

Sudan University of Science and Technology
College of Graduate Studies

**Prevalence of Varicocele among Sudanese Army
Students Using Ultrasound Imaging**

انتشار دوالي الخصية بين الطلبة الحربيين السودانيين باستخدام الموجات
فوق الصوتية

**A thesis Submitted for Partial Fulfilments of the Requirements for M.Sc
Degree in Medical Diagnostic Ultrasound**

By:

Mohammed Ali Yousif Mohammed

Supervisor:

Prof. Asma Ibrahim Ahmed Elamin

2019

الآية

قال تعالى

بسم الله الرحمن الرحيم

(فَتَنبَسَّمْ ضَاحِكًا مِّن قَوْلِهَا وَقَالَ رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَىٰ وَالِدَيَّ وَأَنْ أَعْمَلَ
صَالِحًا تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ)

صدق الله العظيم

(سورة النمل الآية رقم 19)

Dedication

To My kind mother and father

To my brothers and sisters

To my wife (Aesha Omar)

And to my kids (Manar and Ali)

Acknowledgement

I am deeply grateful to God for gave me patience and power to complete this study; then to my supervisor Dr. Asma Ibrahim Alamin for her great support and valuable guidance.

Best wishes for whole staff of Omdurman military Hospital for their unlimited support and valuable advices and comments.

Thanks to my colleagues.

Finally I would like to thank everybody who helped me to prepare and finish this study.

Abstract

Varicocele disease highly spreads among the army students. This disease is considered to be one of the reasons that lead to infertility. However, this disease is treated by surgical intervention. Varicocele delays military exercise operation: The main objective of this research is found out the relationship between the long standing and the infection of varicocele. The study was descriptive study among a sample consists of 100 students of Faculty of war whose ages range from 18 – 26 years with mean age of 21.9 years. The study carried out at Omdurman military Hospital during May 2019 – October 2019. Data are collected by colored ultrasound machine and transducer of (5-10MHz) and the sample was taken with cross – section. The significant results of the research as follows the percentage of varicocele infection among the students reached 60%, this has shown considerable relationship between long standing and the varicocele infection. Most patients complain of pain and swelling.

The diameter of varicose vein ranged from (2-3.4mm) the most diameters (2-2.2mm) with mean diameter 2.4550mm. The study found there was no linear relationship between the age and diameter of varicose vein.

The study recommended reducing the hours that the students of Faculty of war stand. There must be periodical examination for scrotum make early detection for the disease

ملخص الدراسة

مرض دوالي الخصية ينتشر بشدة بين طلاب الجيش. يعتبر هذا المرض أحد الأسباب التي تؤدي إلى العقم. ومع ذلك ، يتم علاج هذا المرض عن طريق التدخل الجراحي. من أهم أسباب المرض عملية التمرينات العسكرية اليومية. الهدف الرئيسي من هذا البحث هو معرفة العلاقة طويلة الأمد بين الوقوف لمدة طويلة ودوالي الخصية. كانت الدراسة دراسة وصفية لعينة مكونة من 100 طالب من الكلية الحربية تتراوح أعمارهم بين 18-26 عامًا بمتوسط عمر 21.9 عامًا. الدراسة التي أجريت في مستشفى أم درمان العسكري خلال الفترة من مايو 2019 إلى أكتوبر 2019. تم جمع البيانات بواسطة جهاز الموجات فوق الصوتية الملونة بتردد (5-10MHz). كانت النتائج المهمة للبحث على النحو التالي نسبة الإصابة بالدوالي الخصية بين الطلاب 60% ، مما يدل على وجود علاقة كبيرة بين الإصابة بالوقوف لمدة طويلة ودوالي الخصية. معظم المرضى يشكون من الألم والتورم. يتراوح قطر الدوالي من (2-3.4 ملم) بمتوسط اقطار 2.4550 ملم. وجدت الدراسة أنه لا توجد علاقة خطية بين عمر المرضى وقطر الدوالي. أوصت الدراسة بتقليل الساعات التي يقضيها طلاب الكلية الحربية وقوفاً. يجب أن يكون هناك فحص دوري لكيس الصفن لاكتشاف المرض مبكراً.

List of Contents

Content	Page No
الآية	I
Dedication	II
Acknowledgments	III
abstract	IV
الملخص الدراسة	V
List of contents	.VI
List of figures	VIII
List of tables	IX
List of abbreviations	X
Chapter One	
Introduction	
1.1 Introduction	1
1.2 Problems of the study	2
1.3 The objectives of the study	2
1.3.1 General objectives	2
1.3.2 Specific objectives	2
1.5 The overview of the study	2
Chapter two	
Theoretical & Previous Studies	
2.1 Anatomy	3
2.1.1 Testis	4
2.1.2 The epididymis	5
2.2 Physiology	6
2.2.1 Interstitial Compartment	7
2.2.2 Tubular Compartment	7
2.3 Pathology	8
2.3.1 Scrotal masses	8
2.3.2 Extratesticular Pathologic Lesions	11
2.3.2. 1 Hydrocele	11
2.3.2.2 Hematoceles	12
2.3.3 Spermatoceles and epididymal cysts	13
2.3.4 Benign cysts of the tunica albuginea	15
2.3.5 Benign intratesticular cysts	15
2.3.6 Sperm granulomas	15
2.3.7 Scrotal hernia	16
2.3.8 Cryptorchidism (undescended testicles)	17

2.3.9 Torsion	18
2.3.10 Infection	19
2.3.11 Varicoceles	20
2.4.2 Imaging used in diagnosing	23
2.4.2.1 Ultrasound physics	23
2.4.2.1 Ultrasound technique for testis	23
2.5 Previous Studies	24
Chapter three	
Material and Methods	
3.1 Material	27
3.1.1 Patient	27
3.1.2 Machine	27
3.1.3 Design of study	27
3.2 Methods	27
3.2.1 Scanning technique	28
3.2.2 Variable of study	28
3.2.3 Method of data analysis	28
3.2.4 Data presentation	28
Chapter Four	
The Result	
Results	29
Chapter Five	
Discussion, Conclusion & Recommendations	
5.1 Discussion	34
5.2 Conclusion	35
5.3 Recommendation	36
References	
Appendix 1	

List of Figures

Figure	Page No.
Figure: (1): shows the scrotum contains	4
Figure: (2): shows the physiology of male reproductive system.	8
Figure (3) shows Mixed tumor	9
Figure (4) shows seminoma	10
Figure (5) shows Nonseminomatous germ cell tumors	10
Figure (6) Hydrocele with peritesticular fluid in the tunica vaginalis	12
Figure (7) shows Hematocele and Pyocele	13
Figure (8) shows Spermatocele involving the head of right epididymis	14
Figure (9) Epididymal cyst	14
Figure (10) shows Tunica albuginea cyst adjacent to tunica albuginea	15
Figure (11) shows Sperm granuloma with a hypoechoic non vascularized round mass in the epididymal tail	16
Figure (12) shows scrotal hernia	17
Figure (13) shows undescending testis	18
Figure (14) shows Left testicular torsion with absent of vascularization	19
Figure (15) shows Orchitis with highly vascularized testis	20
Figure (16) shows characterization of varicocele	21
Figure (17) shows sperntine	22
Figure (18) shows color Ultrasound machine (Siemens, Sonoline G60S)	26

List of Tables

Table	Title	Page
Table 4:1	Study group Age distribution.	29
Table 4:2	Mean of study group Age.	30
Table 4:3	Study group presenting complains distribution.	30
Table 4:4	Study group Presence of Varicocele distribution.	31
Table 4:5	Study group diameter of Varicocele distribution.	32
Table 4:6	Descriptive Statistics	33
Table 4.7	Correlations	33

List of Abbreviations

Abbreviations	The Meaning
INSL3	Insulin-Like Factor
LH	Lutenin Hormone
FSH	Follicular Stimulating Hormone
NSGCTs	Non Seminomatous Germ Cell Tumors
ICSI	Intra-cytoplasmic sperm injection

Chapter One

1.1 Introduction:

Testis is important parts of male reproductive system localized in the scrotum in which they are suspended by the spermatic cord, and it is surrounded by three membranes, the tunica vaginalis outer (parietal and visceral layer), the tunica albuginea –middle membrane of fibrous tissues and the tunica vasculosa –inner layer of areolar tissues. Inside the testis they are Multiple thin septations (septula) converge posteriorly to form the mediastinum testis which is forms the support for the entering and exiting testicular vessels and ducts, these septula also form 250 to 400 wedge-shaped lobuli that contain the seminiferous tubules they join other seminiferous tubules to form 20 to 30 larger ducts, known as the tubuli recti.

