OF EACH VARIETY OF HYDROCELE**

### **ANATOMICALLY**

#### **1) Vaginal Hydrocele**

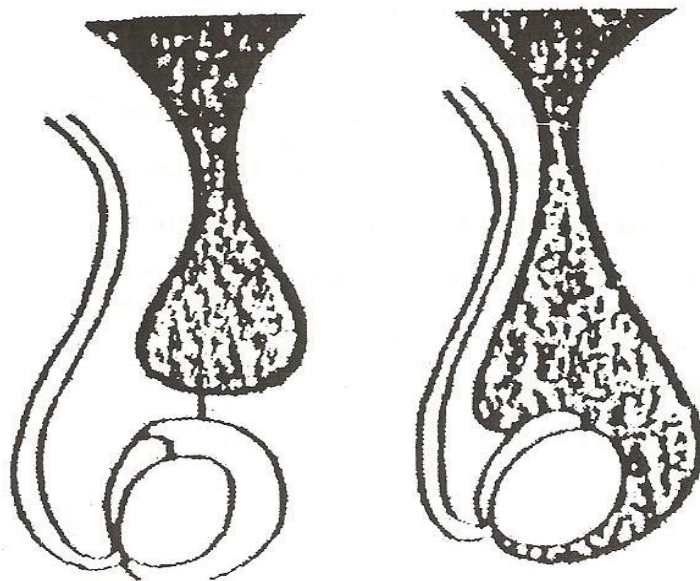
It is collection of serous fluid in the potential space of the tunica Vaginalis (that is processus funicularis). Depending upon the change of the form of tunica vaginalis, it is further classified into

- Vaginal per se
- Bilocular hydrocele
- Hour glass hydrocele
- Multi locular hydrocele



## 2. Congenital Hydrocele

It is due to persistent patent processus vaginalis maintaining its intra peritoneal connection above, with the tunica vaginalis below. Ian Aird (1956) used the term communicating hydrocele and Brown termed it as fluid inguinal hernia. Fluid that accumulates in peritoneum descends into the sac.

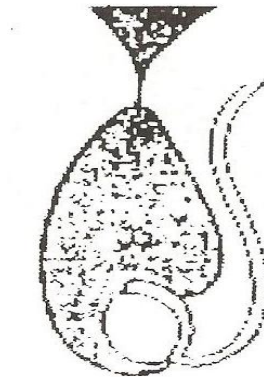




## 2) **Infantile Hydrocele**

The tunica and the processus vaginalis are distended with fluid up to the internal inguinal ring, but the sac has no connection with the general peritoneal cavity. But this type does not necessarily appear in infants, as the name suggest. It can be of two types

A) **Interstitial Hydrocele:** It 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.



## **INFANTILE HYDROCELE**

B) **Abdomino Scrotal Hydrocele**

Syn- Hydrocele-en-bisac

Hydrocele magna

Bilocular hydrocele

Preperitoneal Hydrocele (Holmes, 1932)

Bickle in 1919 proposed the name Abdomino Scrotal hydrocele that is generally now used, <sup>11</sup>. It is hydrocele, which has 2 parts an abdominal, and scrotal part. The Abdominal part is in the pre peritoneal space usually deep to fascia transversalis and a

scrotal part, both are in communication to each other, but not communicated to general peritoneal cavity this variety of hydrocele is very rare up to date 83 cases have been reported.

There is no clear explanation for its pathogenesis. This condition was first reported by Dupuytren in 1834 that suggested that vaginal hydrocele on increasing dimension push its way up through the inguinal canal press against the firmly closed processus vaginalis at deep inguinal rug and assume an abdominal position. But increasing size of vaginal hydrocele should enlarge scrotum but why it assumes abdominal extensions is not clearly explained.

Kocher (1878,1887), Currie (1953) and Burkitt and Williams (1964) shared the above view. It is generally believed that in abdomino scrotal hydrocele, the scrotal swelling usually precedes the onset of the abdominal one (Mitra et al. 1972).

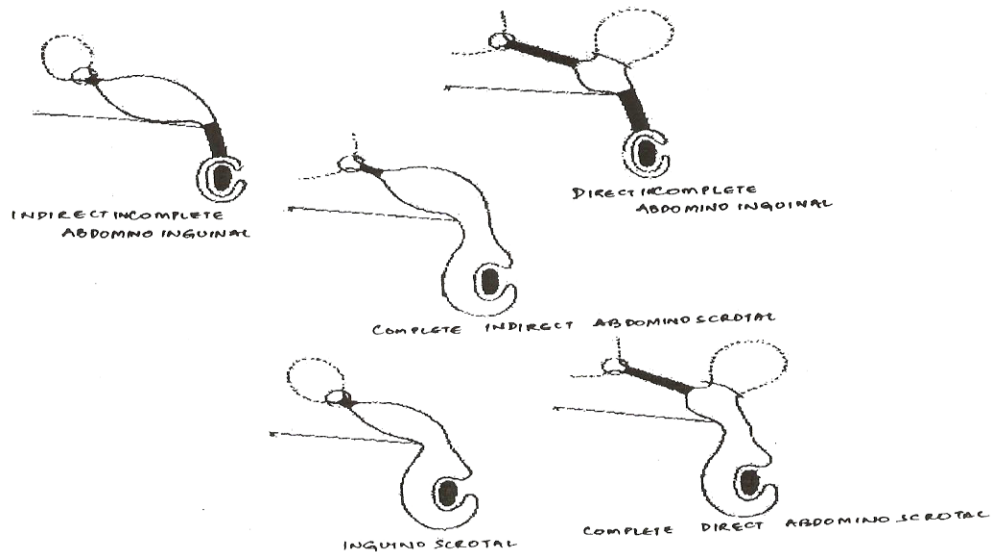
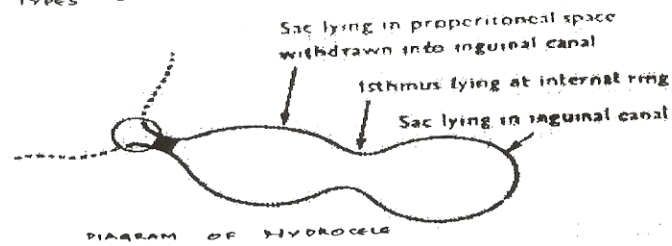
A key to etiology is that this is a hydrocele in the inguinal canal. If this extends into the internal ring it will be nipped every time the patient strains by the normal slide valve mechanism of the canal. As the arching fibers of the internal oblique contract to close the inguinal canal, a portion of the sac containing the fluid is pinched like a fluid filled balloon resulting in a forced expansion 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.

It can be classified as follows.

- 1) Complete abdomino scrotal hydrocele
  - a) Indirect type
  - b) Direct type
- 2) Incomplete Abdomino scrotal hydrocele
  - a) Abdomino -inguinal hydrocele
    - i. Indirect type
    - ii. Direct type
  - b) Inguino- scrotal hydrocele

Diagnosis can be made by Clinical examination and ultrasound. The treatment of choice is excision of the abdominal part, excision of tunica vaginalis and herniorrhaphy.

TYPES OF ABDOMINO SCROTAL HYDROCELE



3) Inguinal hydrocele

Hydrocele is present only in the inguinal region.

4) Funicular Hydrocele

This differs from the infantile type in that its communication with the tunica vaginalis is cut off.

5) Hydrocele of Cord

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

6) Encysted hydrocele of testis and epididymis:

It is localised accumulation of fluid under the tunica albuginea. This fluid does not communicate with the potential vaginal sac. The same holds true with epididymal variety.

7) Hydrocele of hernial sac

It is an accumulation of fluid in that part of processus vaginalis, the orifice of which is obliterated by omental protrusion. The contents of such a hernia) sac is only fluid.

8) Hydrocele complicated with hernia

Especially congenital variety of sac is present, the intestine or omentum can slip down into the patent processus vaginalis.

9) Hydrocele of tunica vaginalis with hernia

10) Hydrocele of Canal of Nuck

It is hydrocele, which occurs in relation to round ligament in the inguinal canal of females. Unlike hydrocele of cord, this is wholly or partially in the inguinal canal <sup>19</sup>



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

- Vaginal
- Abdomino-vaginal (Congenital)
- Funiculo-vaginal (Infantile)
- Funicular
- Abdomino-funicular

In the 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 communicates 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 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 exudate 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 diseases 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 preoperatively. Possibly this is due to damage of lymphatic vessels of the tunica vaginalis which pass to the testis along the spermatic cord. The chronic symptomatic hydrocele complicating syphilis, tuberculosis, neoplasm and chronic pyogenic lesions are to be differentiated from idiopathic ones.

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

## **CLINICAL MANIFESTATIONS AND DIAGNOSIS**

### **VAGINAL HYDROCELE**

It occurs in men of all age groups. Suggestive symptoms are few. It appears as a pear shaped swelling, larger below than above and tapering sharply at the cord. When it is of large dimensions it is often sausage shaped. The fluid accumulates slowly painlessly and eventually a dragging sensation is felt in the groin. It may involve only one side or both sides, being slightly more frequent on the right side. It cannot be pushed into the inguinal canal unless it is of a bilocular type. The upper pole can be palpated at or just below the external inguinal ring. In small hydroceles, the testis is surrounded by a lax fluid swelling and is capable of enormous distention. In large ones the tunica vaginalis

may be so tensely distended that the testis cannot be identified, though pressure from behind may elicit testicular sensation. The scrotal skin is tense and shiny.

Penis may be withdrawn into the distended scrotal skin and a puckered dimple marks its position in a very large hydrocele especially when bilateral and it appears to be shortened as the hydrocele enlarges and extends upwards into the scrotum as opposed to carcinoma of the testis in which the penis appear larger. Thus, an enlarged tense scrotal sac that gives a sense of fluctuation and cannot be reduced is a characteristic sign of a hydrocele.

**TRANS-ILLUMINATION:** Hydrocele fluid trans-illuminates light held against the scrotal wall The position of the testis can often be determined. This method may fail when the walls of the sac are thick (due to chronicity) or in case of a hematocele or pyocele this test may fail.

#### **CONGENITAL HYDROCELE :**

It occurs in undernourished children. In bilateral cases ascites or ascitic tubercular peritonitis should be suspected. Congenital hydrocele may not become apparent until adult life. The fluid disappears in the horizontal position but returns when the erect posture is assumed. Frequently the patient notices that the testis becomes larger in the evening after an active day and smaller early in the morning. The hydrocele cannot be emptied by digital pressure as this results in an inverted ink bottle effect at the internal ring It has to be differentiated from indirect inguinal hernia by the fact that it fills up from below upwards on coughing.(cf in an inguinal hernia the swelling descends from



above downwards). Also an inguinal hernia may be reduced easily, unless uncomplicated and its reduction may be associated with a gurgle. A congenital hydrocele is Trans-illuminant.

### **INFANTILE HYDROCELE**

It does not necessarily appear in infants, It is a cystic inguino-scrotal swelling, the top of which can be reached. There is no impulse on coughing. It is irreducible though it tends to diminish in size because of mobility of the fluid in the sac into the inguinal region. Trans-illumination is positive and the testis is not felt separately.

### **ENCYSTED HYDROCELE OF THE CORD**

It is a smooth oval cystic swelling situated either in the inguinal or the inguino-scrotal region associated with the spermatic cord and felt separated from the testis. It is liable to be mistaken for an irreducible hernia. It is mobile transversely and with the traction of the testis descends down and becomes less mobile (Traction test).

### **HYDROCELE OF THE CANAL OF NUCK**

It is a swelling situated in the inguinal region of females. The cyst is in relation to the round ligament. Although it is reducible, it is mobile in all the direction. It is rarely painful and in usually chronic. The cyst seldom transmits light as the external oblique fascia covers it. The differential diagnosis would be irreducible inguinal hernia. It can also present as giant form, and then the differential diagnosis would be femoral artery aneurysm or cold abscess from vertebral tuberculosis.

## **ABDOMINAL SCROTAL HYDROCELE**

This is an inguino-scrotal and abdominal swelling. The scrotal swelling precedes the abdominal mass by a few months. Sometimes the abdominal swelling is the size of a 3-7 month gravid uterus. A translucent cystic swelling, which has got a positive impulse on coughing seen in the hypogastric region either near the deep ring or superficial ring and also a scrotal swelling, which has got cross fluctuation between two swellings the swelling is dull to percuss and non tender. The patient will be unaware of the abdominal swelling, sometimes the abdominal swelling can be palpate per rectum on pressing hard over the abdominal swelling.

The swelling becomes less prominent on contraction of the abdominal muscles. There will be presence of prominent skin folds overlying the neck of the scrotal position and external inguinal ring. It is not present in pure vaginal hydroceles but may be present in those associated with inguinal hernia, it is suggested that this fold could be valuable in the diagnosis of the condition.

## **SECONDARY HYDROCELE**

It is usually secondary to acute or chronic epididymo-orchitis, tubercular epididymitis, and syphilitic orchitis and occasionally in malignant tumor of testis. The amount of fluid is usually small and the swelling is lax. The testis is palpable. Pain is apt to be severe. Pain is usually proportional to tension and great with rapidly forming hydrocele as an acute gonorrhoeal epididymo-orchitis or slight or nil pain in tubercular epididymo-orchitis.

**A) Tubercular epididymitis:**

This condition results from retrograde spread of infection from seminal vesicles via deferens, then it affects globus minor first and commonly blood borne infection will affect globus major first. Slight aching is the only complaint. On examination, normal rugosity of the scrotal skin is lost, there is some restriction in the mobility of the testis, first there is nodular enlargement of globus minor but later the whole of epididymis will become hard irregular craggy and nodules which become tender. These nodules gradually soften and cold abscess develop which becomes adherent to scrotal skin, burst out discharge thin pus on the posterior aspect of scrotum. In the spermatic cord, the deferens may be thickened and beaded due to sub mucous tubercles. In 30% of cases secondary hydrocele is present. On Per Rectal examination, the seminal vesicles may also be slightly irregular and tender. A thorough investigation of the urinary system is must as no less than 60% of cases shows presence of active lesion in the renal! tract and on chest and shows evidence of tuberculosis is about 50% of cases culture of semen may be performed to detect presence of tubercle bacilli.

**B) Acute Epididymo-Orchitis**

Infection usually starts in the epididymis and may gradually spread to the body of the testis. It is actually retrograde infection secondary to the infection of the urethra prostrate and seminal vesicles, which spreads via the lumen of vas deferens. Blood borne infection though rare, affects globus major commonly. Patient presents with severe pain and swelling of the testis. The scrotal wall becomes red and edematous later on epididymis may soften and adherent to scrotal skin. Secondary hydrocele can occur due to other causative organisms like E.Coli, Streptococcus, Staphylococcus, and Proteus etc.

### **C) Syphilitic orchitis**

It can present with three-type manifestation,

- a) Bilateral orchitis -Most common with congenital syphilis
- b) Interstitial fibrosis - Symptomless with loss of testicular sensation
- c) Gumma- It always-be unilateral- Commonly seen type. Testis gets enlarged, painless testis gets hard and loss of testicular sensation. Secondary hydrocele is almost always present.
- d) Lymph nodes enlargement also seen and also with other afflictions.

### **D) Filarial sub acute epididymo-orchitis**

Affects globus major first, it swells and becomes firm and slightly tender. The digital fossa between the testis and the epididymis on the lateral aspects is obliterated with inflammatory adhesion. It will not involve seminal vesicles. It is always associated with secondary hydrocele.

The lymphatics get dilated in the spermatic cord, which is also associated with fever, chills and rigor. It presents as multilocular enlarged cystic swelling, which can be termed as “diffuse hydrocele of the cord”.

