

**BRIEF SUMMARY: HYDROCELE AND CURRENT THERAPY OPTIONS**

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Sciences (GIPS), Lucknow,  
Uttar Pradesh, India.**ABSTRACT**

A hydrocele is a buildup of serous fluid in a body cavity. The English word "hydrocele" is derived from the Greek words "hydro," which means "water," and "kele," which means "tumour" (swelling). When transudate or watery (serous) fluid accumulates excessively, the sac of tunica vaginalis becomes plugged. A hydrocele is brought on by the fluid buildup in the bilayer tunica vaginalis. In both children and adults, peritoneal fluid frequently accumulates because of the patent processus vaginalis, which allows it to travel through the processus vaginalis into the scrotum and surround the testicle. The bulk of studies on abdominal-scrotal hydrocele that could be found all used the same definition: an abdominal hydrocele is when the inguinoscrotal and abdominal chambers are in contact with one another. Hydrocele, which is characterized by a buildup of fluid in the tunica vaginalis that causes the scrotum to expand, is one of the chronic forms in men. There are 26.79 million cases of hydrocele worldwide, with India accounting for 48% of those cases. This review study discusses the etiopathogenesis, pathology, aetiology, risk factors, and combined therapy (surgery) related to hydrocele.

**KEYWORDS:** Hydroceles, Histology, Causes, Symptoms, Risk factors, Diagnosis and Treatments.

**INTRODUCTION**

A collection of serous fluid in a bodily cavity is known as a hydrocele. The buildup of fluids surrounding a testicle is known as a hydrocele testis, which is the most typical type of hydrocele. It is frequently brought on by fluid accumulating in the tunica vaginalis, a peritoneum-derived layer wrapped around the testicle. It disappears without therapy in the first year if there is no hernia. Although hydroceles often only affect males, a few female cases have been reported in the Canal of Nuck.<sup>[1]</sup> The Greek words "hydro," which means "water," and "kele," which means "tumour" (swelling), combine to form the English word "hydrocele." The sac of tunica vaginalis becomes clogged with an excessive buildup of transudate or watery (serous) fluid. The Wuchereria bancrofti-caused lymphatic filariasis that it represents is the most frequently seen chronic clinical presentation.<sup>[2]</sup> The fluid that accumulates in the bilayer tunica vaginalis causes a hydrocele. Due to the patent processus vaginalis, which lets peritoneal fluid pass through the processus vaginalis into the scrotum and surrounds the testicle, this fluid often builds up in infants and adults.<sup>[3]</sup> The precise moment the processus vaginalis closes on its own accord is unknown, despite the fact that the majority of paediatric hydroceles resolve on their own during the first year of life.<sup>[4]</sup> The majority of observable papers on abdominoscrotal hydrocele (ASH) presented the same definition, stating that an abdominal hydrocele is one that causes the inguinoscrotal and abdominal cavities to communicate with one another.<sup>[5]</sup> Between the two layers

of the tunica vaginalis of the testis, a hydrocele is an abnormal collection of serous fluid. It might be inherited or acquired. Failure of the process vaginalis to obliterate leads to congenital hydrocele. The testes begin to develop retroperitoneally in the abdomen during the third gestational week and then proceed to descend the inguinal canal into the scrotum. A fold of peritoneum from the processus vaginalis follows the testes as they descend towards the scrotum. The distal section of the processus vaginalis, which normally forms the tunica vaginalis, which covers the anterior, lateral, and medial sides of the testes, survives the destruction of the proximal portion of the processus vaginalis. If the proximal section of the processus vaginalis is still open and allows unrestricted connection with the peritoneal cavity, causing congenital hydrocele, the tunica vaginalis is a potential location for fluid to collect. A fluid-filled sac that is generally present in the scrotum and less frequently in the external genitalia and pelvic areas is the hallmark of a hydrocele. It might be a symptom of certain serious underlying disorders. A patent processus vaginalis or an imbalance of secretion and absorption inside the tunica vaginalis may be the cause of fluid accumulation. A hydrocele can be divided into a number of categories and can affect both sexes at any age. Although hydrocele typically causes little pain, it can have negative physical and psychological effects.<sup>[3,6]</sup> It is a rare condition brought on by the processus vaginalis' failure to shut during embryological development, which can result in hydrocele and inguinal hernia.<sup>[7]</sup> As a result,

