

IDIOPATHIC HYDROCELES.

M.MED.(SURGERY)

IDIOPATHIC HYDROCELES.

An Analysis of 173 Cases of Scrotal Swellings seen at the
Kenyatta National Hospital, Nairobi over a period of
5 years, 1973 - 1977.

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This dissertation has been submitted for Examination with my Approval, as University Supervisor.

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INTRODUCTION:

Much has been written about secondary forms of hydroceles, particularly those found to be due to filariasis. (Nos. 5, 6, 7, 8, 9, 15 a, 20). Yet in this series at Kenyatta National Hospital situated in Nairobi, which is far from the endemic filarial areas, hydroceles are commonly seen. Hydrocelectomy is therefore a commonly performed operation. (15c)

Pare (1510-1590) was the first to use the word "hydrocele", though Celsus (first Century) and Galen (131 A.D.) described the operation for hydrocele through an inguinal incision using seton. Documented and artistic work shows that hydrocele was recognised in Greece in the second century before Christ. But ⁵⁷ in spite of this, a clear definition of idiopathic hydrocele, and indeed its aetiology, has not been agreed on.

A hydrocele is an abnormal accumulation of fluid within the two layers of tunica vaginalis. Idiopathic hydrocele is a type of hydrocele with chronic fluid accumulation of unknown or obscure aetiology. It has been shown to have, as components, failure of prompt clearance of any accumulated fluid in tunica vaginalis and cystic cavities, or complete failure of closure of the processus vaginalis soon after birth (52, 53, 54). A secondary form of hydrocele is one that is secondary to a causative or aetiological factor.

The congenital type occurs during infancy and is usually due to patent processus vaginalis.

Studies show that in East Africa and Kenya in particular, hydrocele is mainly secondary. (5,6,7,8,9). In this series it was found that over 75% of the cases had no cause for their scrotal swellings i.e. there were no physical findings suggestive of primary or accompanying condition predisposing to hydrocele, and also where hydrocele occurred in children. The rest showed concomitant presence of physical findings that could be associated with hydrocele formation - e.g. diabetes, congestive cardiac failure, renal pathology, Tuberculosis, trauma to the scrotum, torsion of testis, pyogenic infection and also testicular tumours.

In this review, many cases of congestive cardiac failure, renal pathology and liver failure which gave rise to pitting oedema and anasarca were found. But where the words scrotal swelling did not appear in the diagnosis or physical finding that case was left out for the purpose of this study.

The Embryology anatomy and pathology are presented first with special emphasis on the lymphatics. Thereafter, Aetiology, classification, diagnostic procedures and forms of management are presented. In the discussion and conclusion, new information is highlighted and a summary of all the chapters is given in a concise form.

AIMS OF THE STUDY

The aims of this dissertation are:-

1. To assess the frequency of idiopathic hydrocele in comparison with the other scrotal swellings seen at the Kenyatta National Hospital, Nairobi.
2. To compare the local frequency with those of other countries.
3. To correlate the theories on the aetiology of idiopathic hydrocele to the anatomy and embryology of the scrotum and contents.
4. To review and compare the various forms of surgical management of this form of hydrocele.

MATERIALS AND METHODS.

This being a retrospective study, all the materials have been collected from the records of 178 patients admitted to the Kenyatta National Hospital from January 1973 to December, 1977 inclusive with scrotal swellings. 135 of these cases were idiopathic hydroceles - which gives an average of 27 cases of idiopathic hydroceles admitted to the Kenyatta National Hospital every year. No seasonal variation was noted.

All the records in this study were obtained from the Kenyatta National Hospital Records Department.

RESULTS

The records of each patient gave information about age at the time of presentation; tribe; presenting symptoms; duration of symptoms; side of presenting lesion (the left or right), associated illness, and the forms of management given.

Age distribution at the time of presentation.

From Table 1 it will be observed that the peak incidence was at 1 - 13 years and 20 - 60 years. The youngest patient seen was 3 weeks old while the oldest was 90 years, a mean average of 45 years.

Frequency of different scrotal swellings.

Out of a total of 178 cases of scrotal swellings seen, 135(76%) of these were idiopathic hydrocele (Table 2). Other causes of scrotal swellings found in this series are: Tumours 11(6%), Torsion of testis

15(3%). Abscesses 5(3%), Trauma to the testis 8(5%), Tuberculosis 4(2%). (Table 3).

Associated Diseases

The following conditions were either incidental findings in course of physical examination or were found to complicate scrotal swellings in this series: Congestive cardiac failure (4 cases), Diabetes (3 cases) hernia (10 cases), Renal pathology (1 case), enlarged prostate (2 cases) Undescended testis (1 case), Urethritis (2 cases). (Table 4).

Side of Lesion

72 (53%) cases presented on the right side, while 48(36%) cases presented on the left side (Table 5) 15(11%) cases presented bilaterally and this was observed mainly in patients over the age of 40 years (Table 1).

Presenting Symptoms

In this series, all cases of idiopathic hydrocele presented with a scrotal swelling. 19(14%) complained of scrotal pain, and 19(14%) complained of both scrotal swelling and pain. (Table 6).

Tribal Distribution

57 (42%) cases were Kikuyu, 27 (20%) were Luo, 21 (15%) were Luhya, 17 (13%) were Kamba and "Others" 13(10%) which included Digo, Taita, Masai Bere, Somali, Indian, (Table 7).

This tribal distribution may not be a true representation of the actual situation. Rather it is a reflexion of the distribution of tribes generally seen at the Kenyatta National Hospital as patients.

Forms of Treatment given.