### **E) Secondary to testicular malignancy;**

The secondary hydrocele is present in about 10% of cases. The disease is insidious in onset, with duration of a few months. The patient presents with a painless smooth or nodular swelling of the testis, which is either uniformly firm or irregular in consistency with cystic areas. Testicular sensation is lost. The spermatic cord is free in

the early stages but later extension of growth occurs along the lymph vessels of the cord. Lymphatic metastasis is usually to the pre and para-aortic nodes. The vas is usually not involved (cf-Tuberculosis, vas is involved-VAS Sign).

**F) Chylocele:**

It is the collection of chylous fluid in the tunica vaginalis. The fluid may contain microfilaria. The condition is suspected when in addition to the clinical picture of hydrocele a history of periodic attacks of fever is present and translucency is negative. Diagnosis can be confirmed by aspirating milky fluid.

**7) DIFFERENTIAL DIAGNOSIS**

1) **Epididymal Cysts:** These are cystic swellings in relations to the epididymis or it can be cystic transformation of aberrant structures like paradidymis, hydatid of Morgagni (appendix of the epididymis), the vas aberrans of haller etc. Though congenital, yet the sufferers are usually middle-aged men. There are actually multiple cysts or multilocular cyst above and behind the body of the testis. The testis can be felt distinctly apart. They have got a bosselated surface with a fasciculated appearance. The fluid it contains is crystal clear. They are tense, fluctuant and brilliantly translucent, but due to presence of multiple septa, brilliant translucency is finely tessellated giving the appearance of a Chinese lantern.

2) **Spermatocele:** This is a smooth cystic swelling which is poorly transilluminant situated in the head of the epididymis that is upper and posterior aspects of the testis. It rarely is more than 1-2 cm in size. The fluid inside contains spermatozoa and resembles

barley water. It is retention cyst, (which can develop in some area of sperm conductivity mechanism of the epididymis) It is rarely big to present as 3 testicles.

3) **Inguino scrotal hernia:** Especially complete irreducible Inguinal hernia, which patient gives history, previously used to reduce and use to come out whenever the patient strains and on inspection swelling extends through the external ring into inguinal canal that it cannot be got above the swelling (CF hydrocele can get above the swelling) Expansile cough impulse present (Cf no cough impulse in hydrocele) consistency will be soft if intestine. Firm, doughy if omentum, tympanic note on percussion if it is enterocele and dull if omentocele or hydrocele. Testis cannot be distinctly made out always (if testis cannot be felt unless it is secondary hydrocele). Transillumination will be negative unless in children.

4) **Hematocele:** In a tense cystic swelling non-translucent with history of trauma one should suspect hematocele. In the absence of trauma with heavy swelling of the scrotum, besides hematocele, malignancy of the testis cannot be easily ruled out, a point of great importance from the treatment point of view. In a recent case of hematocele is usually the result of injury or during tapping of a hydrocele or following surgery. Patient presents scrotal swelling with pain. On examination the swelling is quite tender, fluctuant but not translucent. Old hematocele may result from slow hemorrhage in to the tunica vaginalis. This may be a painless condition, which gives more confusion to the diagnosis. There is no history of gradual enlargement of the swelling. Presence of testicular sensation (this is absent in testicular tumour) and absence of metastasis favors the diagnosis for this condition Inflammatory swelling of the testis and epididymis produce a solid swelling and are often accompanied by secondary hydrocele i.e small and does not interfere with

the palpation of the testis or the epididymis. Cysts of Morgagni and organ of Germalder are difficult to diagnose preoperatively.

5) **Pyocele:** This is a sequel of infection in the hydrocele sac, which is non-transilluminant. The condition should be differentiated from cellulitis of the scrotal wall. Pressure on the hydrocele through a comparatively healthy area will elicit tenderness in the cases of suppurated hydrocele but not in case of cellulitis. Systemic feature like fever can be present. Aspiration reveals frank pus.

6) **Chylocele:** When a hydrocele presents with a periodic history of fever. It is usually due to filariasis. It has chyle containing liquid fat rich in cholesterol; this is due to rupture of lymphatic varices with discharge of chyle into hydrocele. Dense adhesions would have formed between scrotum and its contents. Microfilarial can be found in the fluid or adult worm in the epididymis. It has negative transillumination.

Gumma is usually painless, hard or doughy mass, not transilluminant. Always unilateral. There will be loss of testicular sensation. It is associated with secondary hydrocele. At later stage, history is present and a positive Wasserman suggests the diagnosis.

7) **Neoplasm of the Testis:** Purely scrotal swelling which can be firm or hard, smooth or nodular, heavy with absent testicular sensation with negative Transillumination. 10% are associated with secondary hydrocele. Dragging pain or dull aching pain may be the presentation. General malaise, wasting and loss of appetite is associated features

**Edema of Chronic Venous Congestion:** It may simulate a hydrocele on inspection but the fluid infiltrates will be felt in the loose scrotal tissue with the testis and epididymis in normal position. It may be due to ascites hypoalbuminemia.

## 8) INVESTIGATIONS

Hydrocele is mainly diagnosed with clinical discretion. Only when there is necessity to rule out secondary causes of hydrocele or clinically misleading scrotal masses. Apart from routine blood and urine investigation special investigation are done, like

Blood- Eosinophilia	}	Filaria
Microfilaria		
Lymphocytosis	}	Tubercular
ESR		
Positive WR	}	Syphilis
Kahn tests		

Urine- Pus cells, RBC's

Culture and sensitivity

## CHEST X-RAY

To exclude associated pulmonary Koch's in cases of tubercular epididymo-orchitis or metastasis if malignant testicular tumour with secondary hydrocele.

## ASPIRATION

For diagnostic purpose in rarely done nowadays for secondary hydrocele but however it can be done.



## **ULTRASONOGRAPHY**

It can be extremely useful investigation, which shows an anechoic fluid once the testis (hyper echoic solid structure) in case of secondary hydrocele, the nature of position of epididymis and testis. It can easily rule out hematocele, hydrocele, secondary hydrocele torsion of testis, malignant testicular tumour etc. State of kidney in tubercular epididymitis on it is involved in >60% of cases.

## **PROSTATIC MASSAGE**

To look for presence of gonococci in cases of acute gonococcal epididymo-orchitis or may demonstrate tubercle bacilli in cases of tubercular epididymo-orchitis.

## **HERNIOGRAM**

Which is of historical importance in case of congenital hydrocele in infants and children to confirm patent processus vaginalis [Dwoskin & Kuhn et al, 1972]<sup>39</sup>.

## **9) COURSES AND COMPLICATION OF HYDROCELE**

### **COURSE:**

A Small hydrocele may tend to regress, but a majority of them gradually increase in size adding bulk and weight to the scrotum with difficult gait. Burying of the penis may mechanically interfere with coitus, walking or micturition. The size and bulk may hinder day-to-day work.

## **COMPLICATION:**

- 1) Rupture may occur after trauma with dispersal of contents into the neighbouring tissue space.
- 2) Hemorrhage may occur in to the hydrocele with the formation of hematocele from injury or aspiration or spontaneously. Blood can get clotted and present as testicular malignancy.
- 3) Calcification may occur with the wall of sac or inside the fluid as calcinosis.
- 4) Infection leads to pyocele or suppurative hydrocele, which may even destroy the testicle.
- 5) Herniation. The tension of the fluid within the tunica vaginalis causes herniation through the datos muscle.
- 6) Rarely at operation the sac is found to be the site of secondary carcinoma, usually from a primary in the lung or very rarely a site of primary mesothelioma.
- 7) Infertility- Phadka (1958) observed that a large hydrocele might interfere with the act of coitus, thereby resulting in infertility. It has been observed that in most of the infertile cases the seminal fluid was thinner, the sperm count lower and the sperms lost their normal feature much earlier (Grewal and Jain). It has also been shown that the longer the duration of the hydrocele the greater the chance of infertility (Dandapat MC etal,1990 <sup>20</sup>).
- 8) Effect on the testis

There may be no effect. When however the pressure has been severe and prolonged there may be thickening of the surrounding tissue with flattening or atrophy of the gland. The atrophy is also due to obliteration of blood supply by

the wideing mesorchium. In some cases when the pressure is removed the testis may return to its original size,

### **13. TREATMENT**

#### **PRINCIPLES OF TREATMENT**

The main aim is to remove the accumulated fluid and prevent its recurrence. This can be achieved by both operative and non-operative line of treatment, though surgery is the treatment of choice. Nowadays non-operative modality is also a safe effective alternative to surgery. This was not previously tried because earlier reports showed high rate of reoccurrence and complications.

#### **Methods Available**

I) Non-operative conservative management

II) Operative management.

**I) Non-operative modality:**

a) Tapping.

b) Tapping and injection of various drugs (sclerotherapy).

**a) Tapping:**

The part is shaved and prepared as for an operation. Under strict aseptic precautions the fluid is tapped under local anesthesia (1% Xylocaine) by trocar and cannula in a translucent area. If the testis is anteverted the tapping should be done in the postero-anterior part. Usually the anterior part is chosen. But the main disadvantages of this modality is very high rate of recurrence with in a period of 48-72hrs re-accumulation

of fluid occurs as a complication of the also occur as a complication of the procedure. This is performed since centuries but in vain.

**b) Sclerotherapy of hydrocele.**

Although surgery is the gold standard in the management of hydrocele, it is not without complications like postoperative hematoma, scrotal edema etc. with this continued problem. Sclerotherapy came into vogue. Recent reports on Sclerotherapy have promoted many to study the role of Sclerotherapy in the management of hydrocele.

Selection of patients is essential for Sclerotherapy, secondary hydroceles should be excluded

Exclusion criteria for Sclerotherapy [Hu et al].

1. Suspected malignancy
2. Ipsilateral concomitant inguinal hernia
3. Ipsilateral patent processus vaginalis
4. Ipsilateral epididymitis during the preceding three to six months.

These are the various sclerosants, which are used of late.

1. Tetracycline<sup>9 2 59</sup>
2. Polidocanol<sup>86 49</sup>
3. Ethanolamine oleate<sup>32 33</sup>
4. Sodium tetradecyl sulphate [3%]
5. Phenol [2.5%]<sup>62</sup>
- 6 Antazoline<sup>34</sup>
7. Talc<sup>92</sup>

8. Quinine
9. Urethane
- 10 Quinacrine
11. Fibrin glue, Tisseel <sup>88 51 78 15 87</sup>
12. Phenozone
- 13 Bismuth phosphate <sup>22</sup>
14. Hydrocortisone
- 15 Hyaluronidase

## **METHOD**

Preparation should be done as per for surgery. Shaving the part, bath etc. It should be transilluminant. Anesthesia is not needed but local skin infiltration with 2% xylocaine and spermatic cord block can be used after painting and draping the scrotum. The assistant makes the sac tense by means of manual compression. No 18 or 16 PTFE cannula is inserted into postero superior part, as this has got less vascularity i.e. less subcutaneous vessels.

The sac is completely emptied of hydrocele fluid. No fluid should be left back as this dilutes the sclerosant, and hinders its efficacy. After emptying, the testis is examined carefully to feel for any morphological changes of testis, epididymis. Any sclerosant (the quantity and strength is different for each sclerosant) is injected into the sac and PTFE cannula is withdrawn then the sac/scrotum is massaged for equal and effective distribution of the sclerosant. The aspiration fluid is seen for its quality and quantity.

Depending on its morphology it is sent to biochemical analysis. Compression dressing applied so that the layers are in contact with each other. Scrotal support is given for 24-48 hrs. Patient are sent home and advised to be on regular follow up and patient should be explained that there will be transient re-accumulation of fluid due to irritant effects of the sclerosant which will regress or resolve by 4-8 weeks, hence to repeat sclerotherapy, at least 8weeks should be waited for, after 5 sittings of sclerotherapy if hydrocele still persists or recurs then the modality is considered failure and next modality that is surgery should be adopted.

Sclerotherapy is beneficial because it is easy to perform, less time consuming, sclerosant is cheap, cost effective, postoperative complication is minimal and economical. The patient need not be hospitalized because it is a day case procedure; it is best for those who are unwilling for surgery and those who are medically unfit for surgery.

The disadvantages are

- 1) Recurrence
- 2) Infection and sepsis
- 3) Hematocele
- 4) Injury to testis and epididymis
- 5) Allergies manifestation and chemical necrosis of tunica vaginalis
- 6) Scrotal gangrene or penile gangrene
- 7) Multilocular hydrocele
- 8) Affects fertility by certain sclerosants

- 9) Repeated tapping may lead to formation of adhesion making future surgery difficult.
- 10) It is not applicable to all cases especially with long standing thick walled ones.
- 11) It is better for small and thin walled hydroceles

The Trans-scrotal instillation (in to the cavity) of tetracycline of the emptied hydrocele sac gets absorbed rapidly and almost completely and it can be measured in plasma in 30mins after instillation. Normally the tunica vaginalis forms a peritoneal lining of the anterior, medial and lateral surface of the testis when the testis descends from the peritoneal cavity to the scrotum. In cases of primary and secondary hydrocele, an alteration in the permeability of the tunica vaginalis is presumably of pathogenic importance. Entz have shown that phenol sulphor phthalein administered Intra scrotally was not absorbed in hydroceles when compared with normal individuals but how tetracycline gets absorbed is not correctly explained <sup>8</sup>.

If the PTFE cannula gets dislodged after aspirating the fluid then postponement of the procedure should be done and to wait for re accumulation of fluid and reintroduced. If manipulation is tried at first attempt, drug can be injected into subcutaneous or other tissue planes leading on to hematoma, sclerosis and gangrene of scrotum.

The success of sclerotherapy was 47.5%, 30%, 12.5%, 5% and 2.5% after 1 , 2 , 3 , 4 and 5 injection respectively in study by Shan et al.<sup>102</sup>

In a study comparing the Sclerotherapy and surgery it was found that Postoperative complications including pain (24% & 20%), hematoma (8% &12%), infection (8% & 12%), recurrence (40% & 12%) and complications related to anesthesia (0% & 36%). Success rates of sclerotherapy after first attempt were 60%. Another 20% patients were cured after 2 injections. They concluded that sclerotherapy and surgery for hydrocele are comparable with advantage of economy and convenience for sclerotherapy.<sup>103</sup>

Another study showed that patient satisfaction was 75% for aspiration and sclerotherapy and 88% for hydrocelectomy. The overall success rate for aspiration and sclerotherapy was 76% compared with 84% for hydrocelectomy. The complication rate was only 8% in the aspiration and sclerotherapy group, but 40% in the hydrocelectomy group. Comparative costs per procedure demonstrated that hydrocelectomy was almost nine fold more expensive than aspiration and sclerotherapy.<sup>104</sup>

With regards to the sclerosing agents, many have been tried in the past with tetracycline being one of the popular ones. Bullock et al in their study on 37 hydroceles and 18 epididymal cysts in patients over the age of 50 years showed that all but one of the epididymal cysts were sclerosed satisfactorily at 9 months; 35 hydroceles sclerosed satisfactorily, although four patients required re-treatment at 3 months. One patient required orchidectomy for an infected haematocele. Pain after instillation of tetracycline was an occasional complication which could be prevented by prophylactic spermatic cord block. They concluded that tetracycline sclerotherapy is a safe and effective alternative to surgery for hydroceles and epididymal cysts in older patients.<sup>105</sup>



Another study showed that tetracycline sclerotherapy is quick, safe and economical but associated with high frequency of intractable pain.