meticulous follow-up is crucial, and the best time for surgical intervention should be carefully assessed. The patent processus vaginalis is usually tied off as a therapy for hydrocele. However, there is debate regarding when a surgical intervention for hydrocele should be performed. If an associated inguinal hernia is detected, early surgical surgery is taken into account.<sup>[8]</sup> Infection, ongoing edoema, discomfort, and hematoma are all complications. Injuries to the epididymis and/or vas deferens may also occur in some people, which may reduce fertility. suggest that these operations have a 20% overall complication rate.<sup>[9]</sup> The most typical cause of scrotal enlargement in adult males is a hydrocele, which is an accumulation of fluid in the potential space between the visceral and parietal tunica vaginalis (TV). Despite the fact that hydrocele is a benign illness, patients frequently seek medical attention because of discomfort, aesthetic issues, and restrictions on everyday activities. Sclerotherapy, endoscopic hydrocele ablation, silicone catheter drainage, and surgical techniques like the Jaboulay's operation or Lord's approach are just a few of the minimally invasive procedures that have been widely used for treatment.<sup>[10]</sup> One of the chronic forms of in men is hydrocele, which is characterized by an accumulation of fluid in the tunica vaginalis that causes the scrotum to enlarge. In the world, there are 26.79 million cases of hydrocele, with 48% of those cases occurring in India.<sup>[11]</sup>



**Fig.1: Hydrocele-related illness.**

#### TYPES OF HYDROCELES

The two types of hydroceles are the primary and secondary.

##### ❖ Primary Hydroceles

At term or within 1-2 years after birth, the spermatic cord's processus vaginalis merges, destroying the ability of the abdomen and scrotum to communicate. The tunica vaginalis covers the testis, leaving the distal end exposed and potentially creating a gap where fluid buildup could result in the development of a hydrocele. There are four forms of primary hydrocele depending on where the processus vaginalis is destroyed.

##### ▪ Vaginal Hydrocele

Only around the testes does the processus vaginalis stay patent, and as fluid builds up, it makes the testes impalpable.

##### ▪ Encysted Hydrocele of the Cord

Proximal and distal sections of the processus vaginalis are destroyed, but the middle region is left intact and fluid builds up there.

##### ▪ Congenital Hydrocele

When the peritoneal cavity and processus vaginalis are open and communicating, this happens. While peritoneal fluid can travel through this connection, the intraabdominal contents cannot herniate through due to its small size.

##### ▪ Infantile Hydrocele

In this instance, the deep inguinal ring is where the processus vaginalis is destroyed. The area distal to it, however, is still open and enables fluid collection.

##### ❖ Secondary Hydrocele

This typically results from an underlying illness, such as an infection (filariasis, epididymal TB, syphilis), trauma (post-herniorrhaphy hydrocele), or cancer. With the exception of secondary hydrocele brought on by filariasis, which can be very enormous, this form of hydrocele typically has a minor size.<sup>[12]</sup>

#### HISTOLOGY

The most common complaint of hydrocele patients is a painless scrotal enlargement that makes the testicles impalpable and has a positive transillumination and fluctuation. Both supine and upright positions should be used by the examiner to examine this edoema. The following trio of inquiries should be made by the supplier during the examination. Is it possible to feel the chord while extending over the swelling? If not, this can be a hernia or a congenital or infantile hydrocele. When compared to a hydrocele, a hernia differs by having an expansive cough impulse and reducibility but not by possessing transillumination or fluctuation. the epididymis, the testis, or both of these structures are affected by the swelling. Both the testes and the epididymis frequently have hydroceles that make them impalpable. Does the swollen area glow. The prevalence of primary hydrocele increases with age. A common hydrocele risk factor is living in a warm climate. It grows enormously without causing any pain before the patient seeks medical help. With the exception of filarial hydrocele, the secondary hydrocele is often smaller. Because the hydrocele fluid normally drains into the peritoneum when resting flat, congenital hydrocele tends to be intermittent. Congenital hydrocele, however, does not shrink when pressure is applied to it. Near the spermatic cord, an encysted hydrocele feels like a smooth oval bulge. It should be distinguished since it could have an inguinal hernia-like sensation. A cyst that develops in front of the uterus' round ligament is called a hydrocele of the canal of Nuck in female patients.<sup>[7,13]</sup>

#### CAUSES

There are fundamental processes by which hydrocele can grow. via a congenitally present patent processes

vaginalis, connection to the peritoneal cavity. extra fluid production (secondary hydrocele). fluid absorption that is flawed. interference, such as in filarial hydroceles, with the lymphatic drainage of scrotal tissues. The primary cause of hydrocele in children is a functioning processus vaginalis, which permits peritoneal fluid to enter the scrotum. The disruption of the lymphatic system is one of the many factors that can lead to hydrocele, and it is typically the most prevalent. The postoperative complication of hydrocele is brought on by surgeries, such as laparoscopic varicocele, which can either fully or partially compromise testicular lymphatic drainage. Another contributing factor to hydrocele is an unbalanced flow of drainage and input into the lymphatic tissue surrounding the scrotum.<sup>[14-16]</sup> Aquaporin channels may be to blame for noncommunicating hydrocele. in connection to noncommunicating hydrocele, the expression of aquaporin channels was examined. Tunica vaginalis from hydrocele patients was examined, and the results were compared to a control group of males without hydrocele. Aquaporin channels 1 and 3 were discovered using Western blot analysis. The creation of hydroceles may be related to abnormalities with aquaporin channels, which control water flow across the plasma membrane. The research found that patients with hydrocele had an overexpression of aquaporin channel one in the tunica vaginalis. Increased fluid output from capillaries with overexpressed aquaporin channel 1 may