Varicocele is a cluster or varicose veins that take place in the scrotal area this veins have absent or weakened valves over the time weaken the vessel wall and causes vein dilatation. Many Varicoceles are a symptomatic but sometimes can cause uncomfortable feeling specially when sitting or standing upright. It is more common in the left side of the scrotal. The serious effect of Varicocele can lead to infertility by damaging the sperm. High resolution ultrasound combined with Doppler and color flow techniques is an excellent method for evaluation the scrotum. The modality can, define cystic and solid lesions, monitor infectious process, identify Varicocele, determine torsion, localize undescended testis and differentiate testicular from extratesticular lesions.

1.2 Problems of the study:

To study of the frequency of varicocele and of its incidence among men of different ages.

1.3 Objectives of study:

1.3.1 General objectives:

To study prevalence of varicocele among Sudanese army student.

1.3.2 Specific objectives:

- To know Varicocele prevalence in Sudanese Army students.
- To discover army student with symptomatic Varicocele.
- To find out the relationship between the Varicocele and long standing.
- To find out the relationship between the Varicocele and age.

1.4 Overview of this study:

The research consists of five chapters. Chapter one is dealing with introduction, problems of the study, importance of the study, objectives and thesis outline. Chapter two shows the literature review and previous studies. Chapter three dealing with subjects and methodology, Chapter four shows the results. Chapter five is dealing with discussion, conclusion and recommendations.

Chapter Two

Theoretical Background and Previous Studies

2.1 Theoretical Background:

2.1.1 Anatomy:

The testes are symmetrical, oval-shaped glands residing in the scrotum. In adults, the testis measures approximately 3 to 5 cm in length, 2 to 4 cm in width, and approximately 3 cm in height. Each testis is divided into more than 250 to 400 conical lobules containing the seminiferous tubules. These tubules converge at the apex of each lobule and anastomose to form the rete testis in the mediastinum. The rete testis drains into the head of the epididymis through the efferent ductules. Sonographically, the testes appear as smooth, medium gray structures with a fine echo texture.

The epididymis is a 6- to 7-cm tubular structure beginning superiorly and then coursing posterolateral to the testis. It is divided into head, body, and tail. The head is the largest part of the epididymis, measuring 6 to 15 mm in width. It is located superior to the upper pole of the testis. It contains 10 to 15 efferent ductules from the rete testis, which converge to form a single duct in the body and tail. This duct is known as the ductus epididymis. It becomes the vas deferens and continues in the spermatic cord. The body of the epididymis is much smaller than the head. It is difficult to see with ultrasound on normal individuals. (Sandra, 2012)

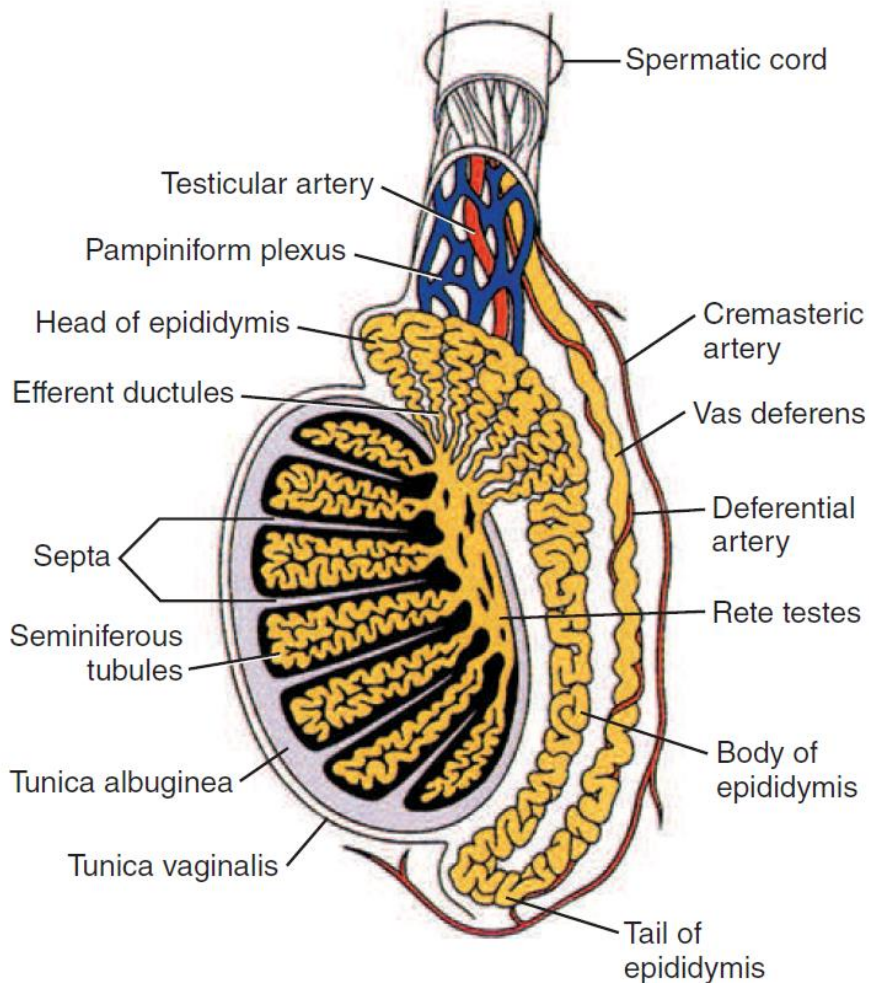


Figure (2-1): shows the scrotum contains. (Rumack 2018).

2.1. Testis:

The adult testes are ovoid glands measuring 3 to 5 cm in length, 2 to 4 cm in width, and 3 cm in anteroposterior dimension. Testicular size and weight decrease with age. Testis localized in the scrotum in which they are suspended by the spermatic cord, and it is surrounded by three membranes, the tunica vaginalis-outer (parietal and visceral layer), and the tunica albuginea -middle membrane of fibrous tissues and the tunica vasculosa – inner layer of areolar tissues. Inside the testis they are Multiple thin septations (septula) converge

posteriorly to form the mediastinum testis which forms the support for the entering and exiting testicular vessels and ducts, these septula also form 250 to 400 wedge-shaped lobuli that contain the seminiferous tubules they join other seminiferous tubules to form 20 to 30 larger ducts, known as the tubuli recti. The tubuli recti enter the mediastinum testis, forming a network of channels, called the rete testis. The rete terminate in 10 to 15 efferent ductules at the superior portion of the mediastinum, which carry the seminal fluid from the testis to the epididymis(Romack et al 2018).

2.1.2 The epididymis:

Is a curved structure measuring 6 to 7 cm in length and lying posterolateral to the testis. It is composed of a head, a body, and a tail. The head (globus major), is located adjacent to the superior pole of the testis and is the largest portion of the epididymis (10-12mm in diameter), the body (corpus) lies adjacent to the posterolateral margin of the testis, The tail (globus minor) is loosely attached to the lower pole of the testis by areolar tissue, measure 2-5mm in diameter(Romack et al 2018). The globus minor courses cephalad on the medial aspect of the epididymis to the spermatic cord(Romack et al 2018). The spermatic cord (ductus deference) is composed of arteries, veins, nerves, lymphatics, and the seminal duct. There are small ovoid structure usually located on the superior pole of the testis or in the groove between the testis and the head of the epididymis called appendix testis. (Romack et al 2018).

Testicular blood flow is supplied primarily by the deferential, cremasteric (external spermatic), and testicular arteries. The deferential artery originates from the inferior vesical artery and courses to the tail of the epididymis, The cremasteric artery arises from the inferior epigastric artery. It courses with the remainder of the

structures of the spermatic cord through the inguinal ring, continuing to the surface of the tunica vaginalis, where it anastomoses with capillaries of the testicular and deferential arteries. The testicular arteries arise from the anterior aspect of the aorta immediately below the origin of the renal arteries (Romachet et al 2018).

The transmediastinal artery supplies the testis, entering through the mediastinum and coursing toward the periphery of the gland. These arteries may be unilateral or bilateral and single or multiple (Romack et al 2018).

2.1.2 Physiology:

The testes produce the male gametes and the male sexual hormones (androgens). The term spermatogenesis describes and includes all the processes involved in the production of gametes, whereas steroidogenesis refers to the enzymatic reactions leading to the production of male steroid hormones. Spermatogenesis and steroidogenesis take place in two compartments morphologically and functionally distinguishable from each other. These are the tubular compartment, consisting of the seminiferous tubules (tubuli seminiferi) and the interstitial compartment (interstitium) between the seminiferous.