Various other substances used as sclerosant include polidocanol , antazoline , OK-432, Quinacrine ,Sodium tetradecyl sulphate (STD) , ethanolamine oleate ,phenol and fibrin glue with variable results. Sclerotherapy with OKB432 is associated fever and local inflammatory reaction although the recurrence is only 10%. Polidocanol and STD cause less pain and inflammation as compared to Tetracycline or OKB-432. Results with fibrin glue have been equivocal and sample size has been small (only nine patients in series of Sirpa & Martti) . Moreover, the cost of fibrin glue is high for low socioeconomic population like ours.<sup>103</sup>

Phenol, off late has regained its popularity as a sclerosing agent. In a study comparing Phenol (5%) and tetracycline for treating idiopathic scrotal cysts they found that both are equally efficacious sclerosants for idiopathic scrotal cysts, achieving almost 100% cure with re-treatment and matching the efficacy of surgery. Concern about post-treatment fertility applies equally to surgery and demands informed consent for both modalities.<sup>106</sup>

In another Indian study by Agarwal et al comparing 5% phenol with 5% phenol with polidocanol they concluded that 5% phenol is a better sclerosant than 1% polidocanol and is as efficacious as operative treatment [of primary, vaginal hydrocele], with lesser morbidity and similar safety profile<sup>107</sup>

Together with reported efficiency and safety of 2.5% phenol in the literature, the recently proved safety of 3% phenol in esophageal variceal sclerotherapy led Ozdemir E to perform a prospective study to lessen the number of sessions. Sclerotherapy with 3% aqueous phenol was applied on an ambulatory basis to 23 patients with 31 hydroceles, who were over 40 years old and who had no fertility problems. The over-all cure rate was 96% with an average follow-up of 3 years, and 58% of the hydroceles required only one session of treatment. The average number of treatment sessions was 2.2 (range; 1-7). One patient with a history of herniorrhaphy 10 years earlier, was treated surgically following failure of seven sclerotherapy sessions. Ozdemir E concluded that phenol is a sclerosant superior to other conventional agents including tetracyclines, requires neither anesthetics nor prophylactic antibiotics and that sclerotherapy with 3% phenol is an effective, economical and safe form of therapy for patients with hydrocele.<sup>108</sup>

In another study by Savion et al using 2,5% Phenol as a sclerosant they found that in 51.6% of the patients (32 hydroceles) 1 treatment was sufficient, while 2 treatments were necessary in 25.8% (16 hydroceles), 3 in 13% (8 hydroceles) and 4 in 8% (5 hydroceles). One patient required 7 injections. Treatment was unsuccessful in 1 patient in whom a local allergic reaction developed. Only 1 patient complained of pain, and other complications were rare and mild. On the basis of this experience they concluded that sclerotherapy with phenol 2.5% is a painless, highly effective, safe and economical procedure that permits one to avoid an operation, anesthesia and hospitalization. Its use is warranted in adults and particularly in the elderly.<sup>109</sup>

There has also been criticism for sclerotherapy by various researchers. Khaniya et al in their study concluded that although aspiration and sclerotherapy had less complications,

morbidity and was cheaper, it had lower success rate and less patient's satisfaction than hydrocelectomy <sup>110</sup>

## **OPERATIVE MANGEMENT**

The gold standard or the time tested one in the management of hydrocele that is with the aim of obliterating the space forever, after getting rid of fluid and to prevent recurrence. Procedures evolved during recent years

- 1) Winklemann method, 1898.
- 2) Jaboulay technique, 1902.
- 3) Bottle operation of Andrews, 1907.
- 4) Young's procedure, 1940. .
- 5) Solomon's technique, 1955.
- 6) Window operation by Qzdilek, 1957.
- 7) Radical cure for large hydroceles by H.T Gangal, 1964.
- 8) Lord's procedure, 1973.
- 9) Thambugala, 1971.
- 10) Wilkinson's technique, 1973.
- 11) Sharma & Jhaver's minimal dissection technique, 1979.
- 12) Belokar & Kaur, 1979.
- 13) Wanna's procedure, 1983.
- 14) Treatment of hydrocele in children.
- 15) Treatment for abdomino scrotal hydrocele.
- 16) Treatment of hydrocele in aged.
- 17) Treatment of monstrous hydrocele.

Laparoscopic treatment

Endoscopic treatment

Treatment of secondary hydrocele.

## **Description of operative procedures**

### **Pre-Medication**

Sedation with tablet diazepam 10 mg on the previous night. Followed by injection morphine 0.25mg and injection atropine 0.001 gm 1/2 hour before surgery is desirable in adult and old patients. In children only atropine is used.

### **Anesthesia**

3 forms of anesthesia can be provided

- 1) General anesthesia with nitrous oxide and oxygen is anesthesia of choice.
- 2) Spinal anesthesia, which is most commonly used. But it is not preferred because after heavy spinal anesthesia, the blood pressure falls, hence bleeding points are few. However, although homeostasis is achieved, after the effects of anesthesia wear off, the vessels of the testis that arise from the aorta directly bleed profusely and cause hematoma along with its complications. While positioning the patient for spinal anesthesia a fact that has to be kept in mind is that the posterior two thirds of the scrotum is supplied by the S3 segments, where as anterior one third is innervated by LI. Nowadays with day case surgery, local anesthesia is more often used. However any type of anesthesia can be used in day care surgery. Local infiltration with 2% xylocaine injection to the root of scrotum to bring cord block and along the line of incision.

## **BASIC STEP**

After anesthesia, patient is positioned for either inguinal or scrotal approach of hydrocelectomies. The scrotal approach which is more commonly used. Unnecessary destruction of groin anatomy is avoided by scrotal approach. Painting is done with spirit and the part draped.

### **Inguinal approach**

Incision placed transversely parallel to inguinal ligament over superficial inguinal ring, external oblique aponeurosis opened. Hydrocele sac is separated from the scrotum by passing a finger downwards and sweeping it around from the hydrocele sac. The testis is delivered and through this fluid is drawn by aspiration after which the entire sac can be withdrawn.

### **Scrotal approach**

Enough painting is essential on the scrotal skin, which has lot of rugosity (although stretched in hydroceles) has got increased amount of commensals. Superficial Infection, which is very common hence great care, should be exercised in handling the scrotal skin during the operation. Keye's admonition to "get it (scrotal skin) as clean as possible then handle it as the dirtiest thing in the world", (that is handle it as minimal as possible) is most appropriate <sup>13</sup>.

Then sterile gauze is wrapped around the scrotum and held tight. The incision is made through the gauze, skin and the dartos avoiding the superficial vessels up to the sac. Some place the incision in postero superior part of scrotum, as it is less vascular as less

superficial vessels run here. Some in the anterior part of the scrotum. Some advice to approach through median raphe of the scrotum, since no major vessels are encountered in this area (Wright, 1966) for both unilateral as well as bilateral hydroceles.

An incision length of 3-4cms just to deliver the testis out is enough. After exposure of tunica vaginalis, various procedures are done as described below. Testis can be delivered out along with sac, and aspirate the fluid and reducing its tenseness, which has its own benefits which will be explained as this- The stretched tunica vaginalis, if cut, because of its elasticity, retract and bleed away from surgeon's eye. Hence reduction of tension and then cutting visualise the bleeder, which can be cauterised.

Inguinal approach: After the sac with the testis is delivered into inguinal canal. The coverings have been stripped aside, an opening is made into the tunica vaginalis and the testis is carefully examined. If it is healthy then hydrocele alone requires treatment. Simple eversion of the tunica vaginalis and few stay sutures behind the testis holding tunica vaginalis is sufficed. If sac is very large, the sac can be excised and then sutured behind and a drain placed in the scrotum and wound closed in layers and compression bandage applied.

## SCROTAL APPROACH

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Winkelmann's procedure

Jaboulay's technique

Bottle operation of Andrew's

Young's procedure

Solomon's extrusion operation

**Window operation by Ozdilek**

Radical cure operation for large hydroceles

Lords procedures

Simplified minimal dissection technique

Wanna's procedure

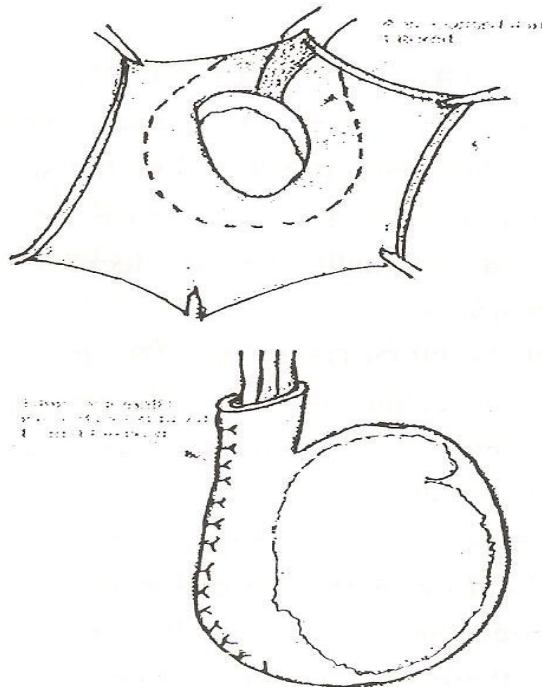
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### 1) **Winkelmann's procedure, 1898** <sup>97</sup>

After exposing the sac. The sac is completely exposed that is enucleation of sac done with finger dissection. Adhesions are relieved by sharp dissection and tunica vaginalis is opened by an incision comparably in length in an avascular area and the fluid is drained. Testis is examined, partial excision of the sac done and the rest of the tunica vaginalis are sutured behind the testis. Perfect hemostasis is secured and sutures are applied taking care not to draw the margins of the sac too tightly around the cord to prevent the interference of blood supply to testis. The testis is returned to the scrotum from which a drain is brought out the fascial layers and scrotal skin closed with interrupted sutures. As precautionary measure the scrotum is well supported by a

compression bandage to prevent hematoma formation. Postoperative analgesia and sedation is usually for a day and drain is removed after 48 hrs and sutures removed after 5 days patient is allowed to walk with a bandage.

This procedure includes extensive dissection with danger of delayed bleeding and hematoma formation. This is done for large and thick sac



## 2) **JABOULAY'S TECHNIQUE, 1902** <sup>35</sup>.

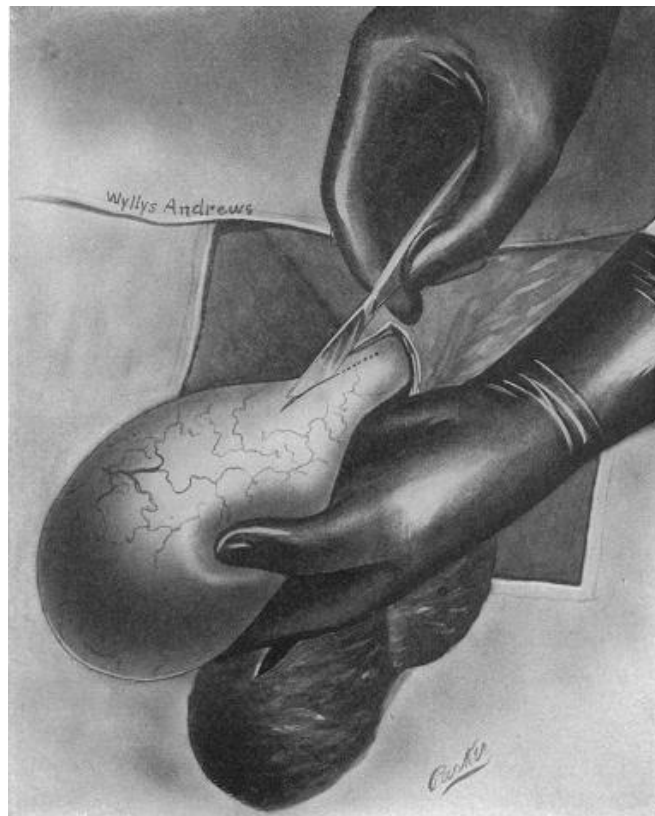
The method as described by Jaboulay consists of first dissecting the hydrocele sac free and delivering it through the wound. The sac then is opened by an anterior incision and is everted and sutured behind the testis in such a way that the whole serous lining faces outwards. No portion of the tunica is excised. In this incidence of scrotal edema,



hematoma, wound infection as well as scrotal abscess formation is high. This cannot be done on large sacs, only in small hydroceles it is better.

### 3) **BOTTLE OPERATION OF ANDREW'S (1970)** <sup>1</sup>

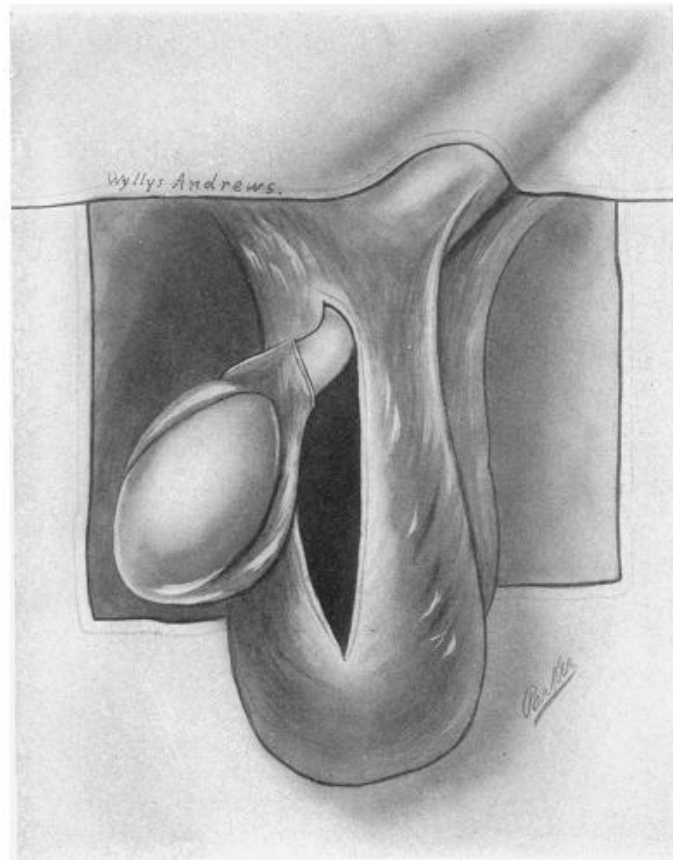
In this, the hydrocele sac is dissected completely and emptied through a small incision. The testis then is pulled out through this incision, everting the parietal layer of the tunica vaginalis, and is replaced in the scrotum without taking any sutures. In this scrotal edema and post operative hematoma has been increasingly evident



Hydrocele and testis enucleated. Incision at anterior upper portion.



Eversion of "bottle" by pushing testis through small hole in upper end.



Completely everted sac. The small anterior cut now takes a posterior position around the cord. No sutures required.

**4) YOUNG'S PROCEDURE, 1940 <sup>100</sup>**

Here, the whole hydrocele sac is excised completely, hemostasis secured and wound closed in layer after placing drain. This procedure has got highest incidence of hematoma.

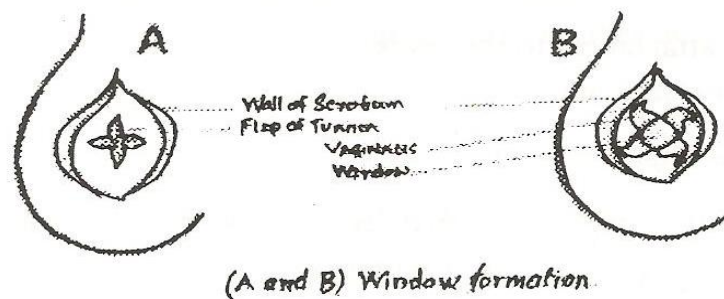
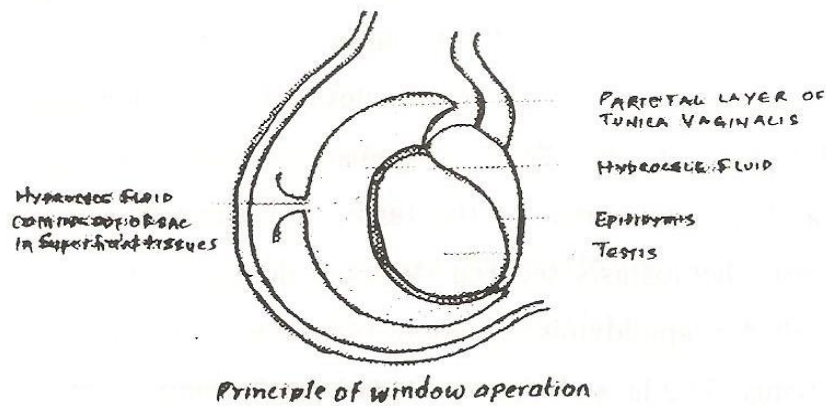
**5) SOLOMON'S EXTRUSION OPERATION, 1955 <sup>79</sup>**

A small incision is made in the tunica vaginalis to allow the testis to be pulled out of the hydrocele, which then is sutured to the sinus epididymis then closing the sac with no excision of the tunica. This procedure has got very minimal dissection with no excision of tunica vaginalis hence decreased incidence of scrotal edema and postoperative hematoma.