cause lymphatic drainage to be less than the output, resulting in the hydrocele fluid. This groundbreaking work raises questions and should inspire additional research into the function of aquaporin channels and how they relate to hydrocele.<sup>[17]</sup> After a kidney transplant, a hydrocele might also happen. The most likely reason of this is a problem with the lymphatic system. explains a study that involved numerous kidney transplants and difficulties with the testicles. The most frequent consequence, hydrocele, was brought on by a disturbance of the lymphatic pathways along the iliac stream. Despite the lymphatics' regular fluid release, the lymphatic disturbance adversely damaged their ability to absorb nutrients, leading to the hydrocele.<sup>[18]</sup> A unusual form of hydrocele is a rheumatic hydrocele. a 53-year-old man with brown deposits on the inside of the tunica vaginalis underwent hydrocele repair surgery. Following a biopsy, the deposits were determined to be vascular fibrous tissue with necrobiosis foci that were palisaded macrophages. This is a sign of a tissue response similar to rheumatoid arthritis. The development of hydrocele in this patient may have been caused by an immunological reaction to the tunica vaginalis.<sup>[19]</sup> Wuchereria bancrofti, which infects 120 million people worldwide in more than 73 countries, is the primary cause of filariasis in adults.<sup>[20]</sup> This is not the case in the United States, where iatrogenic reasons (such as trauma or complications following herniorrhaphy) are more common.<sup>[21]</sup>

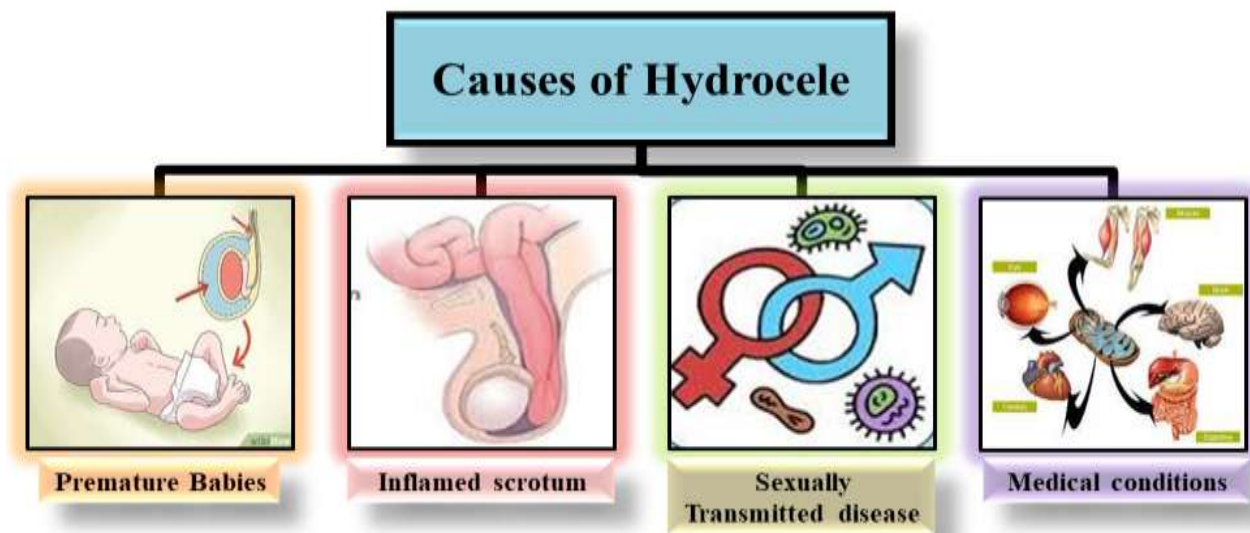


Fig.2: Some Hydrocele-Related Causes.