Tubules Although anatomically separate, both compartments are closely connected with each other. For quantitatively and qualitatively normal production of sperm the integrity of both compartments is necessary. The function of the testis and thereby also the function of its compartments are governed by the hypothalamus and the pituitary gland (endocrine regulation). These endocrine effects are mediated and modulated at the testicular level by local control mechanisms (paracrine and autocrine factors) (Weinbauer et al 2010).

2.1.2.1 Interstitial Compartment:

It's consist of Leydig cells, immune cells, blood and lymph vessels, nerves, fibroblasts and loose connective tissue. Leydig cells are the source of testicular testosterone and of insulin-like factor 3(INSL3). For every 10–50 Leydig cells one macrophage is to be found to influence their proliferation, differentiation and steroid production, through the secretion of cytokines(Weinbauer et al 2010).

2.1.2.2 Tubular Compartment:

Spermatogenesis takes place in the tubular compartment. It contains the germ cells and two different types of somatic cells, the peritubular cells and the Sertoli cells. Sertoli cells synthesize and secrete a large variety of factors: proteins, cytokines, growth factors, opioids, steroids, prostaglandins, modulators of cell division. Another important function of Sertoli cells is that they are responsible for final testicular volume and sperm production in the adult(Weinbauer et al 2010).

Through the production and secretion of tubular fluid Sertoli cells create and maintain the patency of the tubulus lumen. Sperm are transported in the tubular fluid its contains a higher concentration of potassium ions and a lower concentration of sodium ions. Other constituents are bicarbonate, magnesium and chloride ions, inositol, glucose, carnitine, glycerophosphorylcholine, amino acids and several proteins. Therefore, the germ cells are immersed in a fluid of unique compositionLH and FSH are glycoprotein hormones secreted by the pituitary gland that control development, maturation and function of the gonad(Weinbauer et al 2010).

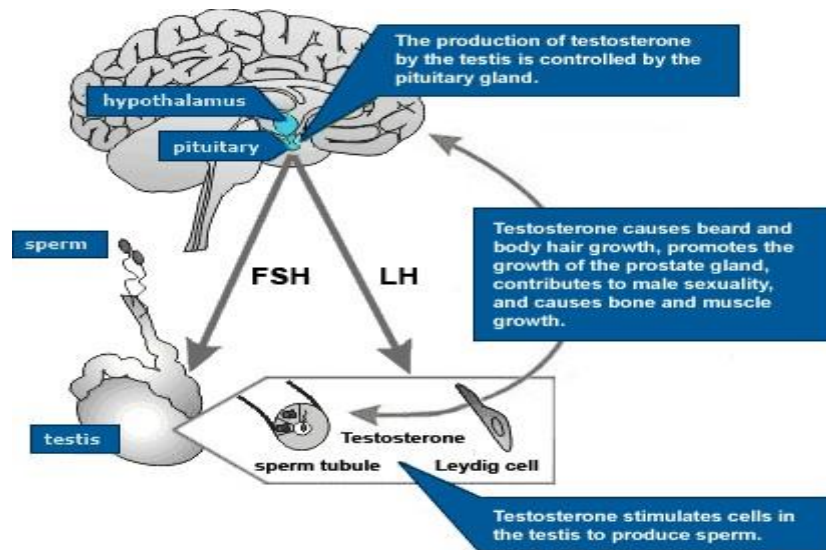


Figure (2-2): shows the physiology of male reproductive system.
(Weinbauer,2010).

2.1.3 Pathology:

2.1.3.1 Scrotal masses:

According to the site of tumor Scrotal masses divided into extratesticular and intratesticular masses, most extratesticular masses are benign, but the majority of intratesticular lesions are malignant(Romachet al 2018).

According to the origin most primary testicular tumors are of germ cell origin and are generally malignant (seminomas and nonseminomatous germ cell tumors(NSGCTs)) and also Gonadal stromal tumors, arising from Sertoli or Leydig cells and are generally benign(Romack et al 2018).

Gonadal stromal tumors in conjunction with germ cell tumors are called gonadoblastomas.The majority of gonadoblastomas occur in male patients with Cryptorchidism, hypospadias, and female internal secondary sex organs Nonseminomatous Germ Cell Tumors (NSGCTs) include Embryonal carcinomas,

Teratomas, yolk sac tumors, Choriocarcinomas, and mixed germ cell tumors. These tumors occur more often in younger patients than do Seminomas (Romack et al 2018).

Sonographically pure seminomas have low-level echoes without calcification, and they appear hypoechoic compared with normally echogenic testicular parenchyma and have a more heterogeneous echotexture rarely, seminomas become necrotic and appear partly Cystic on sonography (Weinbauer et al 2010). NSGCTs are more heterogeneous than seminoma and may have both solid and cystic components. Coarse calcifications are common. It is not possible to distinguish the various subtypes of NSGCTs on sonography (Romack et al 2018).

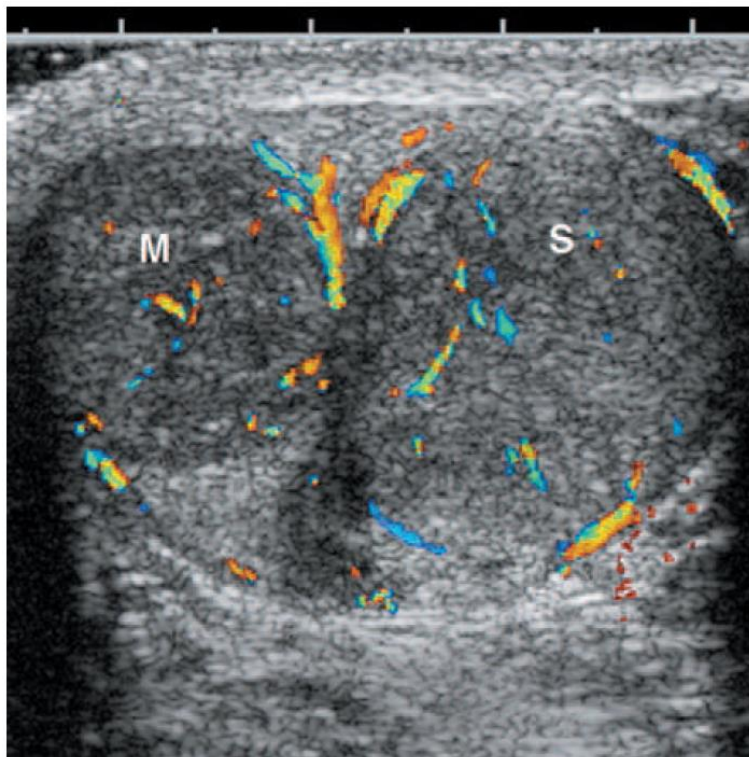


Figure (2-3) shows Mixed tumor. (Transverse scan of coexistent mixed germ cell tumor (M) and seminoma (S)). (Romack et al 2018).

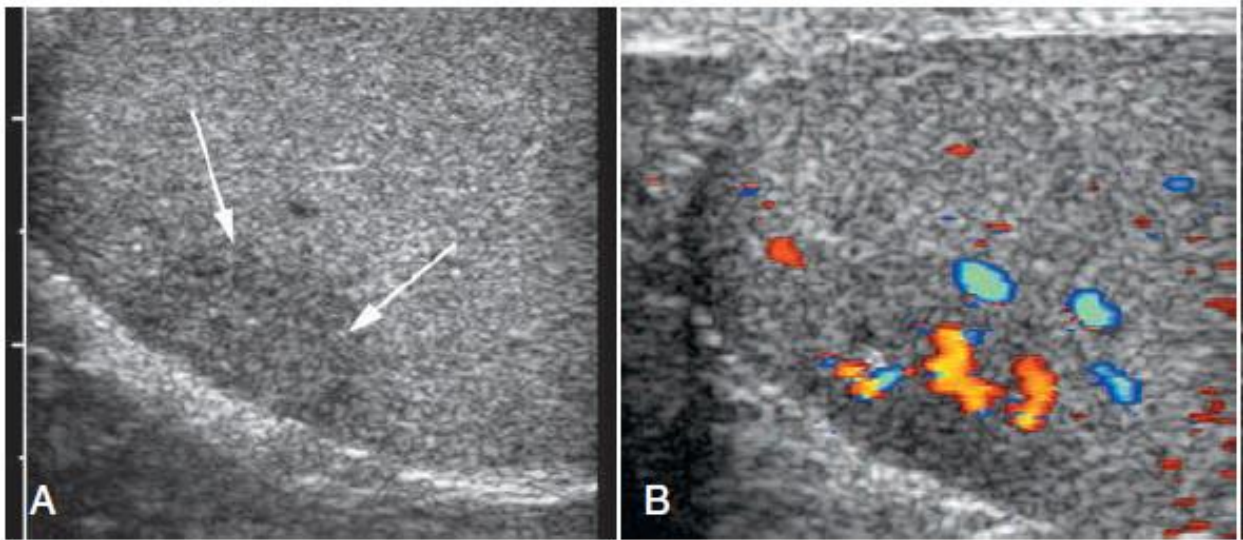


Figure (2-4) shows seminoma (Longitudinal scans. A and B, Subtle hypoechoic seminoma (arrows) with increased flow) (Romack et al 2018).