**6) WINDOW OPERATION BY OZDILEK, 1957 <sup>65</sup>.**

The "Eversion" procedure is blamed for causing tissue edema, hematoma and resultant infection due to excessive handling of tissue and wide dissection. This technique avoids most of the above complications.

The basic principle of this technique is to increase the absorption of hydrocele fluid by making a small window in the parietal wall of tunica vaginalis. Hydrocele fluid drains continuously through the window into the tissue superficial to the parietal layer of tunica vaginalis and from there it is absorbed by the lymphatics (extra serous scrotal lymphatics)



### Principle of window operation

Ozdilek (1957) described an operation in which he created a window or fenestration of about 3cms diameters in the sac by rolling up the edges of the incised sac. An inch square or oval cut is done in the sac and the edges of the fenestration are run once with 2-0 plain cut gut sutures throughout, so it acts as hemostatic as well as maintaining the fenestration and then wound closed in layer without a drain. This procedure should not be done in those hydroceles with thick and tensely adherent sac where stripping is not easy. Complications are negligible, recurrence if at all! occurs within first month of operation, Vinod kumar nigam, 1984<sup>93</sup>.- Has used the same

principle in his new technique for hydrocele the 'WINDOW OPERATION'. In his procedure, instead of excising the piece of parietal wall, he constructs a cruciate incision of 1 inch x 1/2 inch and everts the edges and sutures with 2-0 chromic to parietes as shown in figure and wound closed in layers without drain as usual.

The advantages stated here are less time consuming simple procedure, no admission required, day care surgery, no cord block as testis is not taken out of sac. The protective function of tunica vaginalis is preserved, less operative hemorrhage or post-operative hematoma. No chance of injury to the vasoepididymal apparatus, less recurrence rates. The same experience is given by Singh RK et al, 1999 Nepal and FaJandafy-L (1995, France), Jahnsen et al, 1993. Sweden

**7) Radical cure operation for large hydroceles by H.T. Gangal [1964].**

Dr. HT Gangal of LTMC, Mumbai advocate excision of the sac as far as epididymis and its attachment to the testis. No attempt is made to dissect the tissues behind the testis, hemostasis secured- Wound closed in layers with no drain. In case of large hydrocele the epididymis is widely separated from the testis forming a large sinus of the epididymis. The layer lining this sinus needs removal, in order to avoid recurrence of the hydrocele total excision done of sac by continuing the separation over the epididymis up to its attachment to the testis.

**8) Lords procedures, 1964<sup>53</sup>.**

Peter H Lord, Switzerland evolved an operation in which there is no direct mobilisation of the tunica vaginalis.

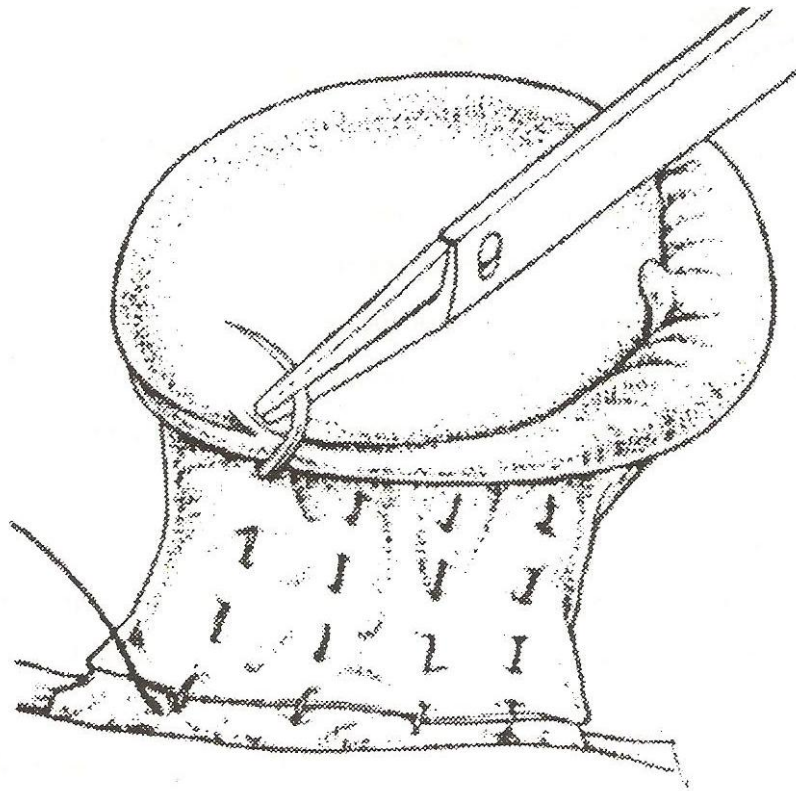
The rule of postoperative hematoma was the only problem with many surgeries. So attention to meticulous hemostasis at operation is a must. Attention to hemostasis is

time consuming and if diathermy is used extensively there is a theoretical risk of damage to the testicular artery, since all the current has to pass between the body and the scrotum through a narrow isthmus, which consists of neck of the scrotum and the spermatic cord on each side. So some surgeons said that it is wise to avoid the use of diathermy as much as possible in this situation<sup>53</sup> and has also quoted in this journal that drainage the wound has its drawbacks, hematoma may collect despite the drain and there is always risk of infection<sup>53</sup>.

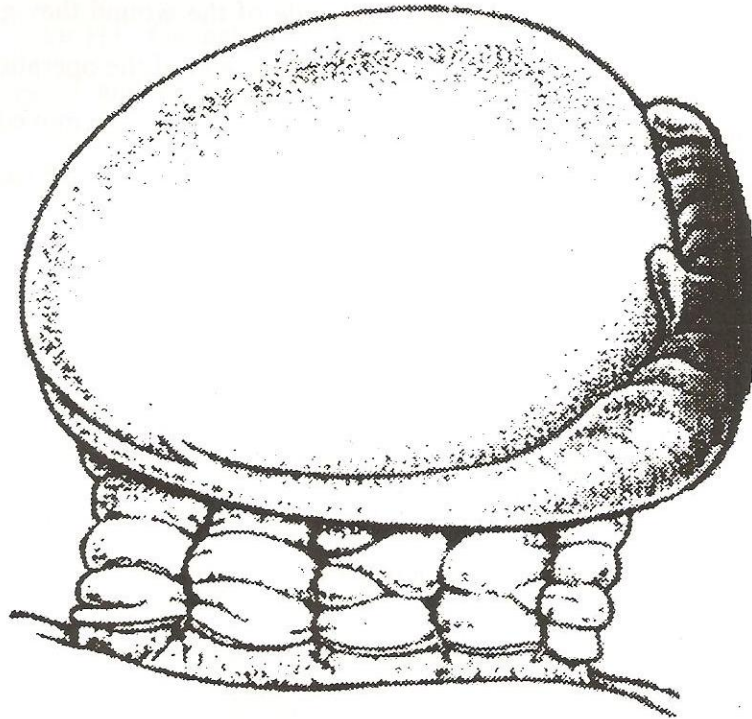
The exact operation as described in his journal article is described in 7 steps.

- 1) The hydrocele is grasped in the left hand in such a manner as to put the scrotal skin on the stretch, and this grip is maintained until the third stage of the procedure. An incision one and half inch long is made through the skin and dartos muscle down to the hydrocele getting as close as possible to the tunica vaginalis without actually opening it. The superficial vessels are early seen through the stretched skin, and the incision is made where these appear to be fewest. The small amount of bleeding seen at this moment should be the only bleeding seen during the whole operation. It is permissible to touch these bleeding points with diathermy.
- 2) Three Allis forceps are applied to each side of the wound they grasp the skin and dartos and control the bleeding points until the end of the operation.
- 3) The tunica vaginalis is incised and the hydrocele fluid is removed with the sucker. The grip on the scrotum can now be relaxed. A finger of each hand is inserted and the opening gently stretched.
- 4) The testis is delivered through the opening thus turning the hydrocele inside out

- 5) Using the atraumatic cutgut suture, the peritoneum, which forms the tunica vaginalis, is plicated to form a collar around the junction of the testis and the epididymis. This is done by picking up the edge of the tunica on to the needle and then taking a small bite of tissues on the shiny surface of the tunica at 1cm intervals. In a line from the cut edge to the junction of tunica and testis a process known is needlework as "gathering"



- 6) This stitch is now tied and further stitches, 8-10 in all are similarly inserted, working around the testis in a clockwise manner. As these sutures are tightened, they pull the cut edge of the tunica away from the skin and dartos, which are still held in the Allis forceps. This tissue is able to stretch without tearing so that it does not bleed.



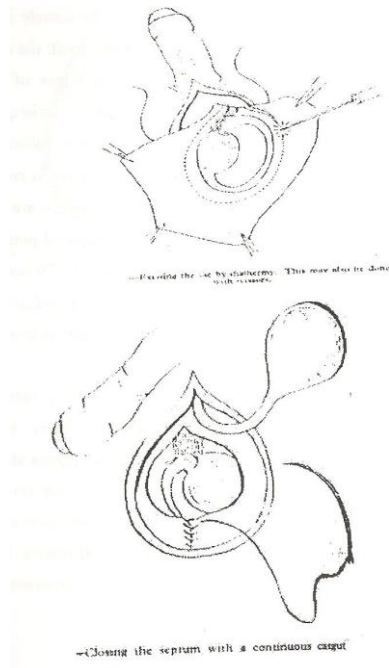
7) The testis is now returned to the scrotum. This may be difficult since the space from which the testis came has been obliterated, and as it is back, the scrotum has to stretch to accommodate it. The lanes tissue forceps are now applied to each end of the wound in such a way as to maintain the eversion of the skin and dartos. The Allis forceps are then removed two at a time, and as each pair is removed that part of the wound is closed with Michele clips. These clips are placed close together and they take over from the tissue forceps to control the bleeding points, The skin edge and dartos must be maintained well everted, so that if there is any oozing it is outward on to the dressing and soon stops. The Michele clip are kept in for 5 days. It is fair criticism that clip in the scrotum are uncomfortable and difficult to remove, but if the scrotum is supported the clips seen to be well tolerated.



There are chances of scrotal edema, minimal incidence of postoperative hematoma. This procedure provides an excellent hemostatic suture and obviates suture removal. However the suture must not be pulled too tight or it will cause ischemic necrosis. The patient is also given scrotal support Nitsches scrotal support (Bailey, 1962).

**THE RADICAL CURE OF HYDROCELE OF THE TUNICA VAGINALIS by RL Thambugala, surgeon, Colombo North hospital, Ceylon.**

Advice to enter the scrotum through median raphe and here the parietal layer of the tunica vaginalis is excised with scissors or cutting diathermy leaving a 1cm margin. The author has never experienced thrombosis of the cord vessels as a result of the use of diathermy for this purpose. During this excision care should be taken to avoid damage to the epididymis, the vas deferens and the vessels of the spermatic cord. When the excision is completed, any visible bleeding points are picked up with hemostats and tied with fine catgut. Wound closed in layers with no drain.



**9) WILKINSON'S OPERATION FOR SCROTAL HYDROCELE from department of surgery, Manchester Royal infirmary. 1973, <sup>21</sup>.**

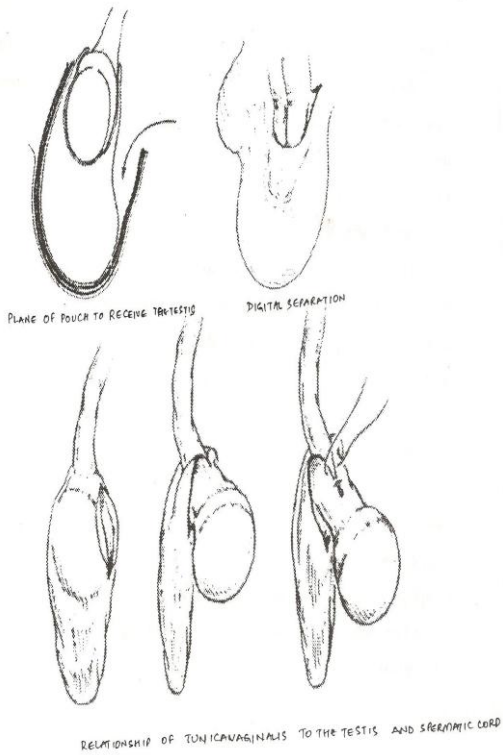
Following induction of anesthesia, the skin of scrotum is cleansed with chlorhexidine for the large hydrocele, which is bilateral, a single transverse incision is placed at right angles to the median skin raphe, about 4cm, below the penoscrotal junction. A low power cutting diathermy with a fine needle, preferably angled, is used to divide the dartos and the layer made up of external spermatic fascia, cremasteric fascia and internal spermatic fascia. When the tunica vaginalis is exposed fascia to form a pouch below the incision large enough to accommodate the testis.

The two layers of the tunica, though individually distinguishable, are closely adherent to one another and are picked up together. Fluid is aspirated. When the testicle is drawn outwards through the skin the naturally mobile tunica becomes entered until the edges of the sac incision come to lie alongside the spermatic cord.

The cut edges of the sac opening are then sutured together on the upper aspects of the cord, catching in the coverings of the cord. This has the dual effect of narrowing the sac incision sufficiently to prevent prolapse of the testis into the original sac, yet by leaving the latter in continuity with the extended scrotal tunica a natural conduit is established. Lane's forceps are used to hold up the skin, dartos and fasciae as the testicle is tucked into the prepared pouch. The fasciae and dartos are approximated with interrupted 2-0 chronic catgut. Dexon 2-0 is used to close skin intradermally. The scrotum is gently compressed to expel any air or fluid. The skin is wiped with Ether, and Nobecutane spray. Scrotal support is given. This method also treats recurrent testicular torsion.

The everted epithelium of the tunica vaginalis quickly loses its secretory nature and becomes together with the testis, adherent to the internal spermatic fascia. In large hydrocele, the fluid for a time continues to be formed in the residual sac passes along the ensheathed cord to be absorbed by lymphatics. When the sac walls are no longer separated by fluid, adherence and atrophy take place. Subsequent to operation on truly massive hydroceles there may be some transient edema of the lax scrotal tissues. If there is redundant scrotal skin it is best left for 3 months, by which time some contraction has taken place and it is rarely necessary to remove it.

The basic concept of these operations is that sac eversion per se by exposing the secretory layer of the tunica to the parietes inhibit fluid formation has withstood the test of over 100 years of surgical practice.



10) **SIMPLIFIED MINIMAL DISSECTION TECHNIQUE P.K. Jhaver and L.S Sharma, W9<sup>77</sup>.**

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 technique was devised.

**Steps of operation**

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

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

**Creation of space in the scrotum.**

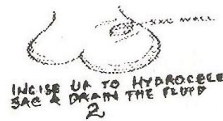
To lodge the testis, with its everted sac back in to the scrotum, a testis size space is created between the scrotal subcutaneous layer outside and the testicular fascial layers on the inside, this is easily done by introducing the two index fingers to do blunt separation of tissues and make room just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

**Reloading of testis**

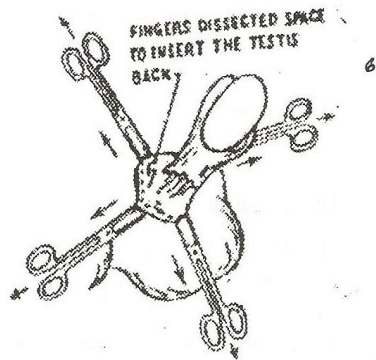
The testis with its everted sac is put back into the new space in the scrotum very carefully.