**SYMPTOMS AND COMPLICATIONS**

One or both testicles can swell hydrocele, which is painless. Adults may have weight in their scrotum due to the swelling. Generally speaking, discomfort worsens as swelling does. The swelled area may occasionally be smaller in the morning and larger in the afternoon. Infection, Pyocele, Haematocele, Testicular atrophy, Infertility (caused by the cessation of spermatogenesis as a result of increasing strain on the testis' blood supply from edoema), Rupture, hydrocele hernia (rare).<sup>[22-24]</sup> A hydrocele may burst after a small injury or occasionally

on its own. A quick solution is required. Hydrocele may occasionally be cured as a result of fluid absorption through dartos. Hematocele can develop suddenly or as a result of trauma. The traumatic hematocele causes quick onset pain and a rise in hydrocele swelling, which causes the hydrocele to lose its translucency. Gradually, there is spontaneous bleeding into the hydrocele sac. When the blood clots, the hydrocele transforms into an old, clotted hematocele that might be difficult to distinguish from testicular cancer. Urgent treatment is necessary for acute hematocele. The typical treatment for

an old clotted hematocele is orchietomy. Pyocele is characterized by pain, a fever that may be accompanied by rigour, redness, and a sudden enlargement of the scrotal bulge. It is the outcome of secondary infection of hydrocele. Antibiotics and drainage are used in the therapy. Calcification - Fibrosis and thickening of the

tunica are brought on by recurrent bouts of filariasis, and over time, these changes may lead to calcification. Severe azoospermia and sterility may develop from the testis, epididymis, and vas being calcified in an old-standing filarial hydrocele.<sup>[25]</sup>

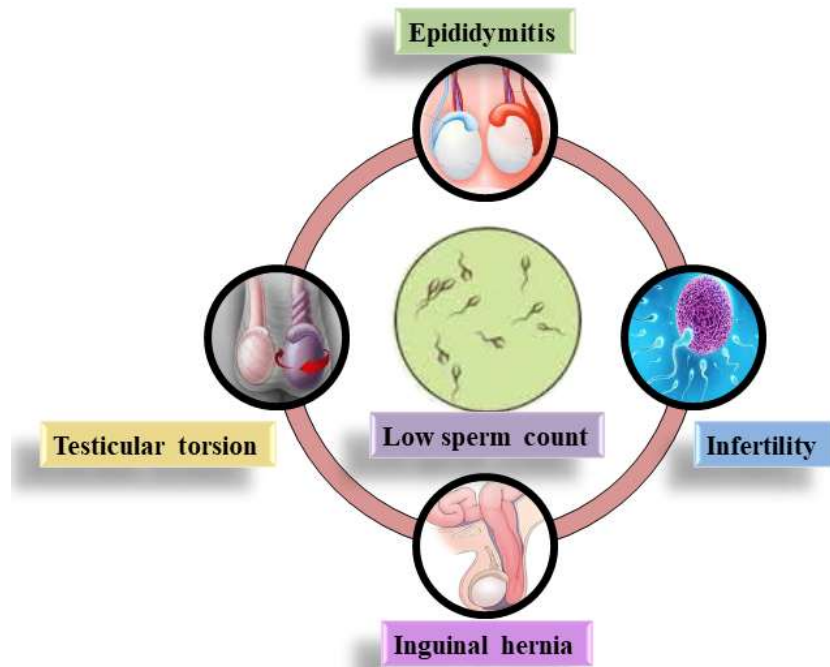


**Fig.3: Hydrocele: Symptoms and Complications.**

**RISK FACTORS**

Babies who are delivered prematurely—more than three weeks before their due dates—are more likely to develop a hydrocele. The following are risk factors for developing a hydrocele later in life: The scrotum may be painful or inflamed. infection, particularly one that is sexually transmitted. On its own, hydrocele does not

appear to have a direct impact on future fertility. But the testes are dramatically changed when certain related pathological symptoms are present. Compared to hydrocele patients without accompanying disease, children with hydrocele and pathological signs are much older.<sup>[12,26]</sup>



**Fig.4: Risk factors for hydrocele.**

#### ETIOPATHOGENESIS AND PATHOLOGY

The tunica vaginalis usually has a thin layer of serous fluid (capillary fluid). It is produced by the serous tunica surfaces and reabsorbed by the spermatic cord's lymphatic and venous systems. As a result, the creation and reabsorption of tunica vaginalis fluid are in a dynamic equilibrium<sup>[27]</sup> Inguinal lymphatics and the epididymis are frequently home to filarial worms, which cause inflammation and adenolymphatic blockage. Adenolymphatic blockage and fluid transudation in the tunica are caused by an excessive amount of fluid being produced as a result of frequent bouts of filarial epididymitis or funiculitis. Damage to the tunica's endothelium and obstruction of the lymphatics in the spermatic cord and inguinal area interfere with fluid absorption and drainage; lymphatic obstruction appears to be the main culprit. Rarely, a spermatic cord lymph varix may rupture into the scrotal sac, causing lymphocele, one type of hydrocele. Given that hydroceles are still prevalent in Leogane, Haiti, despite the successful eradication of filariasis with a mass drug administration programme, persistent processus vaginalis may play a role in the pathogenesis of hydrocele.<sup>[28]</sup> Fluid Although the volume increase is variable, it does occur. The fluid is similar to idiopathic hydrocele in early hydrocele. Its specific gravity is between 1022 and 1024, and it is clear and amber in colour (like urine). 6% albumin, fibrinogen, inorganic salts, and leukocytes are absent. The liquid does not clot on its own, but if it is combined with even a tiny amount of blood, fibrinogen is converted into fibrin, causing the fluid to coagulate to create a gel. A late hydrocele's fluid is high in cholesterol and includes an average of 5.7 g % protein. The fluid from a hydrocele may contain microfilariae for the first time. However, unless tainted by blood during aspiration,