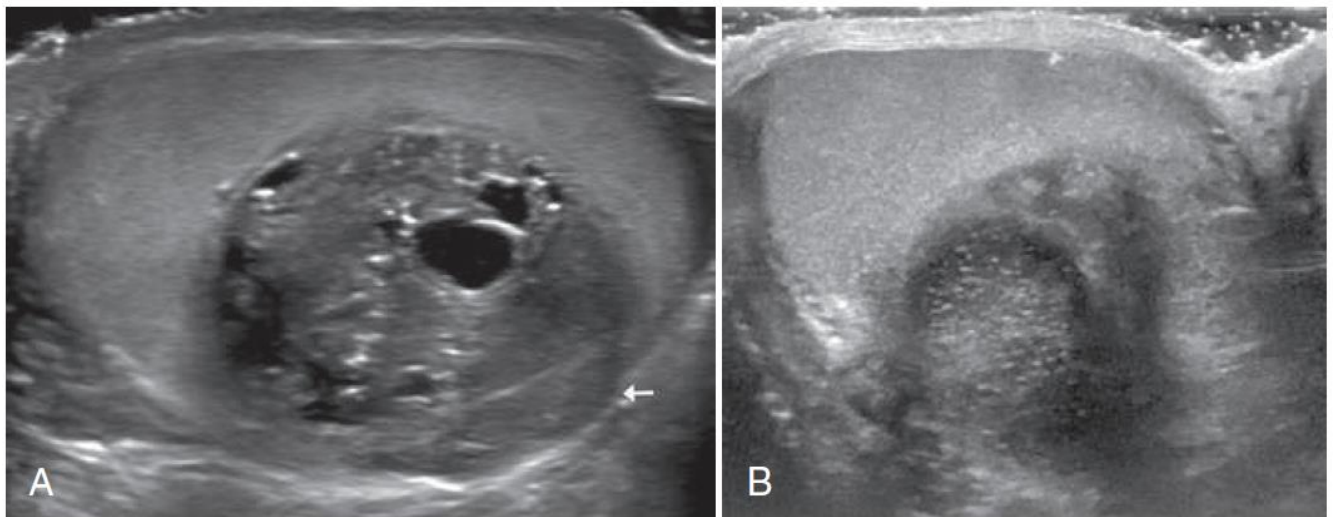


Figure (2-5) shows Nonseminomatous germ cell tumors: (A, Transverse scan shows tumor (arrows) with coarse calcification B, Mixed germ cell tumor. Longitudinal scan shows a large tumor with cystic change occupying most of the testis.) (Romack et al 2018).

2.1.3.2 Extratesticular Pathologic Lesions:

2.1.3.2.1 Hydrocele: is an abnormal accumulation of serous fluid between the layers of the tunica vaginalis. Rarely, hydrocele may be loculated around the spermatic cord above the testis and epididymis. Hydroceles may be congenital or acquired and it is considered the most common cause of scrotal swelling (Romack et al 2018). Sonographically anechoic fluid collection surrounds the testis except posteriorly where the tunica vaginalis is absent (Weinbauer et al 2010).

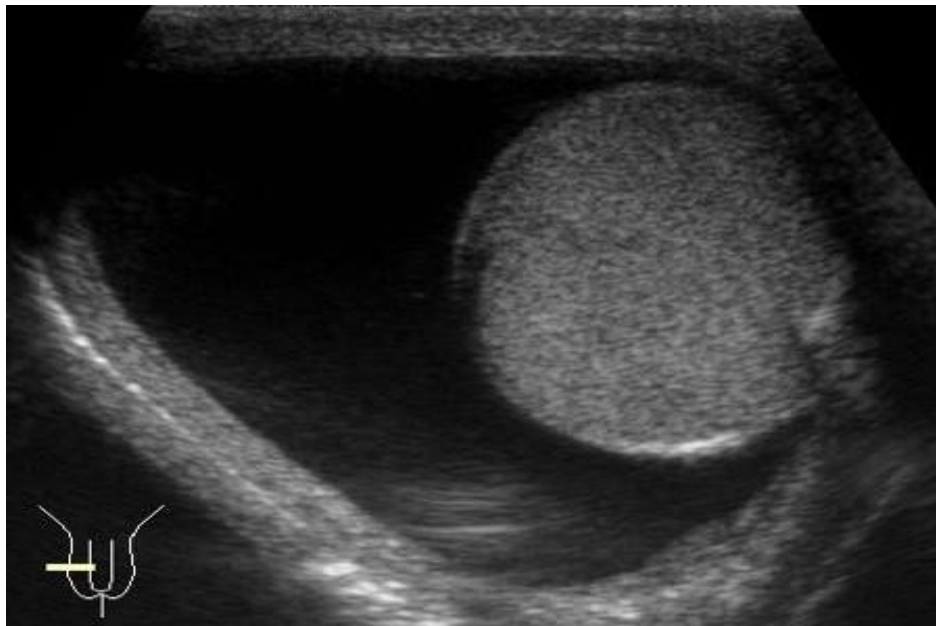


Figure (2-6) Hydrocele with peritesticular fluid in the tunica vaginalis.

2.1.3.2.2 Hematoceles: is an accumulation of blood in the cavity of the tunica vaginalis result from trauma, surgery, neoplasms, or torsion.

Pyoceles is the presence of pus in the cavity of the tunica vaginalis result from rupture of an abscess.

Sonographically both hematoceles and pyoceles contain internal echoes and are associated with internal septations and loculations(Romack et al 2018).

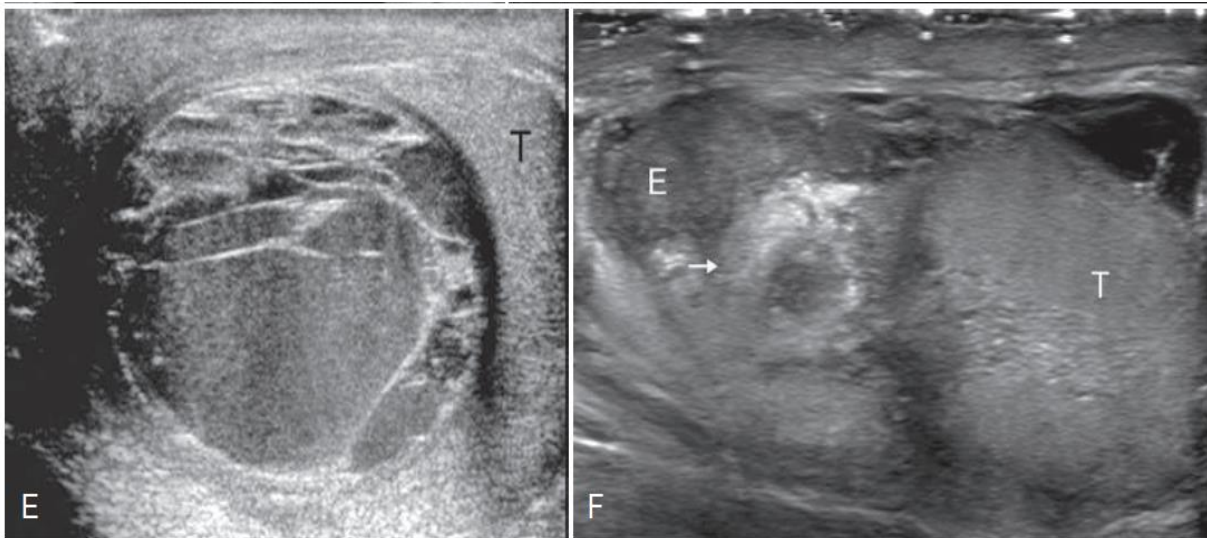


Figure (2-7) shows Hematocele and Pyocele (E, Hematocele. Transverse scan shows fluid with internal echoes and linear membranes. F, Pyocele. Transverse scan shows fluid collection with internal echoes.) (Romack et al 2018).