**Wound closed in layers**

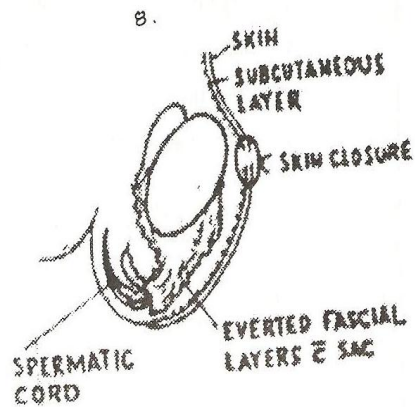
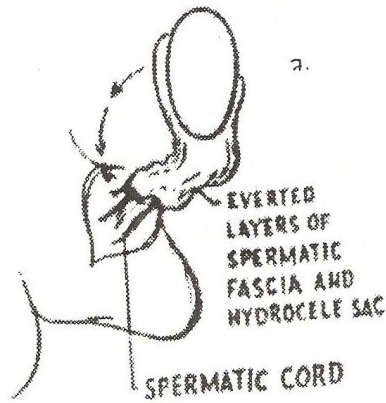
Complications like hematoma and sepsis are remarkably low. Sutures are not used inside the scrotum thus saving on operation time and reducing an infection factor hence reducing-hospital stay.



CREATING SPACE BY FINGER DISSECTION, TO RELODGE TESTIS & ITS SAC



RETRACTION OF SKIN INCISION AT FOUR CORNERS TO EXPOSE SPACE, TO RELODGE TESTIS &



**11) A SIMPLE EVERSION OPERATION FOR RADICAL CURE OF LARGE SCROTAL HYDROCELE by WK Belokar et al, 1979<sup>6</sup>.**

After the skin and other layers, incision up to the tunica vaginalis is done, it is cut, fluid is aspirated and then incised on either side the testis is inspected then a window is made in the tunica vaginalis just adjacent and posterior to testis in a vascular plane. The free edges of the sac He edge to edge near the window is entered after testis is pulled out from the window. The free edges of the sac are united with 2 to 3 interrupted sutures with 2-0 chromic catgut. This narrows the sac sufficiently and also keeps it everted and also fixes the testis, the testis in then replaced back. Wound closed in layer with no drain. Scrotal support given the complications indicated were stitch abscess hematoma of 3% and frank pyocele in 1% patients.

The everted sac wall finally adheres behind and in due course atrophy takes place. After 3-4 months the redundant scrotal skin shows contraction with continued scrotal support. The special advantages of procedures as quoted by author are

- 1) The midline incision offers a better and certain method of approaching both sides through an avascular area.
- 2) As the incision is placed well away from the cord structure, there is no chance of injuring the blood vessels and other structures.
- 3) There is no danger of torsion occurring during reposition as the tissues related to cord and gubernaculum are undisturbed
- 4) Hemorrhage during the operation in minimal.
- 5) There is no need of keeping the time honoured drainage tube.
- 6) The time consumed for the whole procedures is just 8-10 min on one side.

7) The chances of postoperative lymph scrotum, later recurrences are nil.

**12) WANNA'S PROCEDURE 1983 <sup>96</sup>**

An outpatient operation for the cure of primary hydrocele. The principle is to create a hiatus in the parietal layer of the tunica vaginalis just lateral to the posterior border of the epididymis and the fluid is suctioned. The hole is then enlarged into a curved incision 4-5 cm long with its convex border facing the epididymis. The parietal layer of the tunica with any covering layers is gently separated from the dartos muscle. It is then folded on itself along the whole length of the tunica wound for a width of 2cm, the everted tunica requires two, 4-0 chromic catgut stitches on an a traumatic needle to hold its layers together. Wound closed in layers without drain.

The procedure is simple and does not require any manipulation of the testis or excessive handling of the scrotal tissues, which makes it relatively bloodless.

**TREATMENT OF ABDMINO SCROTAL HYDROCELE <sup>11</sup>.**

Excision of the abdominal part of the sac and excision of the tunica vaginalis with herniorrhaphy the treatment of choice.

**HYDROCELE IN CHILDREN**

Prevention is better than cure. Hence many pediatric surgeons believe that a patent processus vaginalis is a potential hernia. They explored the opposite inguinal region in all hydroceles and demonstrated the "Glove sign" or thickening of the cord in a majority of cases and demonstrated the communication between the abdominal cavity and the scrotum. They excised this and thus nipped in the bud any future complications of



a hernia or hydrocele at one shot in the same operation. In the first few months of life operation for hydrocele is not advised since spontaneous sealing of the communication may occur. If, however, a hydrocele appears after the age of six months and gives rise to a tense swelling which persists after three months observation, operation may be advised. Evidence of discomfort or the co-existence of a clinically obvious hernia is additional indication for surgery.

### **Surgical Technique:**

A small skin crease incision is made over the inguinal canal, the external oblique is defined and to expose the cremaster within the inguinal canal the external ring is left intact. The cremaster is now lifted with two artery forceps and cut for about 1cm in the direction of its fibers. Care is taken to avoid cutting any obvious cremasteric vessels and meticulous hemostasis is essential at this stage so that the delicate structures retain their descriptive appearance unstained with blood. The space within the cremaster now opens widely and a grey band may be seen running across the floor of this space. This is the processus vaginalis and it is quite distinct. It is picked up and dissected away from the vas deferens and spermatic vessels. It is characteristic that although the processus is closed, it has the same intimate relationship as the vas and sac of typical infants, hernia presumably small caliber and lack of gross dilatation has not caused overlapping of the sac over the cord. The proximal end is followed through the internal ring for a short distance and its continuity with the peritoneum demonstrated. It is then ligated with peritoneum and divided. The processus is next followed distally for a short distance and is divided without ligation in the vicinity of the external ring. Special care is taken at this

stage as the vas may be drawn up with the processus and damaged. Extensive dissection is not necessary, as the aim of the operation is simple interruption of the processus and removal of any co-existent hernial sac.

The cremaster is allowed to fall back in place. The hydrocele is now aspirated through the scrotum and the testis is drawn into good scrotal position to ensure that the manipulations of the operation have not displaced it upwards to become fixed in high position.

The operation causes minimal disturbance and the child may return home the next day with no restriction in his activities. Bianchi, 1999<sup>46</sup> has described scrotal approach to patent processus vaginalis in children instead of the traditional inguinal approach.

#### **HYDROCELE IN THE AGED:**

In very old patients with very large chronic hydroceles or hematoceles orchidectomy is the treatment of choice as the testis is atrophied. From the patients point of view this is not satisfactory as they lose a testicle and cannot be consoled by any reassurance as to its uselessness. So any of the procedure described can be done or a simple eversion operation described Belokar et al is enough.

#### **TREATMENT OF MONSTROUS HYDROCELE**

In very large hydroceles much of the scrotal skin is left after operation that requires excision. Though the scrotal skin is elastic and is capable of shrinking considerably, in very large hydrocele partial scrotoectomy or partial excision of skin along with the transposition of the testis with long cord is a very useful procedure, by removing

an elliptical wedge of the skin, the subcutaneous tissue space is reduced. About 4-5cm below the penoscrotal junction, a transverse incision or global or circumferential incision. Hematoma formation is less likely. Most importantly it reduces weight, relieves the dragging pain and reduces the size to a respectable one. Any of procedures described above can be used or it would be better to use Wilkinson's procedures or others.

### **ROHANDIA'S MODIFIED TECHNIQUE of everted plication, 1993<sup>72</sup>.**

This technique involves a combination of plication and eversion of tunica vaginalis. as per author, this technique appears better than Jaboulay's and Lord's procedures. It requires less sutures material (average knots required were 4). The risk of injury to epididymis or testis appeared to be less. Time consumption is also less.

### **LAPROSCOPIC REPAIR OF PEDIATRIC HYDROCELES <sup>36</sup>**

The open processus vaginalis presenting as hydrocele was transected with the use of laparoscope. The internal ring was narrowed in those with wide deep rings. Associated a symptomatic hernia was also corrected by the author Janetschet-G-et al

### **ENDOSCOPIC HYDROCELE FULGURATION <sup>30</sup>**

Small sized hydroceles up to a volume of 200ml selected. Modified laparoscopic trocar is inserted into the hydrocele. The resectoscope with a 30 degree lens inserted via the trocar into the hydrocele with video monitoring the entire inside is visualized with continuous flow of irrigants. The entire parietal surface of the tunica vaginalis is ablated using either electrocautery or the KTP-YAG, laser minimal manipulations is done. The procedure is done under monitored local anesthesia with bilateral spermatic cord blocks.

The resectoscope was then removed and a Penrose drain was placed through the trocar into the sac. The trocar is removed over the drain and the drain is secured in place. As per author there was no recurrence after 6 months of follow up. Wound infection or hematomas were not detected. Post operative scrotal discomfort was minimal. But the time consumption of the procedure is about 10-15 minutes more than for convention procedures. But it is effective and well tolerated alternative to treat hydroceles with minimal postoperative discomfort.

There is also description of management of hydroceles with Massage, which was done by Wang R, 1998 at acupuncture department, Wuwei municipal hospital, Gansu province<sup>95</sup>.

### **Treatment of secondary hydrocele**

The management of secondary hydrocele is usually conservative, the main thing here is to tackle the primary cause.

A) **Epididymo-orchitis** - Antibiotics, analgesics, anti inflammatory agents, scrotal support for a case of epididymo-orchitis will suffice, where as for tubercular epididymo-orchitis anti tubercular treatment for a minimum of 9 months is a must Intratunical Rifampicin injection every 4-6 days for 6months would be beneficial The epididymal swellings disappears within a course of 3-6 months, compared to those with oral anti tubercular treatment.

The satisfactory results with the intratunical rifampicin administration seem to be due to the drug reaching the epididymis in high concentration. The tunica

vaginalis is a part of peritoneum and like it, is believed to have a high absorptive power. Furthermore, the intra tunical injection treatment uses a single drug, in contrast to the oral therapy, which by its multidrug administration enhances the incidence of side effects. Scrotal support is given.

Usually it is associated either with renal or prostatic tuberculosis, which should also be treated. If after months of conservative management, an abscess or a discharging sinus exists then epididymectomy is indicated.

B) Filarial hydrocele

Conservative line of treatment with Diethyl carbamazine citrate (Hetrazan) It is the drug of choice with a dose of 2mg per kg orally 3 times daily for 12 days. This drug kills the microfilaria but not the adult worms. Several Courses of the drug may be necessary. Antibiotics may be necessary to control secondary infection. If there is enormous hydrocele tapping can be done for relief of discomfort. After medical management. Surgery for hydrocele can be done if it does not subside but after eradication of microfilaria, but surgery should be done for elephantiasis of scrotum.

C) Malignancy of testis is managed accordingly with excision and staging.

D) Hydrocele following sclerotherapy can occur as multilocular due to sclerosing effect, which can be surgically managed.

The main substance of thought here is to treat the primary etiological agent.

## **Pyocele**

Tapping and sending pus for Culture sensitivity and treating as per the report.

## **11. POSTOPERATIVE COMPLICATIONS**

### **Complications following surgery**

- 1) **Pain-** Most common complication following most surgical procedure, but it is minimal following sclerotherapy. The cause of pain should be searched for and tackled. Analgesic can control pain symptomatically.
- 2) **Infection-** postoperative wound infection is the next common complication; it can vary from a simple stitch abscess to scrotal abscess with wound dehiscence. Abscess pus can be sent for culture and sensitivity and treated accordingly after drainage; wound dehiscence can be secondarily sutured.
- 3) **Secondary hemorrhage-**It may occur even when hemostasis is apparently complete, and is probably often due to retraction of torn vessels into the loose tissues. This usually takes place within the first 24hrs. A small amount can get absorbed. A large amount may lead on to hematoma.
- 4) **Hematoma-**This is the complication for which evolution of surgical techniques in the management of hydrocele is done. Utmost care for securing hemostasis should be looked for, even with that hematoma can occur. Patient coming with table tennis ball and going with a cork ball can be possible. Patient should be explained that hematoma gets absorbed with period of time. Large hematoma should be drained However placing drain postoperatively need not prevent the hematoma

formation. Scrotal support may also not prevent it. It can get secondarily infected hematocele can become pyocele.

- 5) **Pyocele-** Hematoma can get secondarily infected or a stitch abscess can spread and can become a pyocele which may burst open to form scrotal abscess sinus, treatment in drainage and antibiotic as per culture and sensitivity.
- 6) **Orchitis-**Testicle involvement may be immediate-a traumatic orchitis or an infectious process secondary to postoperative infection-or late, atrophy. Some times in infected hematoceles, the testicle becomes involved to the extent that orchidectomy might be indicated. The process in the testicle in these cases is probably secondary to inflammatory thrombosis of the nutrient vessels of the cord.
- 7) **Scrotal edema-** the wall edema follows the scrotal incision against the lines of Langer over scrotum. This will get absorbed in matter of days. This can also be due to damage to the lymphatics of the scrotum due to dissection. This can also be due to infection.
- 8) **Fournier's gangrene-** this is very rare but however can occur, especially in debilitated individuals. Management is conservative and later dates slough excision and Split skin grafting.
- 9) **Testicular torsion-**Due to faulty reposition of testis after surgery.
- 10) **Postoperative lymph scrotum** are higher in cases with filarial disease and/or in case with thickened skin and subcutaneous tissue often in large hydrocele because of oozing as a result of tissue dissection, the size of the scrotum may increase which worries the patient. This may resolve gradually within 3-6 months.

- 11) **Recurrence**-are however present, in Jaboulay's procedure recurrence is due to unevverted small upper portion of the sac. In Wilkinson's technique, the partial eversion of sac does not eliminate the risk of recurrence, where as in Lord's procedure several closed pockets are formed in between the plicated sac. In window operation closure of the window by fibrosis of the sac or adhesions between the window and superficial layer.

### **Complications following sclerotherapy**

- 1) **Pain**- it is the most common complication during the procedure and immediate post procedure. Some patient also feels pain in the right iliac fossa and lateral groin. Pain can be sometimes severe. Many investigators currently use visual analogue scale to measure the degree of pain. It produces more objective and reproducible assessments. Pain incidence is reduced due to concomitant use of local anesthesia along with sclerosants. Pain usually lasts for few days, which can be managed with oral analgesics.
- 2) **Hematoma**- faulty technique, bleeding into the sac by injuring some nearby vessels, but however it is less common. It can present as hematocele.
- 3) **Epididymo-orchitis**- this is due to chemical irritation but however rare.
- 4) **Infection**- skin infection at puncture site which can be subcuticular or pyocele or scrotal abscess. This is also rare.
- 5) **Testicular injury**- rare



- 6) Skin necrosis-accidental infiltration of the sclerosant into tissue planes, missing the sac can produce it. However prevention is better than cure. It is better to postpone sclerosant injection if the needle has come out of the sac post aspiration.
- 7) Fertility after sclerotherapy-certain sclerosant like tetracycline, antazoline, and sodium tetra decyl sulphate brings about oligospermia due to chemical epididymitis/ orchitis (Lancet, volume 337, Jan 19, 1991, Pg 172) however long term studies are required to prove this fact.
- 8) Multilocular hydrocele- this is due to sclerotic effect of the drug, which due to irritation produces fibrosis with septations. Further sclerotherapy to these are useless as the drug cannot penetrate into each loculi, hence these are better managed with surgery,(RK Rencken et al, Pg 92 , B.J.U 1990)
- 9) Recurrence- even after 4-5 sitting of sclerotherapy if the hydrocele does not regress in size, then it is considered to be failure of treatment or recurrence, which is better managed with surgery.
- 10) Hypersensitivity to sclerosant.