the majority of hydroceles do not have microfilariae.<sup>[29,30]</sup> T. Vaginalis It exhibits symptoms of ongoing inflammation and may include cholesterol plaques that are yellow. In a persistent case, it can have significantly thickened. It might have calcified remnants of adult filarial worms and be calcified in some areas. In idiopathic hydrocele, tunica calcification is quite uncommon. Microscopically, it exhibits follicular and perivascular lymphoid cells, lymphatic dilatation, interstitial edoema, and chronic inflammatory alterations. Epididymis It could be normal or enlarged as a result of interstitial fibrosis, chronic inflammation, and lymphatic dilatation. There might be leftover filarial worms. Testicle this organ may be healthy or have alterations resembling those in the epididymis. Modifications might be seen in the seminiferous tubules. The tunica albuginea has thickened, and it may have many adhesions and a persistent infiltration of inflammatory cells. Testicular atrophy may occasionally be observed in cases when the intrascrotal pressure has been chronically elevated. Other Modifications Increasing scrotum weight may cause compensatory hypertrophy of the cremaster muscle. Although it becomes functionally weak, the dartos muscle grows larger and the scrotum's skin loses its flexibility.<sup>[31]</sup>

#### CLINICAL HALLMARKS

Over 80% of hydroceles are brought on by a filarial infection, which is common in lymphatic filariasis. In a patient from an endemic area, a hydrocele that is accompanied by scrotal lymphangiectasis or cord nodules is strongly suggestive of a filarial aetiology. It has been noted that microfilaremia and the filarial density in a population enhance the incidence of hydrocele in that population. It frequently happens after

one or more episodes of epididymo-orchitis. Early acute hydrocele caused by a first filariasis infection may experience spontaneous or full resolution of the edoema. The majority of patients do not, however, have a history of filariasis. Although it can happen at any age, from infancy to old age, adults are more likely to experience it. The patient typically exhibits an insidiously developing unilateral, frequently painless scrotal enlargement. With the burial of the penis in the front wall of the scrotum, it may grow gradually and eventually reach a huge size. It is not unusual to have a bilateral hydrocele that has varying diameters on the two sides.<sup>[31-33]</sup> Except in cases of congenital hydrocele and abdominoscrotal swelling, the highest limit of swelling is achievable. It is translucent, non-tender, fluctuant, and smooth. Translucency may be lost in long-standing hydroceles as a result of increased tunica thickness or calcification, or it may become more murky due to the presence of chylocele, hematocele, or pyocele. The testis is felt in little hydrocele even if fluid surrounds it on all sides, but it is not palpable in massive hydrocele. In bilateral hydrocele, the penis is in the centre, while in unilateral hydrocele, it may deviate to the opposite side. It may be hidden in the anterior scrotum wall and be a big hydrocele. A little hydrocele has no negative social or economic effects, whereas a large hydrocele could have major socioeconomic effects. research in a few villages. indicated that hydrocele has a detrimental impact on sexual activity, work performance, and the fear of being teased in public.<sup>[2,34]</sup>

### HYDROCELE DIAGNOSIS

These are intended to rule out any potential further surgical or medical conditions in the differential diagnosis. Laboratory testing are typically not necessary for inguinal hernias, however leukocytosis can help differentiate them from hydrocele in cases where they are incarcerated, which can mimic hydrocele. An inguinal hernia is more likely to be the cause of negative transillumination and palpable bowel at the deep ring on the digital examination. Testicular Tumour: If malignant teratomas or other germ cell tumours are suspected, serum alpha-fetoprotein and human chorionic gonadotropin (HCG) levels should be checked. Orchitis and epididymitis can result in secondary or reactive hydroceles. Urinalysis and urine culture may be helpful in certain situations. Imaging diagnosis- These are useful for identifying and assessing hydrocele. Additionally, they can check for hidden conditions like epididymitis, testicular torsion, or testicular tumour. Ultrasonography: Because it provides good detail of the testicular parenchyma, scrotal discomfort or the inability to define the testicular anatomy on touch are indications for ultrasonography. An region that is anechoic or echolucent around the testis is a sign of hydrocele during an ultrasonography examination. The size and description of the hydrocele may be improved with the use of ultrasonography. Ultrasonography makes it simple to identify between spermatoceles, testicular tumours, and testicular atrophy. The patient should be evaluated both