2.1.3.3 Spermatoceles and epididymal cysts:

Spermatocele is a cyst containing spermatozoa and debris and is almost always located in the head of epididymis Sonographically spermatocele are located at the superior pole of the testis, are oval or round, solitary, 2-3 cm in diameter with echogenic, often layering fluid and septations are Common(Romack et al 2018).

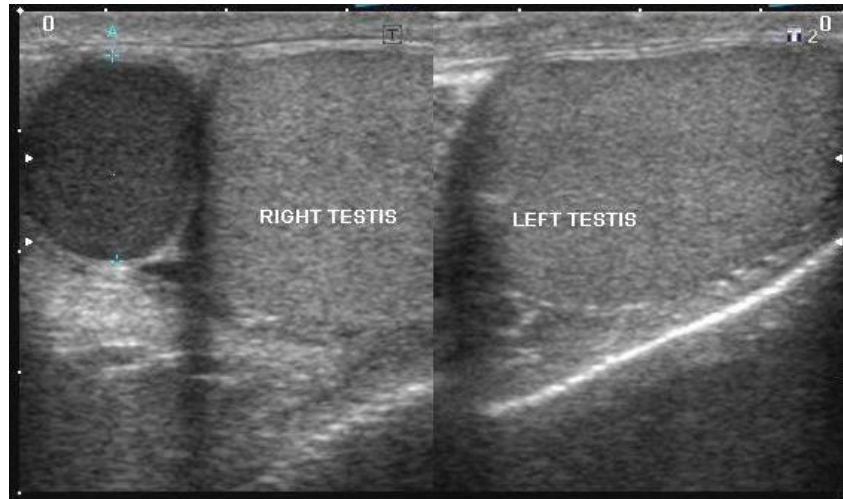


Figure (2-8) shows Spermatocele involving the head of right epididymis. (Romack et al 2018).

Epididymal cyst contains clear serous fluid and arises anywhere throughout the length of the epididymis. Sonographically epididymal cysts may be located anywhere in the epididymis. They have all the features of a simple cyst. They are often multiple and usually < 1cm diameter (Romack et al 2018).

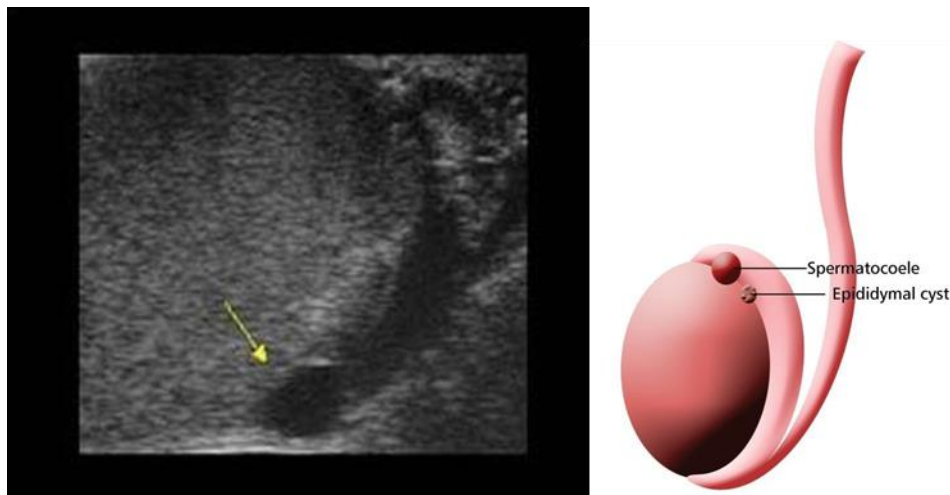


Figure (2-9) Epididymal cyst (shows Small epididymal cyst in the body of the epididymis)

2.1.3.4 Benign cysts of the tunica albuginea:

These cysts are usually firm, palpable testicular masses ranging size from 2 to 5mm. Located in the testis adjacent to the tunica albuginea(Romack et al 2018).

They may be solitary or multiple, unilocular or multilocular and anechoic or hypoechoic (Romack et al 2018).

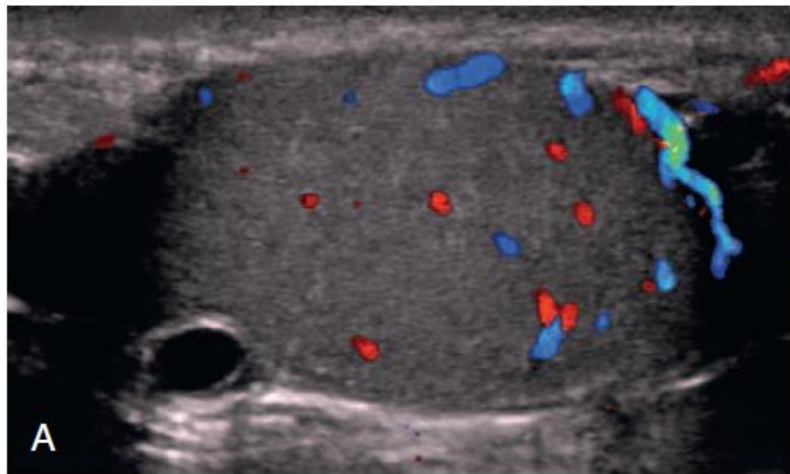


Figure (2-10) shows Tunica albuginea cyst adjacent to tunica albuginea.(Romack et al 2018)

2.1.3.5 Benign intra-testicular cysts:

These are simple cyst filled with clear serous fluid that varies in size from few mm to 1-2cm, Located within the testicular parenchyma and may be single or multiple. They become increasingly more common in older men(Romachet al 2018).

2.1.3.6 Sperm granulomas:

They are extratesticular, inflammatory lesions, usually located adjacent to the testis or seminal vesicle. Sonographically they appear as well circumscribed,

hypoechoic, solid, heterogenous lesions located within the epididymis or ductus deferens(Romack et al 2018).

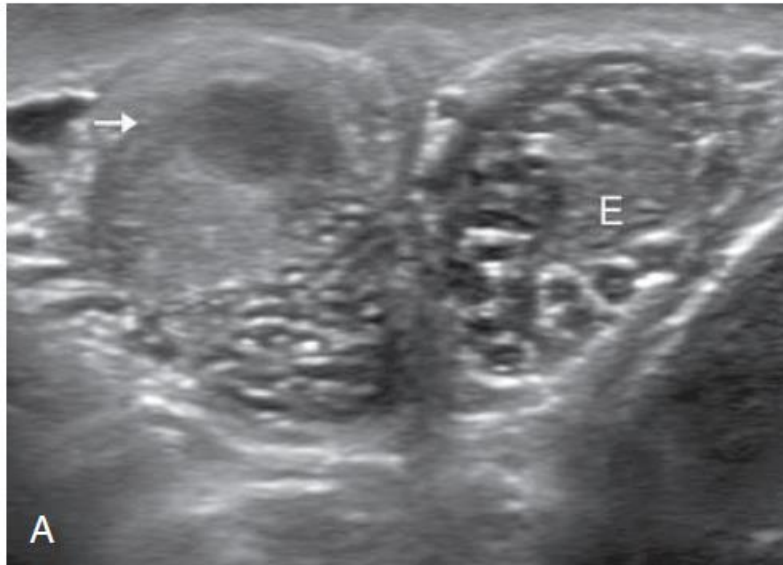


Figure (2-11) shows Sperm granuloma with a hypoechoic non vascularized round mass in the epididymal tail.(Romack et al 2018)

2.1.3.7Scrotal hernia:

They are usually diagnosed on the basis of clinical history and physical examination. Sonography is useful in the evaluation of atypical cases such as inguinal hernias presenting as scrotal masses. The hernia may contain small bowel, colon, and/or omentum. Sonographically, a heterogenous mass is demonstrated extending from the inguinal canal to the scrotum. The mass moves and changes size with the Valsalva maneuver and hydrocele is often present(Romack et al 2018).