In 8 (6%) cases nothing was done - i.e. patients were observed over a period of time with the aim of achieving spontaneous cure; In 2(1.5%) the hydrocele was tapped or aspirated; In 117 cases surgical operations were done: 44 (33%) had inguinal approach (19 were children), 74(55%) had scrotal approach (13 were children); 1(0.5%) had scrotal and inguinal approach; 6(4%) had unspecified treatment (Table 8).

TABLE 1.

AGE DISTRIBUTION AT THE TIME OF PRESENTATION (AND
SIDE OF LESION).

AT BIRTH	BILATERAL	LEFT	RIGHT	TOTAL
	0	3	5	8
UP TO 1 YEAR	0	0	1	1
1 TO 13 YEARS	1	7	29	37
14 TO 20 YEARS	0	2	2	4
21 TO 40 YEARS	0	11	17	28
41 TO 60 YEARS	6	13	14	33
OVER 60 YEARS	8	12	4	24
TOTAL NUMBER OF HYDROCELES	15	48	72	135

TABLE 2

RATES OF OCCURENCE OF IDIOPATHIC HYDROCELES

	NUMBER	PERCENTAGE OF TOTAL
NUMBER OF IDIOPATHIC HYDROCELES	135	76%
NUMBER OF OTHER SCROTAL SWELLINGS	43	24%
TOTAL NUMBER OF SCROTAL SWELLINGS	178	100%

TABLE 3.

ANALYSIS OF SCROTAL SWELLINGS DUE TO OTHER CAUSES.

CAUSES	TOTAL NUMBER	PERCENTAGE OF TOTAL
TUMOURS	11	6%
TORSION OF TESTIS	15	8%
ABSCESSSES	5	3%
TRAUMA	8	5%
TUBERCULOSIS	4	2%
TOTAL	43	24%

TABLE 4.

ASSOCIATED PRESENTING DISEASES (TOTAL 23).

ASSOCIATED PRESENTING DISEASE	NUMBER
CONGESTIVE CARDIAC FAILURE	4
DIABETES MELLITUS	3
HERNIA (INGUINAL).	10
RENAL PATHOLOGY	1
ENLARGED PROSTATE	2
UNDESCENDED TESTIS	1
URETHRITIS	2
TOTAL	23

TABLE 5.

SIDE OF LESION.

SIDE	NUMBER	PERCENTAGE OF TOTAL
RIGHT	72	53%
LEFT	43	36%
BILATERAL	15	11%
TOTAL	135	100%

TABLE 6.

PRESENTING SYMPTOMS IN IDIOPATHIC HYDROCELE (TOTAL 135)

SYMPTOM	NUMBER	PERCENTAGE OF TOTAL.
SCROTAL SWELLING	135	100%
PAIN	19	14%
BOTH SCROTAL SWELLING AND PAIN	19	14%

TABLE 7

TRIBAL DISTRIBUTION (TOTAL 135)

TRIBE	TOTAL NUMBER	PERCENTAGE OF TOTAL
KIKUYU	57	42%
LUO	27	20%
LUHYA	21	15%
KAMBA	17	13%
OTHERS	13	10%
TOTAL	135	100%

TABLE 8.

FORMS OF TREATMENT GIVEN. (TOTAL IDIOPATHIC HYDROCELES)
135.

FORM OF TREATMENT	TOTAL NUMBER OF CASES	PERCENTAGE OF TOTAL
CONSERVATIVE	8	6%
ASPIRATION	2	1.5%
OPERATIVE - Inguinal approach	44	33%
- Scrotal approach	74	55%
- Both inguinal and scrotal approach	1	0.5%
UNSPECIFIED TREATMENT	6	4%
TOTAL	135	100%

INCIDENCE

The actual incidence of idiopathic hydrocele in Kenya and probably the whole world is not known, as evidenced by the scanty literature available.

In this series a total of 178 cases of scrotal swellings were seen over a period of 5 years giving an average of 36 cases per year. Of these, 135 (76%) were idiopathic hydroceles. The frequency of occurrence on the left or right side are set out in table 5.

Fasana^{15a} working in India, Uganda and Kenya (Nyeri) from 1954 to 1972 operated on 273 hydrocele cases. Among the children he operated on, 8 had patent processus vaginalis and 4 inguinal herniae as a concomitant finding. All the other cases were secondary to *Wuchereria Bancrofti* infection. The incidence of the right sided hydrocele was 75%, bilateral 79%, those associated with hernia 6%. He found microfilaria in the blood of 51% of the adult cases, whereas only 33% of the patients had microfilariae in scrotal fluid.

Burkitt²² working in Lango District of Uganda reported that an average of 25% of male adults had hydroceles, and that 43% of them were bilateral.

Earlier studies by Hawking⁶ in the coastal areas of Kenya and Tanzania showed that where filariasis was common, the incidence of hydrocele was high viz. 32% hydrocele rate among adult males

around Kilwa and just less at the Kenya Coast.

Wijers and McMahon⁵ found hydrocele rates above 40% in males over the age of 14 years along the Tana River and Lamu District of Kenya. These, however, were all secondary hydroceles, most probably due to filariasis and therefore gave no true picture of the incidence of idiopathic hydrocele.

King³⁶ examining 268 American Troops in Puerto Rico found no cause for 80% of the hydrocele cases. This is comparable to the present series where 76% of the scrotal swellings were idiopathic hydroceles.

Jordan²⁰ was the first worker to draw parallels on incidence.

Working in Mwanza Region of Tanzania he wrote: "In areas where no Parasitological evidence of Bancroftian filariasis was found, 1.2% of adult males were found to have hydrocele".