supine and upright because, depending on the patient's position, hydrocele has a propensity to reduce into the abdomen. Duplex ultrasound: It gives details about testicular blood flow, which is diminished or nonexistent in hydroceles brought on by testicular torsions. The epididymal flow would be enhanced in the event of hydroceles owing to epididymitis, though. Additionally, duplex tests aid in locating the varicoceles' Valsalva-augmented regurgitant flow. Abdominal plain radiography: One may notice gas covering the groin in an inguinal hernia that is incarcerated.<sup>[12,35]</sup> Eosinophilia may be visible in blood. The fluid from a hydrocele may contain microfilariae even if microfilaremia is typically absent. The scrotal puncture should be avoided, nevertheless, due to the risk of secondary infection. In most cases, the immunological tests for filariasis are positive. A testicular tumour with a subsequent hydrocele, for example, can be detected with ultrasonography, which also provides information about the status of the testis. Also possible is a CT scan. A hydrocele fluid immunologic analysis - Fluid from a hydrocele can be identified equally sensitively for both filaria-related antigens (Og4C3 test) and antibodies present in serum (ELISA). This test can therefore be used as a substitute in the immunodiagnosis of the filarial aetiology of hydrocele and to track the filaria elimination programme.<sup>[36]</sup>

### HYDROCELE TREATMENTS THAT ARE AVAILABLE

The preferred course of treatment for hydrocele is surgery, which is indicated when the condition worsens or manifests symptoms. If congenital hydroceles do not resolve on their own, a herniotomy is performed. Contrarily, acquired hydroceles go away after the main underlying problem is treated. There are two typical surgical methods for hydrocelectomy. Typically, a big hydrocele necessitates surgery; the following are the indications: interference with employment, sexual activity, and/or urination since a big hydrocele may bury the penis in the scrotum. hydrocele symptoms, including dragging pain and heaviness, Applicants for public service who are medically ineligible.<sup>[25]</sup>

#### ❖ Both eversion and excision

This method works well for chyloceles and big hydroceles with thick walls. The testes are then placed in a freshly generated pocket between the fascial layers of the scrotum after the tunica vaginalis is subtotally excised and the sac behind them is everted (Jaboulay operation). It is especially important to avoid harming the ductus deferens, testicular veins, or the epididymis.

#### ❖ Plication

Thin-walled hydroceles are a good candidate for this procedure. The risk of hematocele or infection is considerably decreased because there is less dissection. By using a sequence of numerous interrupted chromic catgut sutures, the tunica is bundled into a ruff during

lord plication so that the sac can develop fibrous tissue.<sup>[37]</sup>

#### ❖ **Aspiration**

Another treatment option for hydrocele is aspiration, particularly for those who cannot endure surgery. However, within a week or so, hydrocele fluid almost invariably starts to recur.<sup>[9]</sup> Additionally, there is a substantial risk of infection and hemocele following aspiration. It has been demonstrated that aspiration followed by an injection of a sclerosant (tetracycline or doxycycline) is successful but uncomfortable.<sup>[38]</sup>

#### ❖ **Anaesthesia**

Surgery is typically performed under local anaesthesia with lignocaine (1%) injected into the spermatic cord before being administered to the site of the incision. Furthermore, spinal, epidural, and general anaesthesia are all options for treating hydrocele. The choice of anaesthesia depends on the preferences of the surgeon and the patient as well as the facilities available. Surgical techniques include the Lord's surgery, sac eversion, and sac excision. Prior to surgery, it is essential to guarantee that all bacterial, fungal, and superficial skin inflammation is completely under control. A full body bath and twice-daily scrotal cleaning with soap and water for three days assure hygiene. The rate of operational wound infection must be decreased. Correct investigations must rule out diabetes mellitus. If it is, it must be completely under control before operation.<sup>[33,39-41]</sup>

#### ❖ **Eversion of sac**

The superfluous tunica is removed when the testis is delivered, leaving a tiny cuff along the posterior edge of the testis. In order to control bleeding and prevent cord strangulation, the cut edges of the tunica are everted and sewn together behind the epididymis. The junctional region of the testis and the lower end of the cord resembles the neck of a bottle after eversion is complete. Thus, it is referred to as a "bottle operation." Now, some medical professionals advise using one or two interrupted sutures rather than a continuous suture to avoid blood clotting between the epididymis and everted tunica. The deadly complication of postoperative hematoma should be avoided at all costs. The purpose of this treatment is to expose the tunica's secreting surface to the outside scrotal wall layers, including the dartos, which absorb all of the exposed tunica's secretion. Because of the following factors, it is preferable to avoid this procedure when a patient has a filarial hydrocele. The everted tunica creates a substantial swelling behind the testis in hydrocele greater than a tennis ball. Filarial hydrocele's tunica exhibits abnormalities. Therefore, it is preferable to remove it. Elephantiasis of the scrotum or lymph scrotum, the latter of which is a bothersome consequence, may develop if it is ignored. However, there are not enough reports of these problems to prevent

sac eversion. The tunica of the upper pole may escape eversion if a massive hydrocele is operated on with a relatively tiny incision created further down, which could happen if the eversion is not performed properly.<sup>[39,41,42]</sup>