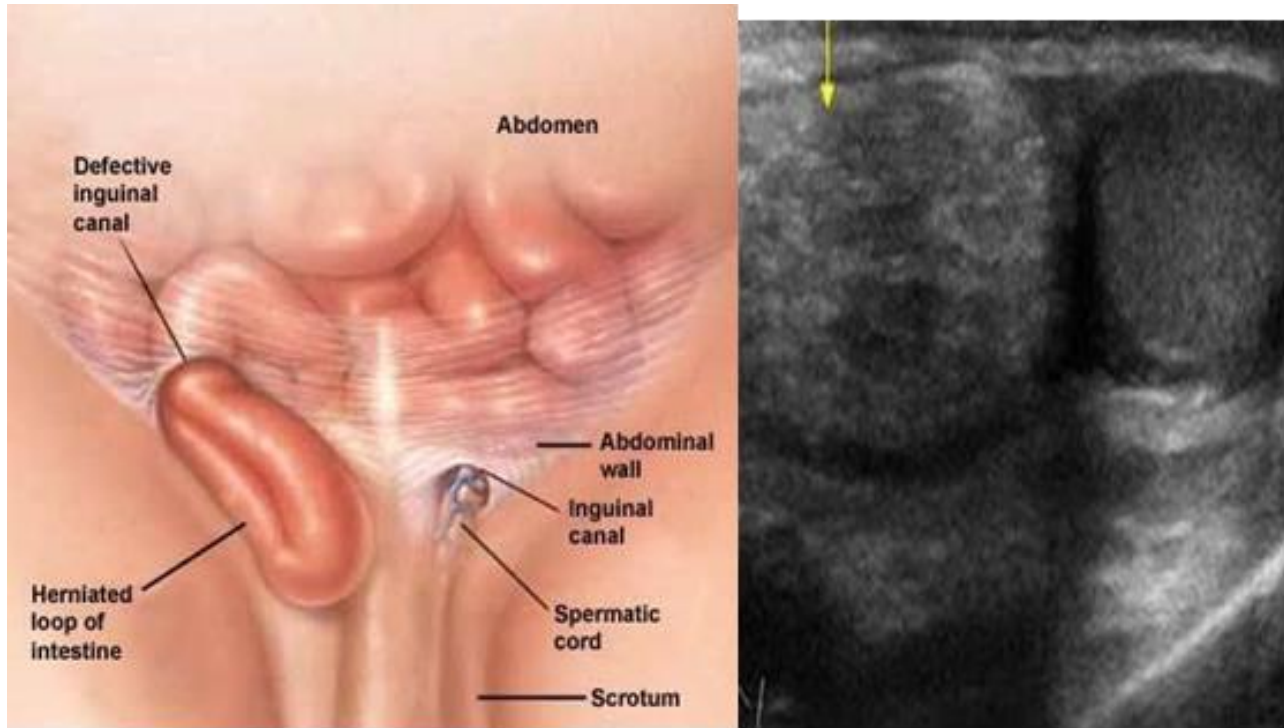


Figure (2-12) shows scrotal hernia (Heterogenous mass extending from the inguinal canal to the scrotum)(Romack et al 2018)

2.1.3.8 Cryptorchidism (undescended testicles):

Failure of the testis to migrate from the abdominal cavity through the inguinal canal and into the scrotum is significant. Undescended testicle search should begin at the scrotum and proceed up into the inguinal canal and finally into the pelvis. Approximately 4% of neonates have undescended testes. Infertility and a 40-50 fold increase in risk of cancer are complications of uncorrected Cryptorchidism(Romack et al 2018).

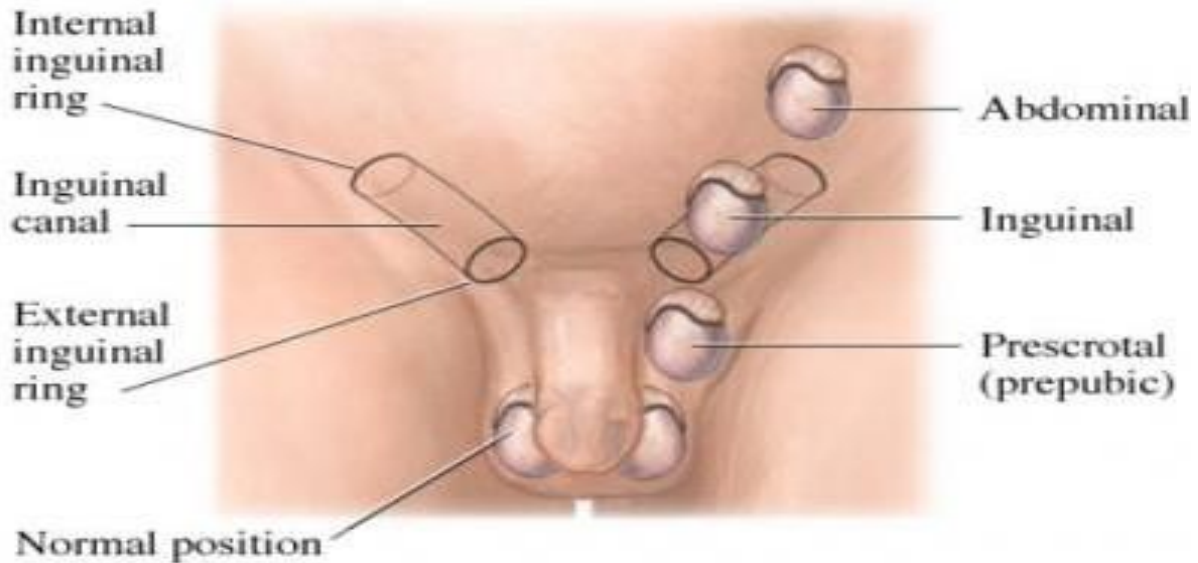


Figure (2-13) shows undescending testis(Romack et al 2018)

Sonographically the undescended testis is demonstrated as an oval solid mass with echogenicity that differ according to age. In infants less than 1 year, the undescended testicle is approximately 1cm in size and isoechoic to descended testicles. In older children and adults the undescended testicles is ovoid, hypoechoic and smaller (atrophic) when compared to normal testis(Romachet al 2018).

2.1.3.9 Torsion:

Torsion of the testes most common occurs in the neonate or adolescent. Torsion leads to hemorrhagic infarction and necrosis of the testicle Ultrasound appearances depend upon the degree of torsion and its duration Torsion is divide to acute stage and late acute stage and each one got different sonographic criteria than the other. In acute stage (initial 6 hours), testis is normal and sometimes enlarged and hypoechoic compared to the opposite side due to venous congestion. In the late acute stage (days 1-4) there is congestion with hypoechoic, enlargement and necrosis causing anechoic areas. Colour

(power) Doppler indicates complete absence of flow in complete torsion (Romachet al 2018).

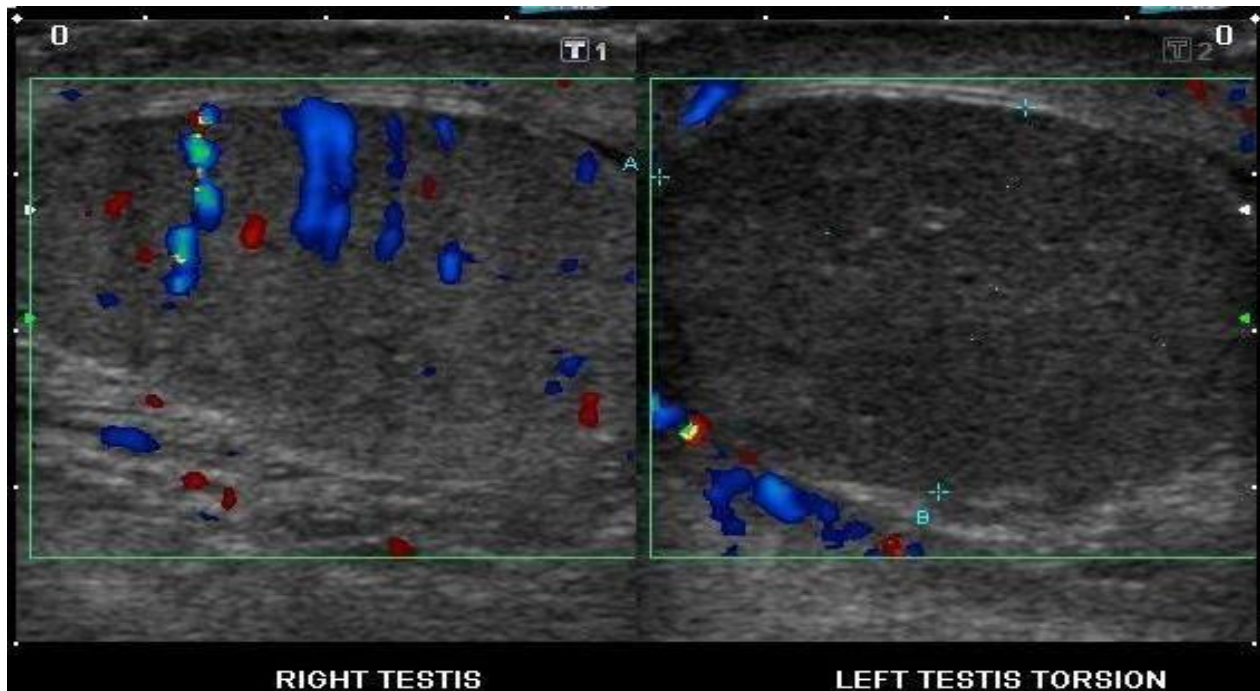


Figure (2-14) shows Left testicular torsion with absent of vascularization.