Drawing evidence from this study and observation, Jordan then undertook to determine the incidence of hydrocele in young British Army recruits from the Far East. This he found to be 1 in 1000. He then concluded that the incidence of idiopathic hydrocele in Tanzania is the same as in Britain.

EMBRYOLOGY

The embryology of the scrotum and contents and also of the spermatic cord is essential in the understanding of the mechanism of the various forms of hydrocele. First I would deal with the embryology of the descent of the testis and its appendages. In the process, I hope to show how the various defects or failures cause particular types of hydrocele.

Embryology of the Scrotum

In the embryos during the undifferentiated sexual stage, the external genitalia develop in the region of the cloacal membrane. This region extends on the ventral aspect of the body from the umbilical cord to the tail. At the cephalic end of the cloacal membrane, by the sixth week, develops a tubercle called the genital tubercle. (The genital tubercle has been described as unpaired, by Spaulding; 1921; paired by Felix 1921, Pallen and Berry 1952). The margins which flank the membrane and the tubercle rise up to form the genital swellings or folds. In the male the swellings move caudally, fuse together and form the scrotum.

Embryology of the Descent of the Testis and its appendages, and the Formation of Tunica Vaginalis.

At first the testis lies on the dorsal abdominal wall but as it enlarges, its cephalad end degenerates and it therefore assumes a more caudal position (Gray's anatomy). The testis, during the greater part of embryonic life and up to the seventh month lies at the level of the acetabulum (Youssef & Raslan 1971)⁴⁹

This is contrary to the normal teaching that the testis actually descends from the level almost corresponding to that of the kidney. The testis is never far from the groin, and there is no abdominal descent of the testis (Loch Wood 1888, Bramann 1884, Wells 1947⁴⁶, Lemeh 1970⁴⁷, Wyndhan 1943)⁴⁸.

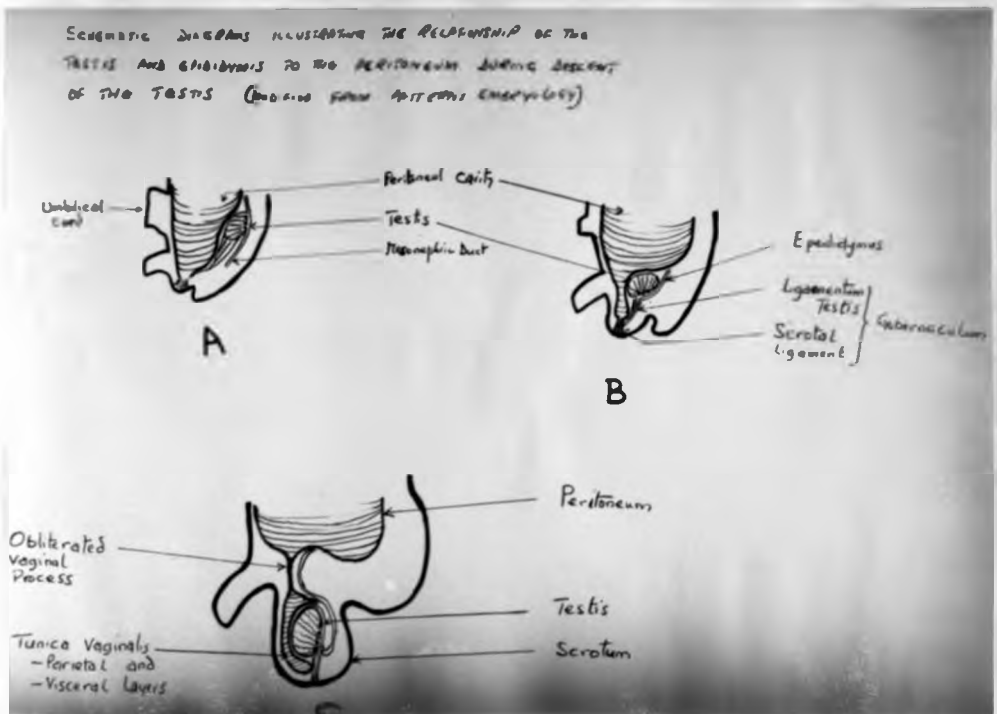
The testis, is attached to the mesonephric fold by the mesorchium which contains testicular vessels and nerves. The lower border of the testis becomes connected to the skin which is later to form the scrotum, by a fold of mesenchymal cells, included in a peritoneal fold (inguinal fold). This fold forms a cord, which later becomes a fibromuscular bundle and is termed the Gubernaculum testis.

Gubernaculum testis is actually a condensation of ligamentum testis and scrotal ligament. From the gubernaculum testis develop fascial coverings of the testis and spermatic cord, including cremaster (Gray & Skandalakis).⁴

In the meantime a coelomic evagination is formed in the inguinal region of each side where the caudal end of the ligamentum testis is attached. Each of these peritoneal lined extensions of the coelom is known as the processus vaginalis (First described by Galen A.D. 176) 53. Scrotal ligament connects the processus vaginalis to the scrotum. As the processus vaginalis is deepened, the scrotal ligament becomes shortened, and broadened and ultimately blends into connective tissue layer of the scrotum (Patten²). The lower pole of the testis is retained in opposition to the deep inguinal ring by Gubernaculum testis by the 5th month. During the 7th month the testis begins to pass through the inguinal ring and by the 8th month they have come to lie in the scrotal pouches (Patten²). The distal end of the processus vaginalis into which the testis projects, forms the tunica vaginalis testis, but the portion associated with the spermatic cord in the scrotum and in the inguinal canal normally becomes obliterated. Obliteration of the processus vaginalis is complete at birth in 50 - 70% infants (Gray and Scandalalis)⁴.