## **MATERIALS AND METHODS**

### **1. SOURCE OF DATA:**

Patients visiting surgery OPD as well as those admitted as in-patients at department of surgery in B.L.D.E.U's Shri B. M. Patil Medical College Hospital for Primary Hydrocele from May 2009 to May 2011.

### **2. METHOD OF COLLECTION OF DATA:**

- Details of the patient with regard to the age, address and contact number were taken
- Diagnosis of Primary hydrocele was ascertained by detailed history taking and clinical examination
- Those selected for sclerotherapy were treated on an outpatient basis and those selected for surgery were admitted, investigated and operated.

### **3. INCLUSION CRITERIA:**

- All primary hydrocoeles

### **4. EXCLUSION CRITERIA:**

1. Patients with secondary hydrocele
2. Patients with previous surgery or aspiration for hydrocele

### **5. SAMPLING:**

- Time period of study: May 2009 to May 2011
- Sample size: 60

- Size of group undergoing Injection sclerotherapy: 30
- Size of group undergoing surgery: 30

Statistical analyses: was done using proper statistical tests

- Diagrammatic presentation
- Mean +/- SD
- Kruskal Wallis test
- Chi square test

## **6. Procedure:**

### **A. Injection Sclerotherapy**

1. Transillumination – to determine the fluid is clear

- to locate the testicles

- to avoid injuring blood vessels

2. Paint the area with povidone-iodine

3. A bleb of skin raised with local anaesthetic

4. A plastic cannula is inserted at the middle or upper part of the swelling and pushed well towards the other side of the swelling and held there so that, on tapping the fluid, the collapsing wall does not slip over the end of instrument.

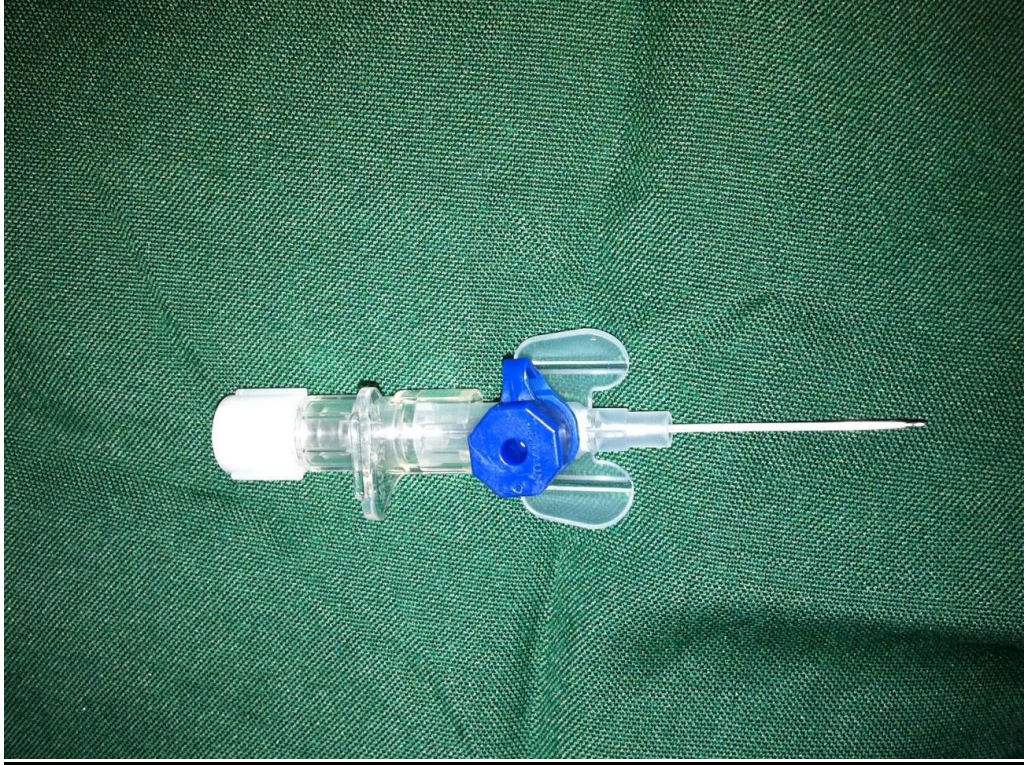
5. The sac was completely emptied by aspiration, volume measured and corresponding dosage of 3% phenol injected.

<b>ASPIRATE</b>	<b>SCLEROSANT INJECTED</b>
<50ml	5ml
51-200ml	10ml
201-400ml	15ml
>400ml	20ml

6. Review after every 6 weeks and repeated until no fluid accumulates

## **B. Surgery**

**Jaboulay's procedure:** An incision of 4cm is given on the scrotal skin and dartos muscle. Hydrocele sac is dissected free and delivered through the wound. The sac is then opened by anterior incision, everted and sutured behind the testis in such a way that the whole serous lining faced outwards.



## INSTRUMENTS



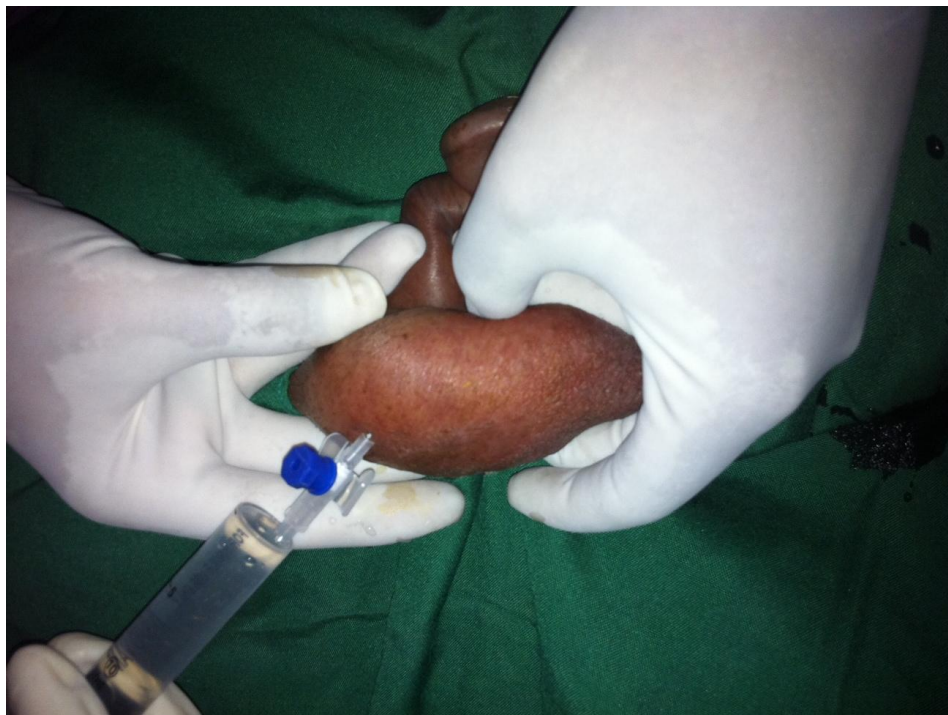
**HOLDING THE HYDROCELE SAC TENSE BETWEEN FINGERS**



**ASPIRATING THE HYDROCELE FLUID**



**THE ASPIRATED FLUID**



**INJECTING THE SCLEROSANT(3% Phenol)**

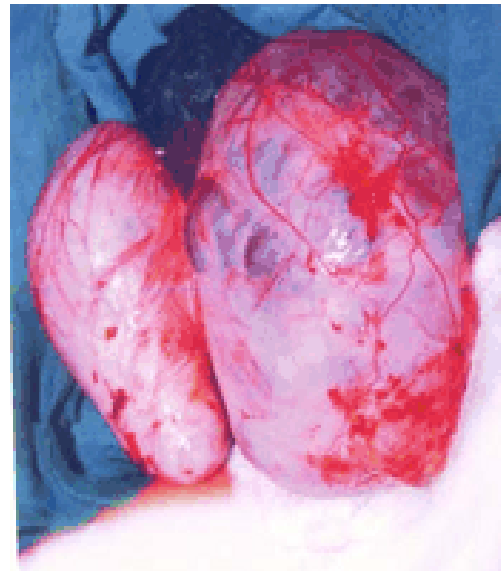
## SCROTAL SUPPORT



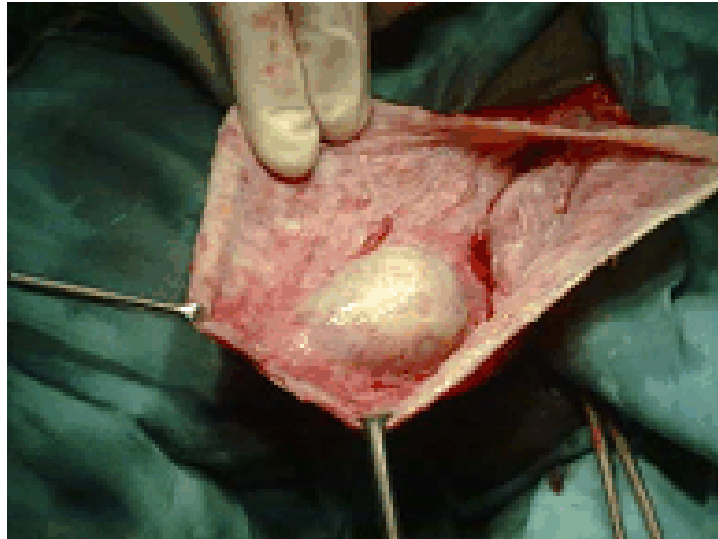




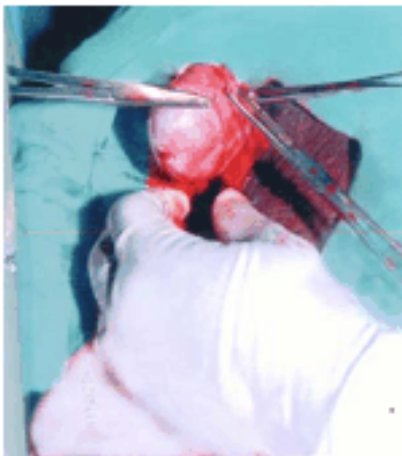
*Incision taken over the scrotum*



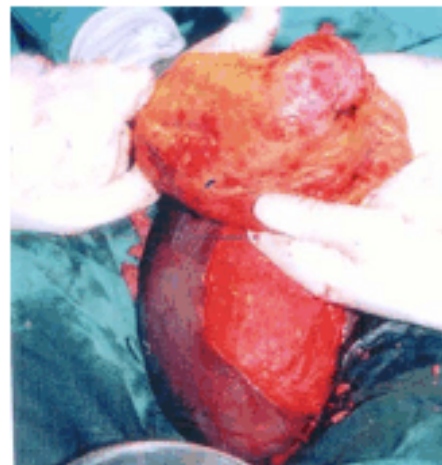
*Tunica vaginalis containing hydrocele fluid on either side of the testis*



***Exposure of tunica vaginalis sac after evacuating hydrocele fluid***



***Eversion of sac***



***Subtotal excision and eversion of sac  
(JABULAY PROCEDURE)***



*Closure of incision with drain in situ*

## RESULTS

**Table 1**

<b>AGE</b>	<b>TOTAL</b>	<b>Percentage</b>
<20 YRS	1	1.67%
20-30yrs	18	30%
30-40yrs	13	21.67%
40-50yrs	17	28.3%
50-69yrs	5	8.3%
60-70yrs	6	10%
<b>TOTAL</b>	<b>60</b>	

In our study of 60 cases, the youngest age was 19 years who underwent sclerotherapy and was 23 years who underwent surgery.

The mean age among those who underwent sclerotherapy was 36 years

The mean age among those who underwent surgery was 40 years

Maximum incidence of hydrocele was found in 20-30yrs age group.

Comparison of age group in years with other series by Meredith F Campbell, MD, New

York <sup>13</sup>

Age of patients presenting with hydrocele

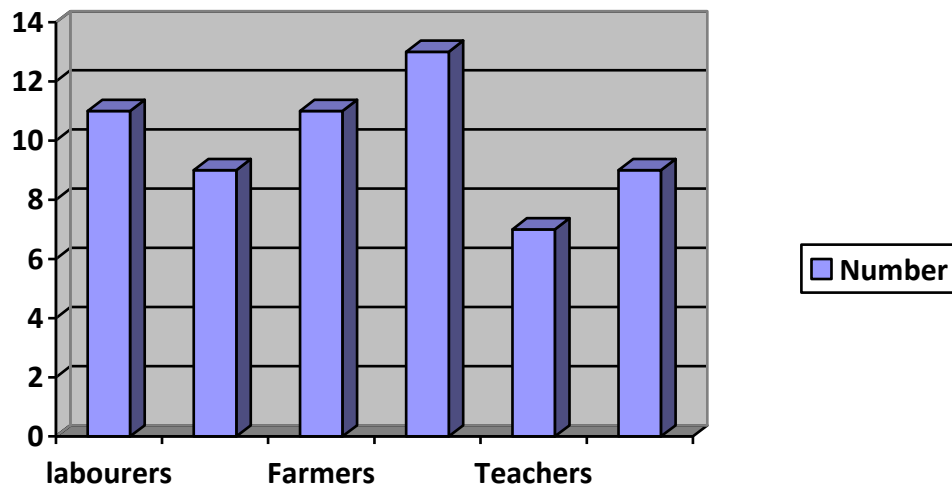
Years	No of patients	Percentage
<6ys	12	2.63
6-14	2	0.44
15-19	35	7.67
20-29	126	27.63
30-39	74	16.23
40-49	89	19.52
50-59	79	17.32
60-69	32	7.01
70-79	6	1.32
81	1	0.22
Not recorded	3	0.66
<b>TOTAL</b>	<b>456</b>	<b>100</b>

Author has quoted 90% of his patients were over 21 years of age and the condition is being most frequently observed between ages 20-30yrs(27%); youngest is 6 yrs and the eldest 81yrs.

**Table 2**

Occupation	No of cases	Percentage
Labourers	11	18.33
Business	9	15
Farmers	11	18.33
Students	13	21.67
Teachers	7	11.67
Private workers	9	15

**Bar graph showing distribution of occupation**



In this study almost equal numbers of cases were seen in most of the occupations. This indicates that hydrocele does not have any predilection for a particular occupation

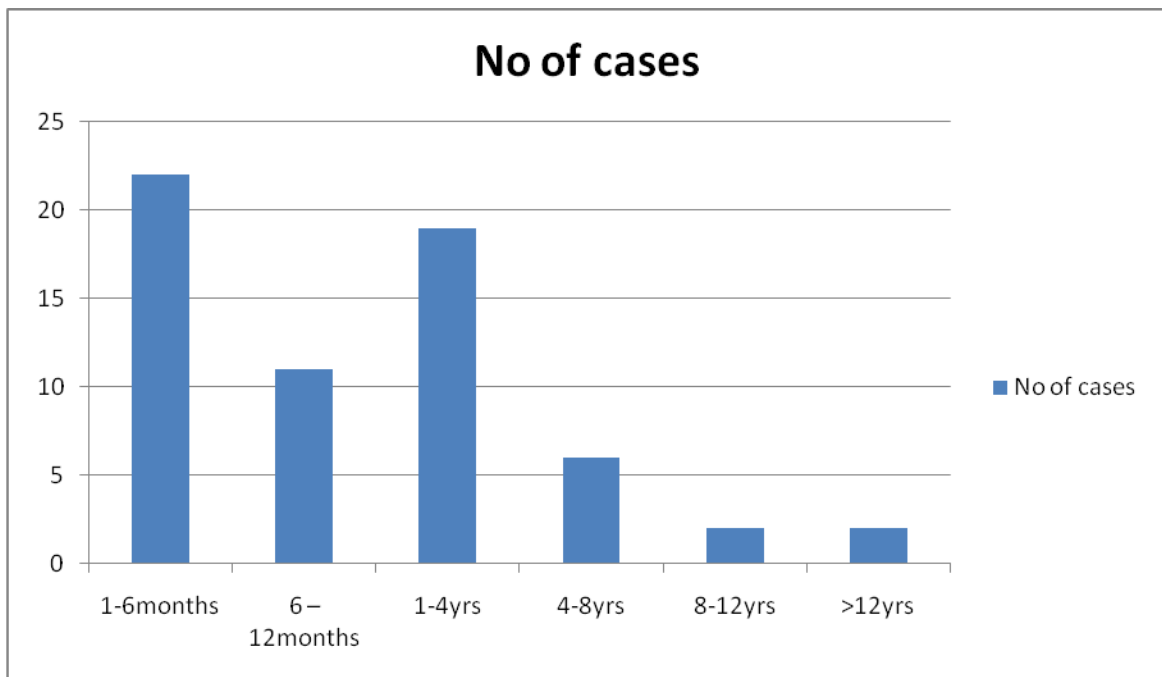
**Table 3**

Shows the duration of symptoms when the patients presented to us

	<u>No of cases</u>	<u>Percentage</u>
1-6months	22	36.67
6 – 12months	11	18.33
1-4yrs	19	31.67
4-8yrs	6	10
8-12yrs	2	3.33
>12yrs	2	3.33

Case with shortest duration of symptoms treated in the present study was 2 months and the longest was 15 years.