#### ❖ **Lord's Operation**

The early thin-walled hydroceles are an indication for this procedure. The goal of surgery is to minimise the region of secretion without leaving any room for blood to pool in the scrotum. Just enough of a scrotal incision is made to deliver the testis out. Without considerable dissection of the dartos layer, the tunica's parietal layer, which is distinguished by its bluish tint, is opened and exposed. The testis is extracted while the cut ends of the tunica are being gripped with Allis forceps. With a 1-cm gap between each pass, interrupted 2/0 or 3/0 absorbable sutures are used to plicate the everted tunica circumferentially. The sac constricts (like an accordion) around the testis and epididymis like the rim of a bicycle wheel as the sutures are fastened. The tunica's secretory area is reduced. It is impossible to do this procedure inside of a huge, thick-walled hydrocele.<sup>[25]</sup>

#### ❖ **Sclerotherapy**

Patients with symptoms who pose a high risk for surgery may undergo it. A sclerosant, such as tetracycline, is administered into the hydrocele sac after the hydrocele is sucked dry via a needle puncture in order to stop the fluid from re-accumulating. This procedure has unpredictable outcomes and is excruciatingly unpleasant. Three treatment sessions are often necessary. It frequently recurs and has problems, some of which include infection and testicular loss. Polidocanol, sodium tetradecyl sulphate, and phenol are some more sclerosants that can be applied. Sclerotherapy is not a suitable treatment for young, otherwise healthy males due to a number of issues.<sup>[43]</sup>

#### ❖ **Additional treatment methods**

- Acute hydrocele is a tiny, transient hydrocele that may go away on its own or as a result of treatment with doxycycline and/or diethylcarbamazine.<sup>[44]</sup>
- According to information from Papua New Guinea, the annual mass drug administration (MDA) of the WHO, which consists of one dosage of albendazole-diethylcarbamazine or albendazole-ivermectin, may lower the incidence of hydrocele.<sup>[45,46]</sup>

**Table.1: Current status of clinical trials on Hydrocele.**

Drug	Mode of administration	Disease	Enrollment	Allocation/Intervention model/Masking	Official Title of the study	Status	Clinical trial	Year
Lord's procedure/ Sclerotherapy	Interventional	Hydrocele	200	Randomized/ Parallel Assignment/ None (Open Label)	Lord's Procedure Versus Sclerotherapy for Testicular Hydrocele; a Randomized Controlled Study.	NA	NCT02082613	2016
Questionnaires/ Hormonal Function measurement	Observational	Hydrocele	330	Case-Control	Quality of Life Among Testicular Cancer Survivors	NA	NCT02304575	2017
Bupivacaine Hydrochloride/ Exparel 133 milligrams per 10 milliliter injection	Interventional	Hydrocele	104	Randomized/ Parallel Assignment/ Single (Participant)	A Randomized Trial Evaluating Use of Long-Acting Liposomal Bupivacaine (Exparel) in Reducing Narcotic Pain Requirements in Pediatric Patients Undergoing Minor Urologic Procedures	Phase-3	NCT04826484	2023
Injection of 0,4 ml/kg of 0,1% levobupivacaine for high volume group	Interventional	Hydrocele	70	Randomized/ Parallel Assignment/ Single (Participant)	Volume or Concentration for the Transverse Abdominal Plane Block in Children Aged 1-5 Years: Analgesic Effects and Safety	NA	NCT02064088	2014
USG-guided Caudal block/ USG-guided Ilioinguinal/Iliohypogastric block	Interventional	Hydrocele	128	Randomized/ Parallel Assignment/ Double (Participant/Outcomes Assessor)	"Comparison of Analgesic Effects of USG-Guided Caudal Versus Ilioinguinal/Iliohypogastric Nerve Block Techniques for Inguinal Surgeries in Children, a Randomized Controlled Trial."	NA	NCT05558748	2022
Bupivacaine hydrochloride	Interventional	Hydrocele	50	Randomized/ Parallel Assignment/ Quadruple (Participant/Care Provider/Investigator/Outcomes Assessor)	Comparison of Analgesic Efficiency in Laparoscopic Percutaneous Extraperitoneal Closure for Pediatric Inguinal Hernia and Hydrocele Provided by Ultrasound Guided Posterior Quadratus Lumborum Block Using Between 0.125% and 0.25% Bupivacaine	NA	NCT04998071	2021
Infants with PPV/ Infants without PPV	Observational	Hydrocele	1000	Cohort	Natural History of Infants With Patent Processus Vaginalis	NA	NCT03042858	2023
Conscious sedation	Observational	Hydrocele	150	Cohort	Evaluating Patient Tolerability and Success for Penile and Scrotal Urologic Procedures Under Conscious Sedation: A Prospective Study	NA	NCT05617261	2022
Ibuprofen/Morphine	Interventional	Hydrocele	100	Randomized/ Parallel Assignment/ Quadruple (Participant/Care Provider/Investigator/Outcomes Assessor)	Assessing the Effectiveness of Ibuprofen Compared to Morphine as a Pediatric Postoperative Pain Management Tool Following Inguinal Surgery (AIMS)	NA	NCT02603848	2023