In its entire descent the testis moves caudally beneath the peritoneum. It does not enter the lumen of the scrotal pouch directly but slips down under the peritoneal lining and protrudes into the lumen, reflecting a peritoneal layer over itself. This reflected peritoneum

is known anatomically as the visceral layer of tunica vaginalis proprius. The remainder of the peritoneal sac which now lines the scrotal cavity is called the parietal layer of the tunica vaginalis proprius. (See photograph I).



Causes of Testicular Descent

The cause of testicular descent is poorly understood (Gray's Anatomy¹⁴) but the factors often thought to be involved are:

1. Hormonal, and mechanical factors: Hormonal role of the anterior pituitary, maternal chorionic gonadotropin which stimulates androgen production in the adrenal cortex, and progesterone have been suggested by Shapiro (1939), Egle (1932), Wislock (1933), Martins (1943), (as quoted by Gray and Shandalakis⁴).

2. Self propelling through testicular organisation and mechanical factors. Although this view has been supported by Hunter (1786) and others, others workers have debated it. The mechanical factors often quoted are:
 - a) Intra-abdominal pressure (Gray and Shandalalis 1972, and Grays Anatomy)¹⁴.
 - b) The contraction of the muscles around the inguinal canal (Gray's Anatomy).¹⁴
 - c) The contraction of the Gubernaculum (Gray's Anatomy).¹⁴

3. Youssef and Raslan (1971) after extensive study have come to the conclusions:

- a) That there is a gradual increase of the size of the testis during its descent and its weight plays an important role in the process of descent.
- b) Gubernaculum prepares with its morphological and histological modifications the way to the descent of the testis, widens the inguinal canal and by contraction of the stomach muscle fibres draws the testis into the scrotum.
- c) That the weight of the viscera and the meconium ought to be considered as an important factor in the testicular descent.

ANATOMY

A simplified and relevant anatomical consideration will be presented here. It is designed to show mainly the structure one comes across at operation. It will also act as a reminder of the structures one comes across at operation, and those mentioned in the chapter on aetiology of idiopathic hydrocele. Special mention is made of the lymphatic drainage which seems to be implicated all round as a major cause of hydrocele formation. The lymphatics have thus got a major share of this chapter.

The coverings and contents of the scrotum are presented in tabulated form to indicate the order in which one sees them at operation, starting with skin. A comparison is made with the abdominal wall and spermatic cord coverings. (See Table).

ABDOMINAL WALL	SCROTAL WALL
1. Skin	Skin
2. Subcutaneous fat (Carnegie and Scarpa's fascia)	Dartos (Scarpa's fascia)
3. External oblique aponeurosis	External spermatic sheath (external oblique aponeurosis)
4. Cremasteric fascia (Internal oblique muscle)	Cremasteric fascia
5. Internal spermatic sheath (transversalis fascia)	Internal spermatic sheath
6. Preperitoneal fat	Pre peritoneal fat
7. Hemial Sac (Peritoneum)	Peritoneum (Tunica Vaginalis) Testis.

Blood supply of scrotum and contents

The front of the scrotum is supplied by the external pudendal arteries whereas the back is supplied by the scrotal branches of the internal pudendal artery. Branches of the testicular artery and artery to the cremaster help to supply the scrotum. The testis is supplied by the testicular artery arising from the abdominal aorta.

The veins accompany the arteries. The testicular veins form the pampiniform plexus of veins which form the bulk of the spermatic cord, and eventually drains into the inferior vena cava (Gardner & O'Rohilly) . . .⁵⁶

Nerve Supply to the Scrotum and Contents

The anterior part of the scrotum is supplied by the ilio-inguinal nerve and by the genital branch of the genito femoral nerve. The posterior part is supplied by the medial and lateral scrotal branches of the perineal nerve and by the perineal branch of the posterior femoral cutaneous nerve. (Gardner et al) . . .⁵⁶ The testis is supplied by the testicular plexus of the sympathetic nerves (Gray's Anatomy) 14.

Lymphatic drainage of the Scrotum and Contents

In the normal hydrocele sac, the subserous lymphatics consist of superficial and deep plexuses, both being confined to the basal fibrous layer of the parietal tunica vaginalis. The superficial plexuses are much smaller and communicate by narrow channels with the deeper plexuses which lie within the deeper portion of the basal fibrous layer, (L.Allen)⁵³ and (Rainller and Allen)⁵⁵. Each plexus is drained by channels which course around the tunica vaginalis from the medial and lateral side and empty into marginal vessel which originates within the testis (L.Allen)⁵³.

Some lymph from the tunica vaginalis and the tail of the epididymis passes direct to the external iliac glands before passing to the para-aortic group. Other vessels drain directly into the para-aortics (Gailoway 1954). (P.Jordan)⁹. The testicular lymph also drains into the para-aortics. The visceral leaf of tunica vaginalis has no lymphatics (S. Gratana)¹⁰ (Lane Allen)⁵³.

P A T H O L O G Y

1. Pathology . The hydrocele fluid is usually described as straw coloured or ambercoloured. Douth Waite⁴¹ has described it as "a golden fluid of soapy feel". Many workers have analysed the constituents of idiopathic hydrocele fluids, with a view to ascertain whether this is trapped peritoneal fluid or the result of increased capillary permeability and reduced lymph drainage. As might be expected nearly all have come out with very similar readings.

A.F. Wallace⁽¹⁾ found the following as chemical constituents of an idiopathic hydrocele fluid, as compared with the findings of Boyce & Pollitano¹².