2.1.3.10 Infection:

Acute testicular pain is most commonly caused by infection (epididymitis, orchitis and epididymoorchitis).

Sonographically, enlarged, hypoechoic (epididymis/testicles) with hydrocele with increase vascularity in color and pulsed Doppler(Romack et al 2018).

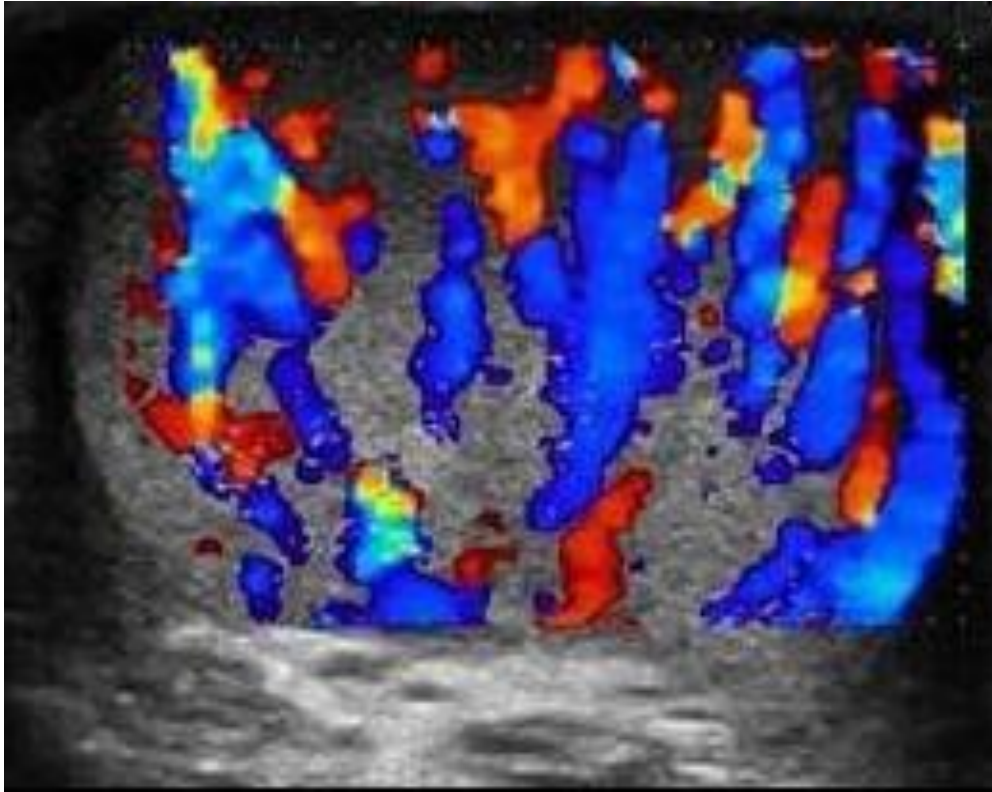


Figure (2-15) shows Orchitis with highly vascularized testis.

2.1.3.11 Varicoceles:

is a collection of abnormally dilated, tortuous, and elongated veins of the pampiniform plexus located posterior to the testis, accompanying the epididymis and vas deferens within the spermatic cord.

The veins of the pampiniform plexus normally range from 0.5 to 1.5 mm in diameter, with a main draining vein up to 2 mm in diameter (Romack et al 2018).

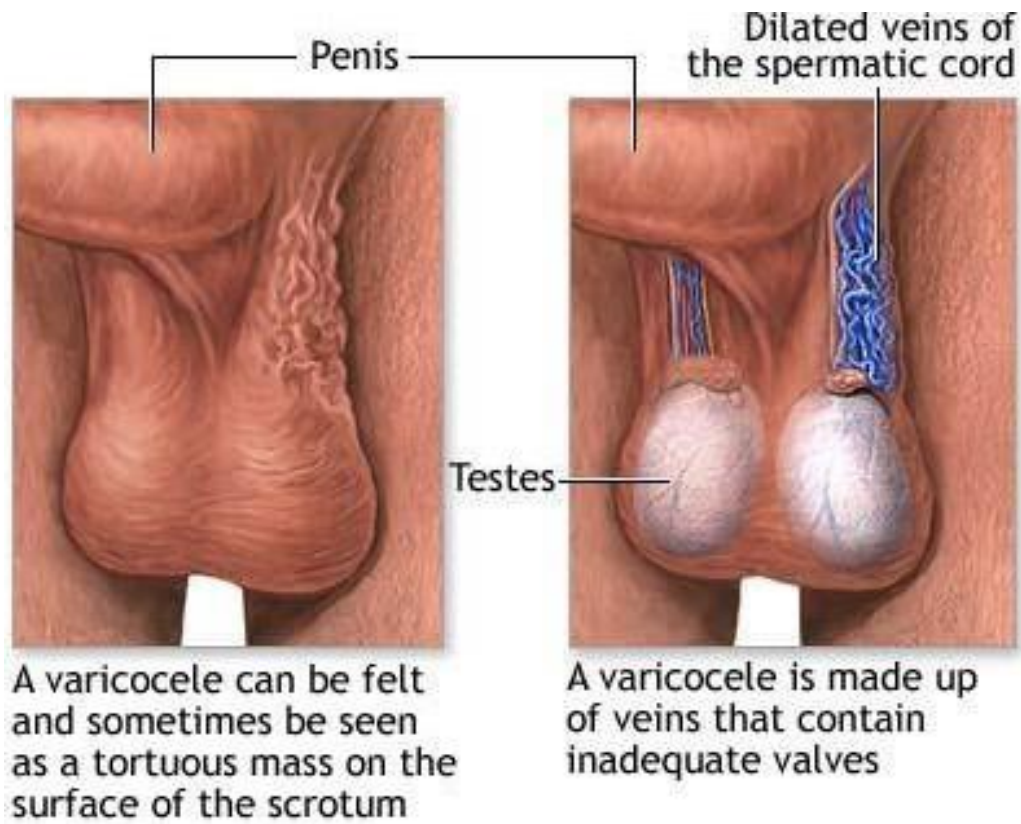


Figure (2-16) shows characterization of varicocele

There are two types of varicoceles: primary (idiopathic) and secondary.

The idiopathic varicocele is caused by incompetent valves in the internal spermatic vein, which permit retrograde passage of blood through the spermatic cord into the pampiniform plexus (Romack et al 2018).

Secondary varicoceles result from increased pressure on the spermatic vein or its tributaries by marked hydronephrosis, an enlarged liver, abdominal neoplasms, or venous compression by a retroperitoneal mass (Romachet al 2018).

Secondary varicocele may also occur in the nutcracker syndrome (nutcracker phenomenon), in which the superior mesenteric artery compresses the left renal vein. A search for neoplastic obstruction of gonadal venous return must be undertaken in cases of a rightsided, nondecompressible, or newly discovered

varicocele in a patient older than 40 years because these cases are rarely idiopathic. The appearance of secondary varicoceles is not affected by patient position(Romack 2018).

In infertile men, sonography aids in the diagnosis of clinically palpable and subclinical varicoceles. Sonography is also of value in assessing testicular size before and after treatment, because varicocele may be associated with a decreased testicular volume. There is poor correlation between the size of the varicocele and the degree of testicular tissue damage leading to infertility(Romack et al 2018).

Sonographically, the varicocele consists of multiple, serpentine, anechoic structures more than 2 mm in diameter, creating a tortuous, multicystic collection located adjacent or proximal to the upper pole of the testis and head of the epididymis(Romack et al 2018).