without dye varicocelectomy	Interventional	Hydrocele	80	Randomized/Parallel Assignment/Single (Participant)	Dye Assisted Lymphatic Sparing Varicocelectomy, Prospective Randomized Study	Phase-	NCT01259258	2010
Inguinal and Subinguinal varicocelectomy	Interventional	Hydrocele	570	Randomized/Parallel Assignment/None (Open Label)	Assessing Post-operative Rates of Recurrence, Hydrocele and Testicular Atrophy in Patients Operated With a New Approach of Varicocelectomy Named Combined Mini-incision Microscopic Varicocelectomy (CMMV)	NA	NCT02092311	2015
Color Doppler Ultrasound	Interventional	Hydrocele	23	Randomized/Parallel Assignment/Single (Outcomes Assessor)	A Comparison of Preoperative and Postoperative Testicular Volume and Blood Flow in Patients With Inguinal Hernia, Hydrocele, and Cord Cyst: A Prospective Cohort Study	NA	NCT03033381	2017
Disposal Aid	Interventional	Hydrocele	202	Randomized/Parallel Assignment/None (Open Label)	Opioid Use, Storage, and Disposal Among Pediatric Patients After Surgery	NA	NCT03575377	2019
Picture book/ Standard preoperative education	Interventional	Hydrocele	120	Randomized/Parallel Assignment/None (Open Label)	Visual Guidelines and Tutoring in Pediatric Urological Surgery	NA	NCT02040389	2016
Interactive Perioperative Teaching Platform	Interventional	Hydrocele	151	Randomized/Parallel Assignment/None (Open Label)	Interactive Perioperative Teaching Platform (IPTP)	NA	NCT03677453	2021
ICSI	Observational	Hydrocele	60	Case-Control	Outcomes of Intra-Cytoplasmic Sperm Injection in Infertile Men With Non-tense Vaginal Hydrocele	NA	NCT03532386	2018
Observational study, non-interventional	Observational	Hydrocele	178	Cohort	Enhanced Recovery After Surgery in Pediatric Surgery in Jordan: A Retrospective Cohort Study in a Tertiary University Hospital	NA	NCT04870242	2015
TAP block/ Local Infiltration	Interventional	Hydrocele	50	Randomized/Parallel Assignment/Single (Participant)	The Efficacy of Transverse Abdominis Plane (TAP) Block in Children Undergoing Hydrocelectomy and/or Hernia Repair	NA	NCT01698268	2017
clonidine	Interventional	Hydrocele	120	Randomized/Parallel Assignment/Quadruple (Participant/Care Provider/Investigator/Outcomes Assessor)	The Addition of Clonidine to 0.2% Ropivacaine for Wound Instillation After Minor Lower Abdominal Surgery in Children	Phase-2	NCT00130091	2015
Hydrocelectomy surgery	Interventional	Hydrocele	100	Randomized/Parallel Assignment/None (Open	Determine the Efficacy of Closed Suction Drain After Hydrocelectomy in Primary Vaginal Hydrocele: An	NA	NCT04653402	2023

				Label)	Open-label Randomised Controlled Trial (END Trial)			
NA	Observational	Hydrocele	110	Cohort	A Material Cost-Minimization Analysis for Hernia Repairs and Minor Procedures During a Surgical Mission in the Dominican Republic	NA	NCT01872364	2013
Ligasure	Interventional	Hydrocele	61	N/A/Single Group Assignment/None (Open Label)	The Use of Ligasure (r) for Cutting and Coagulations of Tissues in Hydrocelectomy Surgery	NA	NCT04406077	2020

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**CONCLUSION AND FUTURE DIRECTION**

The first portion of our review articles gives a complete overview of hydrocele, covering its causes, risk factors, etiopathogenesis, pathology, and combined therapy, including surgery, symptoms, and consequences. According to our research, non-pharmacological (surgical) treatments do the body's full healing even though they take some time to take effect and don't have any undesirable side effects. There has to be more randomised controlled studies done in order to better understand how to treat hydrocele. Future research on hydrocele is something we intend to pursue. With the assistance of our colleagues, further research incorporating counselling will be conducted in our nation or state in order to evaluate patients' physical and mental health and provide more specific information on hydrocele and its enhanced therapy.

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