Water	Resembles plasma
Soluble and insoluble salts	Few lymphocytes and epithelial cells
S.G. 1016 - 1026	S.G. 1010 - 1025
Albumin	Albumin 3-6% of protein
Globulin	Protein 4-6.3gm%
Chlorides	Chlorides
Fibrin	Fibrinogen
Cholesterol	Cholesterol
(A.F. Wallace)	(Boyce and Pollitano)

C. Pappis, and his associates⁵² has worked out the salt content of hydrocele fluid in comparison with that of serum. His findings are presented in Table form to include other electrolytes.

Electrolyte	Serum	Hydrocele Fluid
Sodium Na^+ (MEq/ltr)	137.1	136.5
Potassium K^+ (MEq/ltr)	4.4	4.3
Chlorides Cl^- (MEq/ltr)	101.4	107.2
Calcium Ca^{++} (Mg%)	9.8	9.6
Urea (Mg%)	40.2	29.2

Normal constituents of plasma have therefore been extracted from idiopathic hydrocele fluid, but always in lower concentration. The larger the molecular size the smaller is their concentration in hydrocele fluid in comparison with blood. Hydrocele fluid has the composition of a transudate (A.F. Wallace)¹.

The Pathology of Tunica Vaginalis.

In the non-inflammatory (Primary) cases the tunica appears pearly whitish grey in colour and has the texture of peritoneum (especially in children). It is usually thinner than secondary hydrocele, but this will depend also on the size of the hydrocele and extent of stretch. The secondary hydrocele sac is usually thick, firmer and may even be calcified.

AETIOLOGY

An idiopathic condition is one in which no precise cause is known. That goes for the idiopathic hydrocele, too, where routine examination fails to reveal a causative factor. Many attempts have been made to explain the causative factors of this type of hydrocele, but so far only theories and hypotheses have been propounded some more acceptable than others. The following are the more workable theories put forward with regard to the aetiological consideration of idiopathic hydrocele:-

1. Incomplete obliteration of processus vaginalis, which led Tibbs, and Miller³⁵ (quoting Fowler and Burnet 1958) to conclude that "all childhood hydroceles were due to incomplete obliteration of processus vaginalis". This was as a result of studies with methylene-blue dye injected into the sac to delineate the extent of the hydrocele at operation.
2. Weakness and/or paralysis of the cremaster muscle. This theory hinges on the fact that the cremaster muscle helps to suspend the spermatic vessels. The spermatic veins, having no valves, present a long and weighty column of blood which the cremaster muscle has to support. Contraction of this muscle accelerates circulation. "If the contraction of this muscle is weak or quite lost, the spermatic vessels, now no

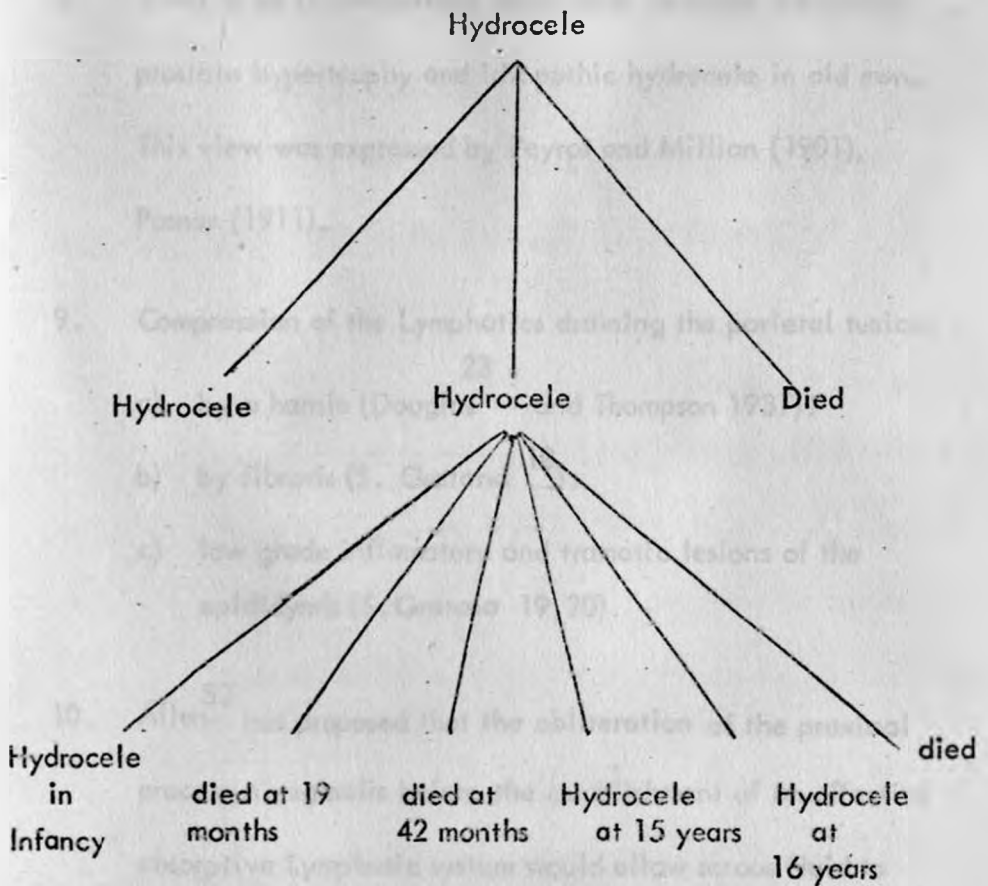
longer supported, will be dragged down by their weight and that of the testicle and their tone impaired, in consequence of which water will at last be accumulated in the cells of the cord". This theory was propounded by Ruvsh 1729 and supported by and elaborated on by Douglas 1755 (as quoted by A.F. Wallace)¹.