Maximum number of cases have duration of symptoms between 1 to 4 years and minimum above 12 years.

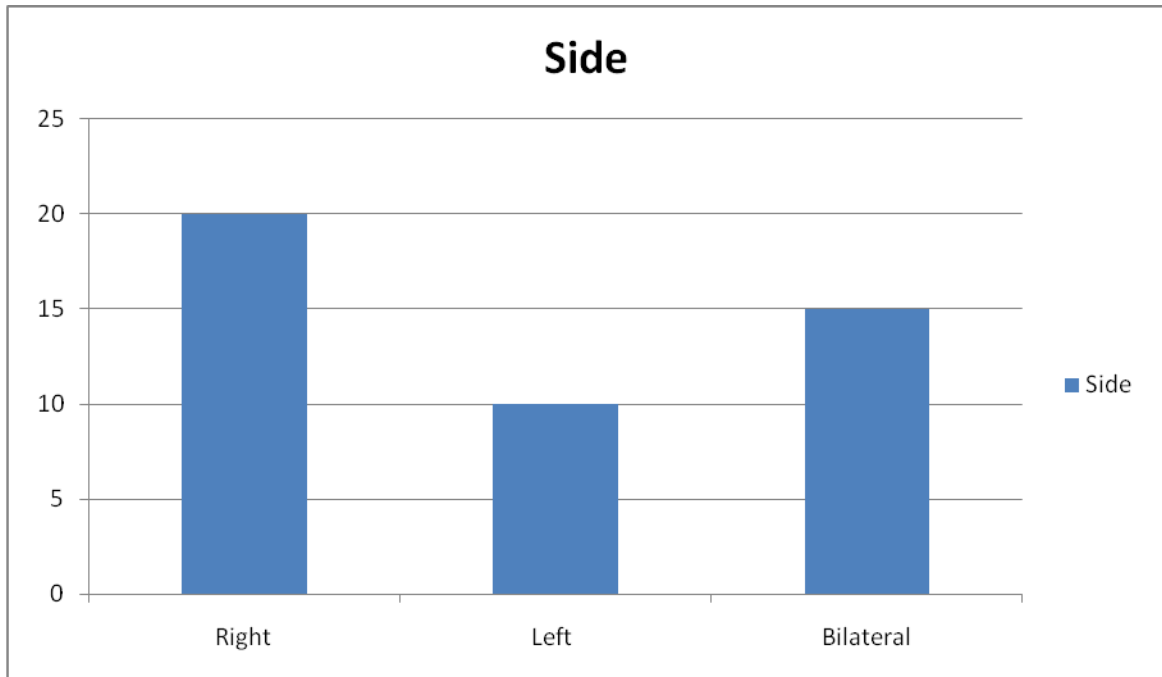


**Table 4**

Shows the side of the testis involved by hydrocele

<b><u>R</u></b>	<b><u>L</u></b>	<b><u>B/L</u></b>
20	10	15

In the present study hydrocele was found to occur more on the right side than the left side. Bilateral cases were seen in 15 cases

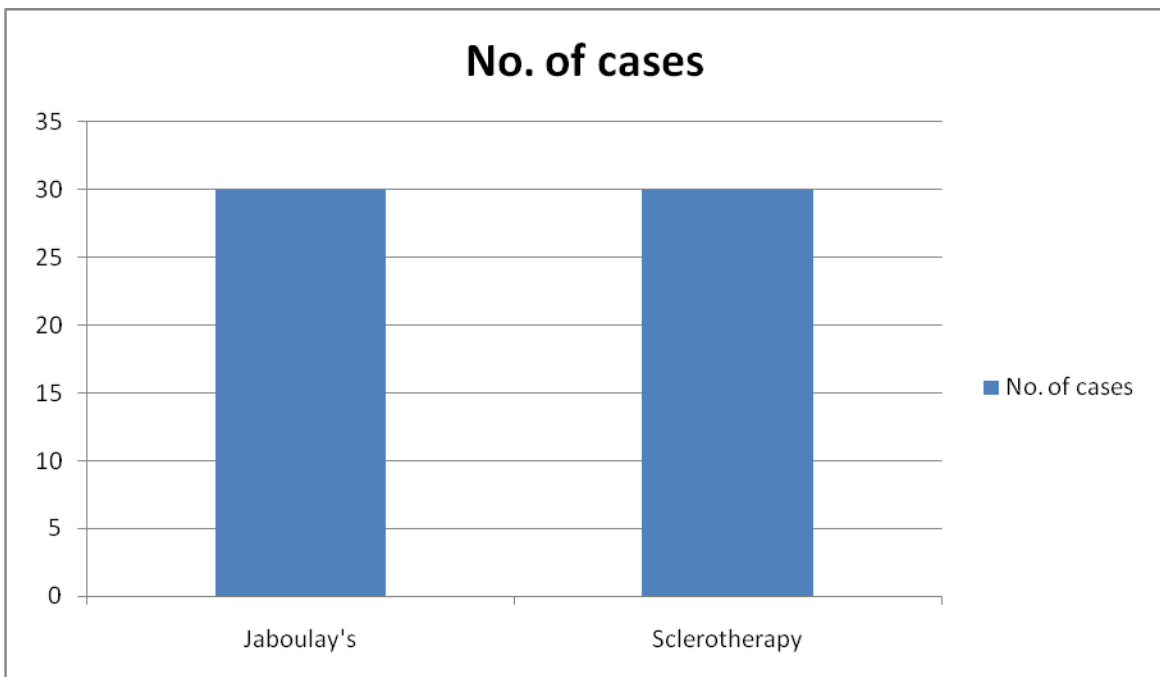




**TABLE 5**

Shows the types of treatments performed

<b>Treatment</b>	<b>Jaboulay's</b>	<b><u>Sclerotherapy</u></b>
Number of hydrocele sacs	30	30



In the present study, Jaboulay's procedure and injection sclerotherapy were performed on 30 hydrocele sacs each.

## POST OPERATIVELY

All patients were given tight scrotal support and appropriate antibiotics and analgesics. In case of surgery, corrugated rubber drain when kept was removed after 48 hours. The sutures in most cases were removed between 6-12 days. In a few cases associated with partial dehiscence or discharge from wound sutures were removed between 12-14 days and the patients were hospitalized and observed till the wound healed.

All cases of injection sclerotherapy were discharged 3 hours after the procedure. All were done as a day care surgery.

### **TABLE 6**

Shows the duration of post operative stay following each procedure

<b><u>Treatment modality</u></b>	<b><u>Duration of hospital stay</u></b>
Jaboulay's	6
Injection sclerotherapy	0

**TABLE 7**

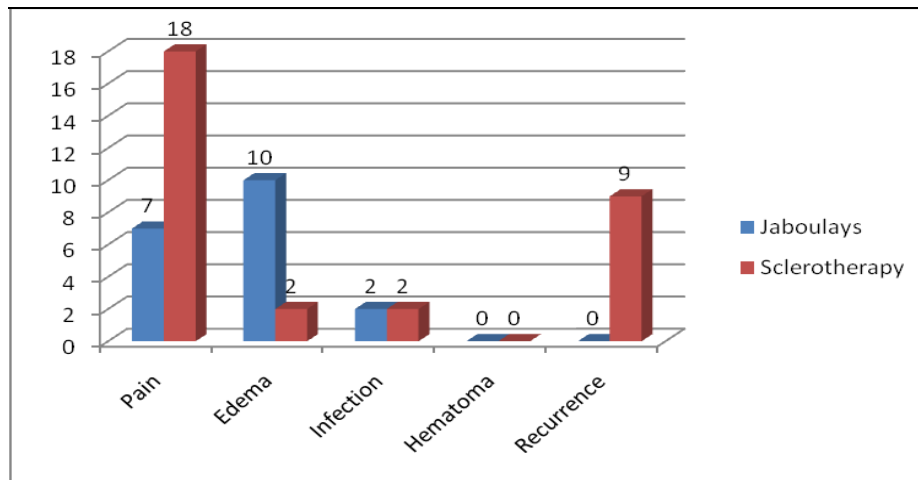
Shows details of Aspiration Sclerotherapy

<b>No of patients</b>	30
<b>Median Age (Range)</b>	36(19-60)
<b>Median Duration</b>	27(2-120)
<b>Median volume of fluid aspirated</b>	90ml
<b>Sclerosant used</b>	3% Phenol

**TABLE 8**

Shows the comparison of the complications between the two procedures

	<b><u>Jaboulays</u></b>	<b><u>Sclerotherapy</u></b>
Pain	7	18
Edema	10	2
Infection	2	2
Hematoma	0	0
Recurrence	0	9



**TABLE 9**

Aspirate V/S Recurrence

ASPIRATE	RECURRENCE	
	YES	NO
0-50ml	1	3
50-100ml	3	9
100-150ml	4	6
150-200ml	3	1
Statistical test	$\chi^2 = 3.517$ P = 0.319	

This shows that there is no association of the possibility of recurrence when compared to the amount of fluid aspirated

**Table 10**

Shows the comparison of the complications and the duration of hospital stay in case of complications in our study with respect to either of the treatment

Duration	<u>pain</u>		<u>Edema</u>		<u>Infection</u>	
	Yes	No	Yes	No	Yes	No
<b>1-4days</b>	5	2	0	7	0	7
<b>4-8days</b>	1	19	5	15	0	20
<b>8-12days</b>	6	2	5	3	2	6
<b>0</b>	13	12	2	23	2	23
Test Applied	$\chi^2 = 18.369$		$\chi^2 = 13.344$		$\chi^2 = 6.32$	
	P=0.000		P=0.004		P>0.05	
	Associated		Associated		not Associated	

Thus, there is significant association of hospital stay to Pain and Edema after the procedure. There were one or more complications in the same patient.

**Table 11**

Compares the Pain with respect to each treatment modality

PAIN	JABOULAY'S	SCLEROTHERAPY
Mild	7	12
Moderate	0	4
Severe	0	2
Nil	23	12
Statistical test	$\chi^2$	=10.773
	P=	0.013
	Significant	

There was statistically significant difference with regard to the degree of Pain when the surgery and sclerotherapy were compared

**Table 12**

Compares the Edema with respect to each treatment modality

<u>EDEMA</u>	<u>JABOULAY'S</u>	<u>SCLEROTHERAPY</u>
YES	7	12
NO	0	4
Statistical test	$\chi^2$	=6.667
	P=	0.010
	Significant	

There was statistically significant difference with regard to the incidence of edema post treatment when the surgery and sclerotherapy were compared

**Table 13**

Compares the rates of infection with respect to each treatment modality

<b>INFECTION</b>	<b>JABOULAY'S</b>	<b>SCLEROTHERAPY</b>
PRESENT	2	2
ABSENT	28	28
Statistical test	P >0.05  No significant association	

There was no statistically significant difference with regard to the incidence of infection post treatment when the surgery and sclerotherapy were compared

**Table 14**

Aspirate V/s Recurrence

<b><u>Volume</u></b>	<b><u>Yes</u></b>	<b><u>No</u></b>
0-50ml	1	3
50-100ml	3	9
100-150ml	4	6
150-200ml	3	1
Statistical test	$\chi^2 = 3.517$ P=0.319 No Association	

Thus, there is no association between the possibilities of recurrence with the initial size of the sac.

**Table 15**

Recurrence patterns

<u>Aspirate volume</u>	<u>Recurrence</u>		
	<u>Yes</u>		<u>No</u>
	<u>1 Extra Session</u>	<u>2 Extra Sessions</u>	
<b>0-50ml</b>	1	-	3
<b>50-100ml</b>	3	-	9
<b>100-150ml</b>	2	2	6
<b>150-200ml</b>	-	3	1

Out of the 30 patients treated with sclerotherapy, primary cure was seen in 21 cases (70%) 9 patients had recurrences. Of the 9 patients, cure was achieved with 2<sup>nd</sup> session of sclerotherapy in 4(13.33%) patients.5 of the 9(16.67%) patients required another extra session of sclerotherapy.

**Table 16:**

	<u>Jaboulay's</u>	<u>Sclerotherapy</u>
Drugs	960	150
OT charges	525	100
Total	1485	250

Thus there was 6 fold increases in cost in the Jaboulay's group when compared to sclerotherapy



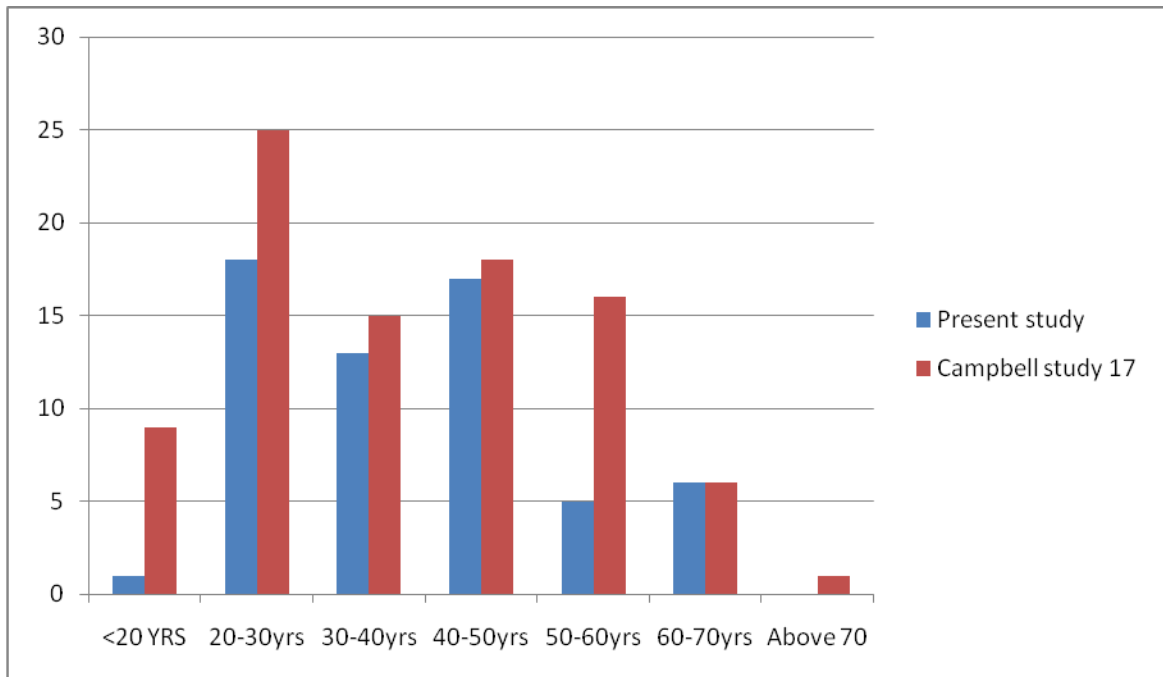
## DISCUSSION

For long surgery has been widely accepted as the most effective treatment of hydrocele. The disadvantage of surgical treatment is high incidence of complications such as hematoma and infection. Aspiration and sclerotherapy can also be used for the treatment for hydroceles. The main complications as mentioned in literature with regards to the latter are pain and recurrence. However in elderly patients, or patients not willing for surgery, patients wanting to defer the surgery, patients not willing for loss of days of work or patients not fit for surgery can be effectively treated by aspiration and sclerotherapy as an alternative to surgery.