3. Rupture of the hydatid of Morgagni, which as Morgagni wrote in 1761 "these hydatids burst asunder and first pour out the water they contain and after that go on to secrete still more and more; there is not the least doubt but they must produce hydrocele" (A.F. Wallace).¹
4. Nearly 2 centuries later Barjon and Cade (1903) after having examined microscopically 25 idiopathic hydrocele fluid specimens they found samples from secondary hydroceles and found that all contained spermatozoa. They then proposed a modification of Morgagni's theory in that rupture of the cyst of the epididymis rather than that of Morgagni is the cause.
5. Hunter (1786-87) made the following observations regarding hydroceles:
 - a) That it occurs in people of all kind of constitution.
 - b) That it occurs in all countries
 - c) That it is most common in warm countries. This is a view supported 2 centuries by Caries (1924) who quotes

examples of Indians wearing supports for their pendulous scrota.

- d) They go away by themselves in the young but never go away in the adults (A.F. Wallace).¹

6. Idiopathic hydrocele may be congenitally inherited. This view was originated by Cadwallader (1895) who published the first "hydrocele Family" over 3 generations; (A.F. Wallace).¹



7. Alteration in the serosa of the tunica vaginalis. This view was initiated by Peyrot and Millian (1901) who listed the following conditions as being responsible for the alteration of the serosal lining.

Alcoholism	Rheumatism	Bronchitis
Typhoid	Arteriosclerosis	Embhysema
Irregular Cardiac rythm	Renal insufficiency	Prostate enlargement.

8. There is an ill-understood association between the benign prostate hypertrophy and idiopathic hydrocele in old men. This view was expressed by Peyrot and Millian (1901), Posner (1911).
9. Compression of the Lymphatics draining the parietal tunica;
23
a) by a hernia (Douglas and Thompson 1937).
b) by fibrosis (S. Gratana 18).
c) low grade inflammatory and traumatic lesions of the epididymis (S. Gratana 19,20).
10. Allen⁵³ has proposed that the obliteration of the proximal processus vaginalis before the establishment of an effective absorptive Lymphatic system would allow serous fluid to accumulate in the sac and result in congenital hydrocele of the new born. This view is supported by C.Pappis and

associates⁵³ and McBrien and associates⁵², who concluded that hydrocele seems to be due to entry of fluid in the tunica vaginalis by capillary filtration and the trapping of this fluid by impaired lymphatic drainage. Failure of lymphatic drainage or delay in absorption as an aetiological factor in idiopathic hydrocele has also been reported by S. Gratana⁽²⁰⁾; O'crowley and Herzlich 1944; Huggins and Endtz⁽⁴⁴⁾; A.F.Wallace⁽¹⁾. Huggins and Endtz, in their research with phenyl sulphophthalein, found that absorption of this substance from tunica vaginalis in idiopathic hydroceles was "so slow as to indicate that delayed absorption may be the chief factor in the accumulation of fluids".

11. It has also been proposed that high ligation of varicoceles possibly leads to a long column of blood which favours hydrocele formation (Hanley 1955, Ruysch and Douglas). This would explain the composition of the hydrocele fluid since it has the composition of a transudate (A.F. Wallace) 1.

12. Traumatic regenerative activation of the endothelial cells of the Tunica vaginalis can give rise to hydrocele formation. This view was stated by Obney (1956) who said that endothelial cells of the tunica vaginalis are capable of regenerating and causing a hydrocele to reform after combined operation for hernia and hydrocele.

13. To the Great majority of idiopathic hydroceles no label or theory could be put up to explain their occurrence (S. Gracina 18,20, and O'Crowley and Herzlich 1944).

CLASSIFICATION OF HYDROCELES

Many workers have classified hydroceles in various ways i.e.:

- according to aetiology (Primary (Idiopathic) or Secondary);
- according to anatomic location of hydrocele; according to presence or absence of infection; according to shape and position of hydrocele etc, etc. This obviously adds up to the confusion there is about hydroceles.

The aim of this chapter is twofold:

1. To present the old classification that is generally taught and that is usually found in textbooks of Surgery.
2. To present a new classification that takes into account the rationale for surgical treatment of hydroceles.

The first classification is that presented by Boyce and Politano¹²

1. Hydrocele of the testis.
 - a) Simple hydrocele. This is the most common type in which a normally formed tunica vaginalis is distended with fluid. It usually appears as a globular or oval mass.
 - b) Infantile hydrocele. This is one in which the finger-like funicular process has failed to close. In these cases the processus funicularis remains open and

extends to various levels, even to the internal ring; however, the upper end is closed, and there is no communication with peritoneal cavity.

- c) Congenital hydrocele. This is the one in which processus funicularis has a small lumen communicating with the abdominal cavity. In this type, the fluid in the tunica may ascend or can be forced upward into the peritoneal cavity-the communicating hydrocele.

- d) Inguinal hydrocele. This is very much like a simple hydrocele of the testis with the exception that the testis is undescended and its position may be within the inguinal canal or the pubic area. (In this respect, hydrocele has been known to occur in intra abdominal testis).

- e) Encysted hydrocele of the epididymis or of the testis. These usually occur on portions of testis or epididymis without tunica vaginalis covering (posterior surface of testis). They appear as a collection of fluid between tunica vaginalis (visceral layer) and Tunica albuginea.

2. Hernial Hydrocele. An accumulation of fluid within the tunica vaginalis may be associated with an inguinal hernia in several different ways. In one type there is merely a small and limited projection of processus funicularis into the scrotum. This closed hernial pouch terminates above the testis and does not communicate with tunica vaginalis surrounding the latter. Bowel and omentum are usually not present in this sac because of its small lumen, but it communicates with the general peritoneal cavity. Another variety is that in which a large communication exists between the cavity of tunica vaginalis and peritoneal cavity. This is the complete congenital hernia, where bowel and omentum have descended partially into the scrotum with fluid present distal to the bowel in the cavity of processus vaginalis below.

3. Hydrocele of the cord. These are usually long, oval or fusiform, and lie in the upper portion of the scrotum or in the inguinal canal. They are closed at each end and have no connection with tunica vaginalis or the peritoneal cavity.

4. Combination Hydrocele. There are a number of combinations of the above mentioned hydroceles, e.g. a simple hydrocele of the testis associated with hydrocele of the cord without communication between the two. Hydrocele of the cord may

also occur with an inguinal hernia in which the peritoneal or hernial pouch above does not communicate with hydrocele of the cord.

Following the criteria established by the aetiology and operative needs, and also the rationale of the surgical treatment of hydroceles, a new classification of hydroceles has evolved. This was by J.G. Ross⁴³, McKay et al; and Fasana^{15a}.

Hydroceles are divided into 2 types:-

- a) Communicating hydroceles - in which the following types belongs:
 1. Congenital hydrocele
 2. Hemic hydrocele
 3. Abdomino scrotal.

- b) Non-Communicating hydrocele -in which the following types belong:-
 1. Vaginal hydrocele
 2. Infantile hydrocele
 3. Hydrocele of the testis and epididymis (without tunica covering).

CLINICAL PRESENTATION AND DIAGNOSIS.

The scrotal swelling due to hydrocele is often "large, heavy, ovoid, tense and elastic rather than fluctuating" (Donthwaite)³³.

(Photograph II)



Clinically the diagnosis of hydrocele doesn't present much difficulty except when it is complicated and/or associated with inguinal hernia and other problems. The following then are the major diagnostic features commonly found:-

- a) Scrotal swelling: All of the cases (100%) in this series presented with, or were found to have scrotal swelling. It is usually of constant or increasing in size. In the communica-

ting types, it may be reported as "coming and going".

- b) Pain in the scrotum. This is usually associated with secondary cases especially those with filariasis, funiculitis epididymo-orchitis etc. Large idiopathic hydroceles may give rise to traction of scrotal suspensory tissues which may be described as painful. In this series 14% of the cases presented with pain in the scrotum.
- c) Cough impulse - This is usually absent in scrotal swelling "per se" but present if there is herniation of gut into the scrotum. In this series, this sign was not demonstrated.
- d) Transillumination. This is nearly always a finding in small and moderately big idiopathic hydroceles. Large ones and secondary hydroceles often transilluminate. Note - In children hernia often also transilluminate.
- e) Hinge sign - to delineate scrotal swellings and distinguish them from hernia. Again in large hydroceles this may not be practical. In this series this sign was not demonstrated.
- f) Swelling of inguinal lymph nodes. This is usually associated with conditions affecting the scrotal coverings (King³⁶). This was not a finding in any of the cases in this series.

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In differential diagnosis, Boyce and Politano have given more than 55 possible conditions that may cause scrotal swellings.

But the table below presented by Essenhigh⁵⁰ gives a more practical differential diagnosis.

In our series, the following were found:-

- a) Tumour of testis, scrotum and the cord.
- b) Infections: Pyogenic and Tuberculosis
- c) Inguinal hernia (mostly indirect ones).
- d) Cysts of the cord
- e) Congestive cardiac failure, hypertension, liver failure and renal failure.
- f) Trauma and haematocele
- g) Torsion of testis.

Causes of Scrotal Swellings.

Origin of Swelling	Pathology
Testis	Congenital: Appendix of testis Inflammation: Orchitis Gumma Neoplasm
Epididymis	Congenital: Appendix epididymis cysts: containing sperm: spermatocele not containing sperm: epididymal cyst. Inflammation: non-specific cyst. Tuberculosis Neoplasm.
Cord	Congenital: Hydrocele of the cord. Torsion, Varicelle, Neoplasm: Lipoma.
Tunica Vaginalis	Congenital? Primary hydrocele Secondary hydrocele: Haemalocele
Scrotum	Sebaceous cyst: Idiopathic scrotal oedema Scrotal oedema.
Originating outside the scrotum	Hernia.

TREATMENT OF HYDROCELE

The methods that have been employed in the treatment of hydrocele are many and varied. In the literature, and in our series, they vary according to age of onset, associated findings, certainty of Diagnosis, ability of patient to withstand general anaesthesia etc. etc. They can be enumerated as follows:-

1. **Conservative:** This is commonly employed in the management of hydrocele in very young children. Some hydroceles do disappear spontaneously in the first two years of life. (Boyce and Politano¹²; Wallace¹, quoting Hunter²⁵; Ross³⁹; Tibbs and Miller³⁵). In our series, 6% were treated this way, i.e. there was no surgical intervention and the hydroceles disappeared spontaneously, after a period of observation.
2. **Tapping or needle aspiration:** This is usually employed in adult case where the patients condition doesn't permit surgery e.g. the aged, and the high-risk patients. It rarely leads to complete cure. Boyce and Politano¹² state that this method is curative in young children. But it is dangerously easy to misdiagnose a hernia and mistake it for hydrocele - as both transilluminate in children. In our series, 2 cases were treated in this way. Both were elderly.