The following tables show the comparison of the present study with the previous studies with respect to various important components.

**Table 17**

<b><u>AGE</u></b>	<b><u>Present study</u></b>	<b><u>Campbell study</u></b> <sup>17</sup>
<20 YRS	1	9
20-30yrs	18	25
30-40yrs	13	15
40-50yrs	17	18
50-60yrs	5	16
60-70yrs	6	6
Above 70	0	1
TOTAL	<b>60</b>	

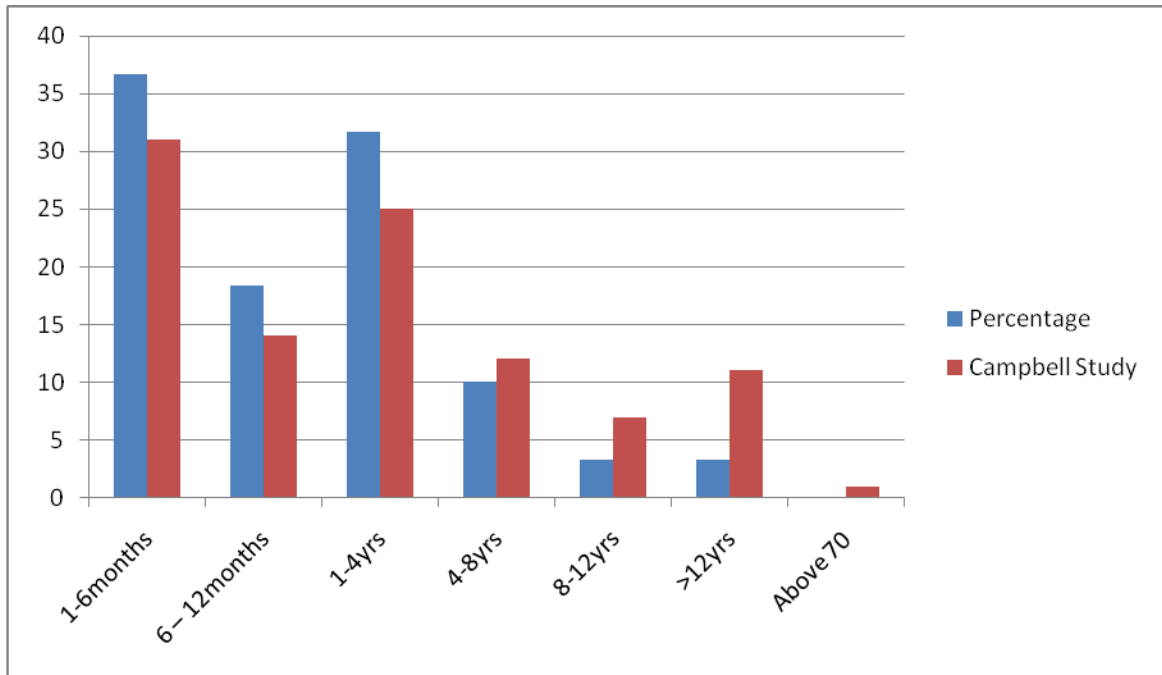


**Table 18**

<b><u>Duration</u></b>	<b><u>Percentage</u></b>	<b><u>Campbell Study</u></b>
1-6months	36.67	31
6 – 12months	18.33	14
1-4yrs	31.67	25
4-8yrs	10	12
8-12yrs	3.33	7
>12yrs	3.33	11

Above table shows that in the present study a maximum of 37% of patients carried the hydrocele for 0-6months. This is similar to the study of Campbell where 31% of patients

carried the hydrocele for 0-6months. With this it can be concluded that majority of patients consult a doctor within 6 months of developing hydrocele.



**Table 19**

Shows the duration of hospital stay compared among other similar studies

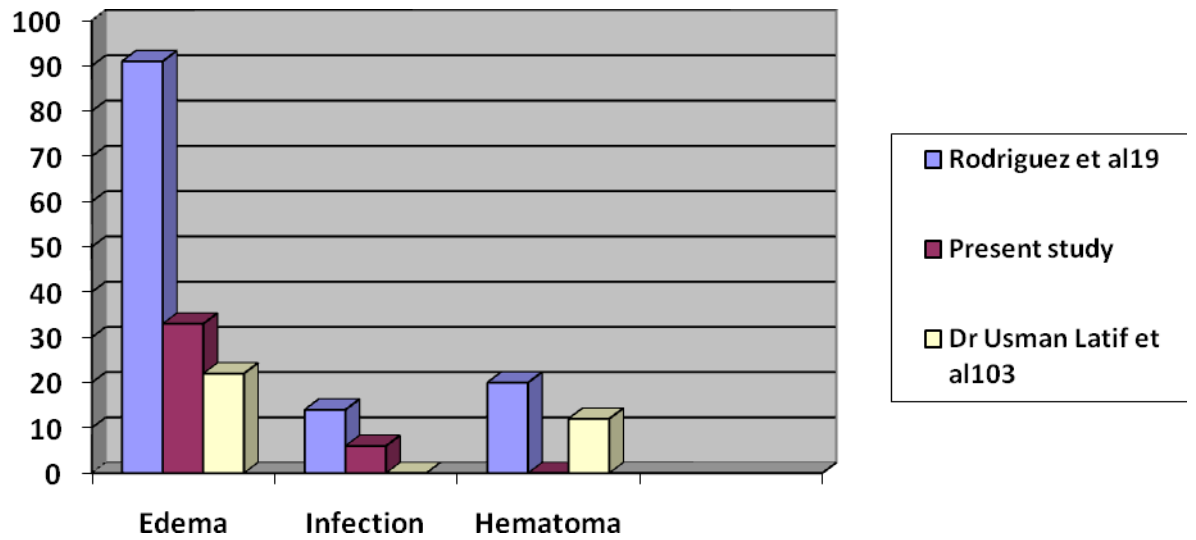
<u>Treatment</u>	<u>Present study</u>	<u>Agarwal et al</u> <sup>107</sup>	<u>Usman Latif et al</u> <sup>103</sup>	<u>Rai et al</u>
Sclerotherapy	0	0	0	-
Jaboulay's	6	9.7	-	9

Above table compares the average number of days of post operative day after the 2 types of treatment modalities

**Table 20**

The following table shows(in percentage) the comparison of incidence of Haematoma, skin edema and infection between the present study and Rodriguez et al study and a study published in Professional Med Journal<sup>103</sup>.

	<b>Rodriguez et al<sup>19</sup></b>	<b>Present study</b>	<b>Dr Usman Latif et al<sup>103</sup></b>
Edema	91	33	20%
Infection	14	6	12%
Hematoma	22	0	12%

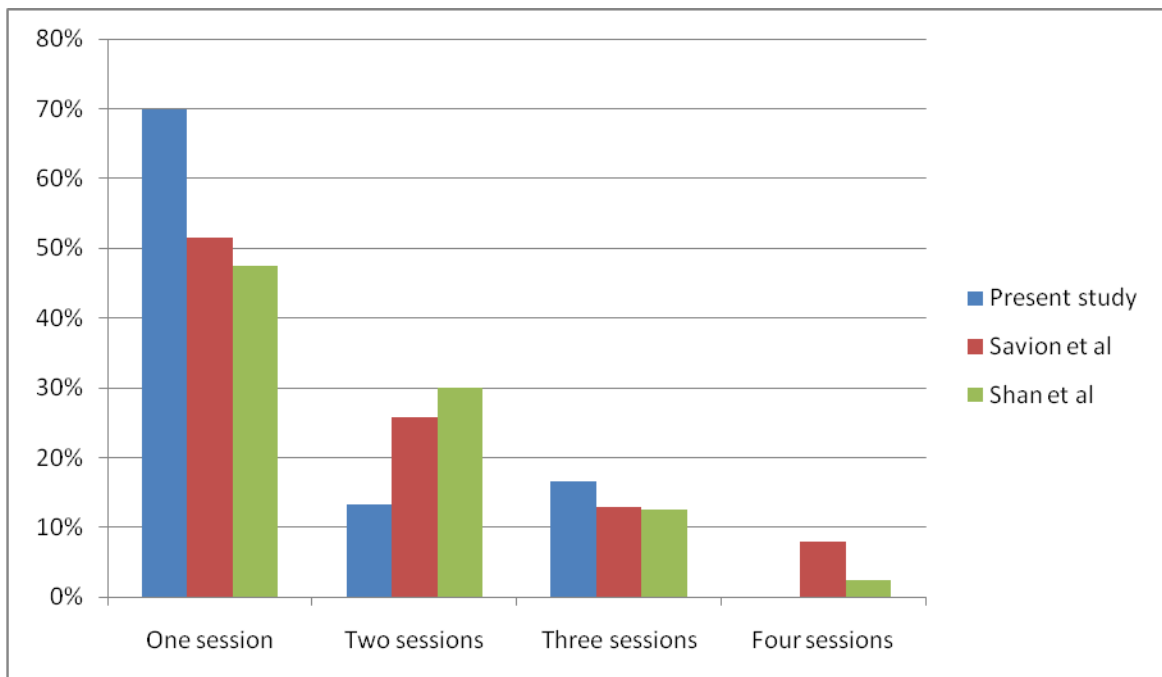


**Table 21**

Shows the number of injections needed for complete cure in case of sclerotherapy

<b><u>No of Injections</u></b>	<b><u>Present study</u></b>	<b><u>Savion et al</u></b> <sup>109</sup>	<b><u>Shan et al</u></b> <sup>102</sup>
One session	70%	51.6%	47.5%
Two sessions	13.33%	25.8%	30%
Three sessions	16.67%	13%	12.5%
Four sessions	0	8%	2.5%

The above table shows that the results of our study are in comparable to the study of Savion et al in 1989 in which 2.5% phenol was used as the sclerosing agent, where they concluded that sclerotherapy with phenol 2.5% is a painless, highly effective, safe and economical procedure that permits one to avoid an operation, anesthesia and hospitalization and that its use is warranted in adults and particularly in the elderly.



## **SUMMARY AND CONCLUSIONS**

1. Maximum number of patients were in the age group of 20-30years
2. In this study there was even distribution of cases among various occupations. This indicates that hydrocele does not have any predilection for a particular occupation
3. Most of the patients came to medical care within 6 months of development of hydrocele
4. Almost all patients presented with a scrotal swelling and a few had pain and heaviness.
5. Spinal anaesthesia was used among patients undergoing hydrocele surgery and local anaesthesia among those undergoing sclerotherapy
6. The average post operative stay after surgery was 6 days where as all patients undergoing sclerotherapy were discharged on the same day of the procedure after pain had subsided.
7. There was more number of cases associated with pain in the Sclerotherapy group (though mild in most cases) as compared to the Jaboulay's group
8. There was more number of cases associated with post operative edema in the group as Jaboulay's compared to the Sclerotherapy group
9. The infection rates among the 2 groups were same.
10. 70% of the cases of sclerotherapy achieved primary cure. Among the 30% recurrences, 13.33% achieved cure after 2<sup>nd</sup> session of sclerotherapy and 16.67% patients achieved cure after the 3<sup>rd</sup>.

11. There was significant difference in the costs, sclerotherapy being cheaper when compared to surgery group.

## **CONCLUSION**

Sclerotherapy is highly effective, safe and economical procedure that permits one to avoid an operation, anesthesia and hospitalization in patients who are either not fit, don't desire for surgery. Its use is warranted in adults and particularly in the elderly.

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**SCHEME OF CASE TAKING:**

1. Particulars of the patient

Name:

CASE NO:

Age/Sex/Religion:

IP NO:

Occupation

DOA:

Residence

DOS:

DOD:

2. Chief complaints

3. History of presenting illness

Duration

Mode of onset

Other symptoms associated with the swelling

Pain

Fever

4. Local examination:

Inspection:

Situation and extent of swelling

Size of swelling

Skin over swelling

Palpation

Temperature

Tenderness

Size

Consistency

Fluctuation

Translucency

### 9. Examination of External Genitalia

Testis

Epididymis

Cord structures

Treatment Given

Type of anaesthesia

Time taken for treating the sac

Post procedure complications

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
Pain							
Scrotal edema							
Wound infection							
Hematoma							

Recurrence of symptoms

Duration of hospital stay

Total cost of treatment

Inference:

Comments:

SAMPLE INFORMED CONSENT FORM

BLDEU'S SHRI B. M. PATIL MEDICAL COLLEGE AND RESEARCH CENTER,

BIJAPUR- 586103

**TITLE OF THE PROJECT** - Comparative study of efficacy of injection sclerotherapy versus surgery as primary modality therapy in treatment of primary hydrocoele

**PG GUIDE: -** Prof Dr M B Patil

**PG STUDENT: -** Dr Jayakarthish Y

**PURPOSE OF RESEARCH:**

I have been informed that Injection sclerotherapy is a substitute for surgery(Hydrocoelectomy) in treatment of hydrocoele

**PROCEDURE:**

I understand that relevant history will be taken and I/My ward will undergo detailed clinical examination after which necessary investigation will be done whenever required.

**RISK AND DISCOMFORTS:**

I understand there is no risk involved and I will experience some pain and discomfort during my procedures performed.

**BENEFITS:**

I understand that my/my ward's participation in this study will help the investigator to understand the disease better and will help in management.

**CONFIDENTIALITY:**

I understand that the medical information produced by this study will become a part of Hospital records and will be subject to the confidentiality and privacy regulation. Information of a sensitive personal nature will not be a part of the medical records, but investigator's research file and identified only by a code number. The code-key connecting name to numbers will be kept in a separate location.

If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photographs and videotapes and hear the audiotapes before giving this permission.

**REQUEST FOR MORE INFORMATION:**

I understand that I may ask more questions about the study at anytime. Dr. Jayakarthish Y is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation.

If during the study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. A copy of this consent form will be given to me to keep for careful reading.

**REFUSAL FOR WITHDRAWAL OF PARTICIPATION:**

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that Dr. Jayakarthish Y may terminate my participation in the study after he has explained the reasons for doing so and has helped arrange for my continued care by my own physician or physical therapist, if this is appropriate.

**INJURY STATEMENT:**

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me, but no further compensation would be provided. I understand that by my agreement to participate in this study I am not waiving any of my legal rights.

**STUDY SUBJECT CONSENT STATEMENT:**

I confirm that Dr. Jayakarthish Y has explained to me the purpose of research, the study procedures that I will undergo, and the possible risks and discomforts as well as benefits that I may experience in my own language. I have read and I understand this consent form. Therefore, I agree to give consent to participate as a subject in this research project.

\_\_\_\_\_

Participant / Guardian

\_\_\_\_\_

Date

\_\_\_\_\_

Witness to signature

\_\_\_\_\_

Date

I have explained to \_\_\_\_\_ the purpose of the research, the procedures required and the possible risks and benefits to the best of my ability in patient's own language.

\_\_\_\_\_

Dr. Jayakarthish Y

(Investigator)

\_\_\_\_\_

Date