3. Aspiration with injection of sclerosing solutions: The solution usually consist of quinine hydrochloride, urathane and water (Farquason and Rintoul¹¹). This method has had "many adherents and as many opponents" Boyce and Politano¹². Opponents of injection stress the occasional occurrence of local reactions (epididymitis, funiculitis) to misplaced injections in scrotal layers, sclerosing of abdomen through patent processus vaginalis (communicating type of hydrocele), and inadvertently injection a hernia. There is also the danger of overlooking scrotal pathology as being the primary cause. "Injection therapy of secondary or complicated hydrocele is contra indicated" Boyce and Politano¹². In our series this method was not used.

4. Inguinal approach; whereby through an incision of skin, external oblique, and exposure of cremaster muscle over the superficial inguinal ring, the testis with the hydrocele (total or partial) are delivered, (Tibbs and Miller³⁵). The hydrocele is punctured and aspirated and then 2 methods are available (Farquahanson and Rinton¹¹):
 - a) Eversion of the Sac (Jaboulay) with a few sutures to retain the sac in position behind the testis and surrounding the epididymis.

b) Excision of the sac especially in the large or thick-walled hydrocele, (the writer has employed this method in some of the inguinal approaches he has made) and haemostasis, is achieved by a running catgut suture of the cut edge. In this series this was the method employed when either the inguinal hernia was the initial diagnosis, or inguinal hernia was an associated finding, or when the scrotal swelling was so big that there was no certainty as to diagnosis. In these situations, Ross³⁹ has advocated the method as being the usual approach in children. This technique was used in 33% of cases in this series.

5. Scrotal Approach:

a) Lord¹⁰ has described an operation (in 7 stages) whereby through the scrotum, the tunica vaginalis is opened and the hydrocele fluid evacuated. The testis is delivered through the wound with the tunica vaginalis or sac turned inside out. Forceps are applied at several places around its cut edge, and five to six gathering stitches are inserted into the

tunica vaginalis and when these are tied, the tunica is plicated to form a collar around the junction of testis and epididymis. Alfthan and Sivula²¹ have echoed successes similar to those of Lord when using this method.

This technique was used in 55% of cases in this series.

- b) Fasana^{15c}, after noticing that the above method proposed by Lord is "only suitable when the tunica vaginalis is thin and normal and can be easily plicated", proposed a modification which he found useful in the 273 case he operated on while working in India, Uganda, and Kenya (materials for a later publication). After opening the scrotum anteriorly and tunica vaginalis incised, the fluid is aspirated. The testis is extruded from the cavity, thereby everting the hydrocele sac. The edges of parietal tunica vaginalis thus incised are sutured with perpendicular stitches with interrupted number 00 catgut. This brings the edges to close proximity but leaving enough space for testicular vessels and the cord. The testis and the epididymis are returned

into the scrotal incision by stretching the periscrotal tissues and by gentle pressure. The dead space is closed with interrupted subcutaneous number 00 catgut sutures and the skin with Mitchell Clips. Suspensory support is provided and patients discharged on the 4th day. No post-operative complications were noticed in the 58 cases used for this method. The method avoids mobilisation of the hydrocele sac and is free from complications and recurrences. This is a new technique and was not done in any of the cases in this series.

CONCLUSIONS

The purpose of this study was to analyse the pattern of presentation, aetiology, incidence and treatment of idiopathic hydrocele, amidst other scrotal swellings. In conclusion then, I will summarise the major observations made:

Aetiology:

1. The precise cause of idiopathic hydrocele remains unknown.
2. The mechanism of hydrocele fluid accumulation seems to be due to impaired fluid absorption due to a lymphatic defect, and increased capillary permeability.

Embryology:

3. The classical teaching that the testis descends into the scrotum from a position in the abdomen corresponding to that of the kidney has been refuted.

Incidence:

4. Secondary hydrocele would appear to be commoner than the idiopathic type.

5. Idiopathic hydrocele can occur at any age: in this series the youngest patient was 3 weeks while the oldest was 90 years.
6. All in all, the scanty literature available shows that idiopathic hydrocele incidence varies little from continent to continent.
7. The pattern of distribution of idiopathic hydrocele in Kenya has yet to be worked out. From the data available at the Kenyatta National Hospital, it is not possible to arrive at any precise pattern to reflect the situation in the whole country.

Presentation:

8. The majority of hydroceles presented on the right side in this series: In old age group, hydrocele tends to present bilaterally.
9. Pain is rarely a presenting features of idiopathic hydrocele.

Classification:

10. A new way of classifying hydroceles has been proposed. It takes into account the rationale for surgical treatment of these conditions and attempts to remove the unnecessary confusion about classification.

Treatment:

11. The conservative methods of treatment are suitable in the young, the aged, and the surgical risk cases, while operation is the definitive cure. Aspiration and injection of sclerosing solutions have almost lost favour with most workers.
12. Fasana (1977) proposed a modification of Lord's operation in which the tunica vaginalis is not plicated, and is adequate in all cases of thickened tunica vaginalis. It has been described and its value emphasized.

Recurrence

13. Only 2 cases of recurrence of hydrocele were seen.
As recommendation, I would like more information extracted from our patients, with a view of further research in this field, as regards the following:-
 - a) Size and amount of hydrocele fluid
 - b) Histological findings of the hydrocele sac should be reported on and recorded in all cases.
 - c) The fertility pattern of all adult males with hydrocele should be recorded since Jordan²⁰ and England³⁸ seem to think that "males with hydroceles are less fertile than those without."

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