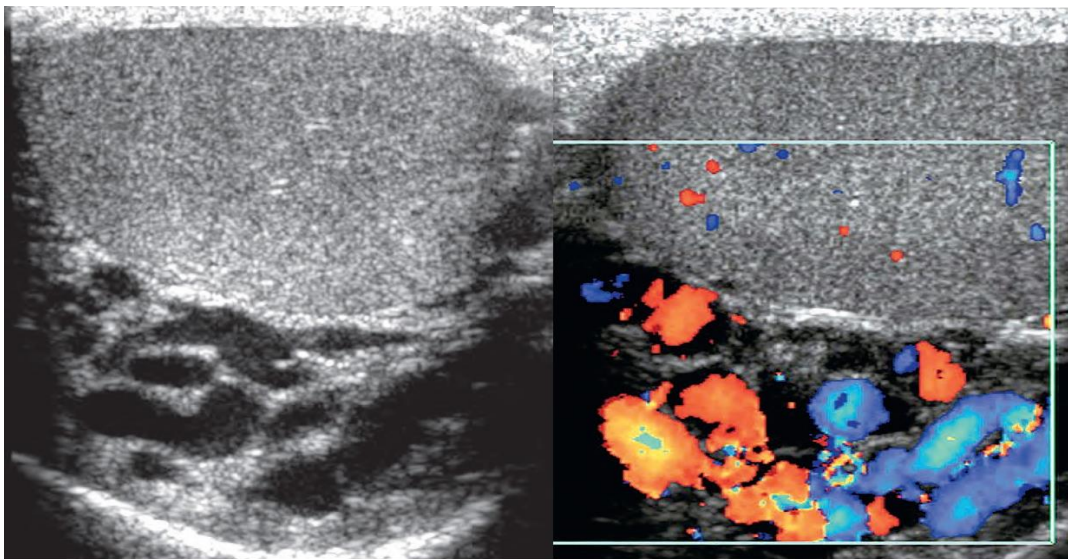


Figure (2-17) shows serpentine (A, Longitudinal, and B, color Doppler, images show serpentine, hypo echoic, dilated veins posterior the testis. The blood flow in a varicocele is slow and may be detected only with low-flow Doppler settings or the Valsalva maneuver) (Palmer 2003).

2.1.4.2 Imaging used in diagnosing:

2.1.4.2.1 Ultrasound physics:

Ultrasound is one type of sound wave with high-frequency sound waves over 20KHz, these waves inaudible to humans, can be transmitted in beams and are used to scan the tissues of the body. These waves are generated by a piezoelectric transducer which is capable of changing electrical signals into mechanical (ultrasound) waves and it can also receive the reflected ultrasound and change it back into electrical signals. Transducer has many kinds but we use linear transducer to scan scrotum. The Doppler Effect occurs if the reflector is moving towards the transmitter, the reflected frequency higher than the transmitted frequency, and vice versa. The difference between the transmitted and received frequencies is proportional to the speed with which the reflector is moving away from or approaching the transmitter. The Doppler can be used to demonstrate blood flow in the peripheral vessels (it is used to detect varicocele) (Palmer 2003).

2-4-2-1 Ultrasound technique for testis:

It is helpful if the patient can localize a palpable nodule within the scrotum, which the sonologist can then palpate during the examination. The patient is examined in the supine position. The scrotum is elevated with a towel draped over the thighs, and the penis is placed on the patient's abdomen and covered with a towel. Alternatively, the scrotal sac may be supported by the examiner's hand. A high-frequency (7.5-15 MHz) linear array transducer is typically used because it provides increased resolution of the scrotal contents. If greater penetration is needed because of scrotal swelling, a 6-MHz or lower frequency transducer may be used. (Romack et al 2018).

A direct-contact scan is most often performed using acoustic coupling gel. Images of both testes are obtained in transverse and sagittal planes. If possible, a transverse scan showing both testes for comparison is obtained using a dual-imaging technique, a larger-footprint transducer, or extended-field of view imaging. Additional views may be obtained in the coronal or oblique planes, with the patient upright or performing the Valsalva maneuver when necessary. Color flow and power mode Doppler sonography are also performed to evaluate testicular blood flow in normal and pathologic states (Romack et al 2018).

2.2 Previous Studies:

Study of Varicocele in Military Students, Gism Alla Yousif Mohamed, 2016:

Varicocele disease highly spreads among the students of Faculty of Law and Police Sciences. This disease is considered to be one of the reasons that leads to infertility. However, this disease is treated by surgical intervention Varicocele delays military exercise operation: The main objective of this research is find out the relationship between the long standing and the infection of varicocele . The research was done on a sample of 32 students of Faculty of Law and Police Sciences whose ages range from 19 – 24 years. And most of them at medical Radiography section at Ribat University Hospital January 2016 – may 2016. Data are collected to this by colored ultrasound machine and transducer of (5-10MHz) and the sample was taken with cross – section. The significant results of the research as follows the percentage of varicocele infection among the students reached 37.5% and this result is expected to be more than the normal ratio (15-20%) and this has shown considerable relationship between long standing and the varicocele infection. In additional, I have found out that 15.6% of the sample suffer from varicososis and this indicates that legs are affected by long standing. Finally,

one of the recommendation is to reduce the hours that the students of Faculty of Law and Police Sciences stand. There must be periodical examination for scrotum make early detection for the disease.

varicocele and sperm affect, Kantartzi et al (2004) Design: Meta-analysis of studies identified via a search of PubMed, Medline, and the Cochrane Library covering the last 40 years. Setting: Not applicable:

Conclusion: The presence of varicocele in youth appears to negatively affect sperm density, motility, and morphology. Treatment appears to result in moderate improvement of spermdensity and mild improvement in sperm motility. (FertilSteril_ 2014;102:381–7. _2014 by American Society for Reproductive Medicine.) <http://fertstertforum.com/norkj-youth-varicocele-treatment-semen-outcomes>

Male infertility and varicocele: myths and reality:

Conclusion: Varicocele is one of most debatable issues in the field of male infertility mainly with regard to surgical intervention. Many scientists believes that the surgical repair of varicocele should include a very narrow group of infertile men. Nevertheless, there are no widely accepted criteria regarding the selection of this group of men. With development of ICSI technique during the last few years, research should focus mainly on the effectiveness of surgical repair of varicocele taking under consideration the pregnancy rates of the methods, their cost- effectiveness as well as couples preference. Hippokratia,2007jul-sep; 11(3): 99-104.

Report on varicocele and infertility: a committee opinion Practice committee of the American Society for Reproductive Medicine and the Society for Male Reproduction and Urology, Birmingham, Alabama.

Conclusions: Treatment of a clinically palpable varicocele may be offered to the male partner of an infertile couple when there is evidence of abnormal semen parameter and minimal/on identified female factor, including consideration of age and ovarian reserve.

In vitro fertilization without ICSI may be consider the primary treatment option when such treatment is required to treat a female factor, regardless of the presents of varicocele and abnormal semen parameters. The treating physician's experience and expertise, including evolution of both partners, together with options available, should determine the approach to varicocele treatment.

Chapter Three

Materials and Methods

3.1. Materials:

3.1.1. Machine:

Different Ultrasound machine, with 10 MHz linear transducer.



Figure (3.1) shows color Ultrasound machine (Siemens, Sonoline G60S), Germany 2004.

3.1.2. Type of study:

Descriptive cross-sectional study.

3. 1.3. Area of study:

The study conducted at Omdurman military hospital in Khartoum state, Sudan.

3. 1.4. Duration of study:

This study done in period from may 2019 up to Oct 2019.

The sample of this study was selected conveniently which consist of 75 patients, admitted to Omdurman military hospital for scrotal ultrasound scan.

3.2. Methods:

3.2.1. Data collection:

The data collected by data collection sheet designed especially for the study and ultrasound examination done to population of the study.

3.2.2. technique:

The patient is supine with slightly separated legs; the head of the patient is at level above the level of the legs. Ultrasound gel is used, also gloves is used to protect the operator from infection. The patient is asked to hold his penis and tracked it against his abdomen. Coughing and Valsalva maneuver are applied. Color Doppler and Spectrum are applied to differentiate blood vessels from other structures and arteries from veins. There are Two main views are applied: Transverse and longitudinal orientation probe is used, with additional projection if needed (oblique).

- Scrotal vessels are examined posterior to the testis.
- Pampinformvenous plexus seen inferior to the base of the penis.

At the end of the exam we clean the probe to protect the latter patient from infection.

The data this study collected using the following variable age, family history, and scrotal pain.

3.2.4. Data analysis:

The data analyzed by using Statistical Packaged for Social Studies (SPSS) program and presented through tables and graphs.

3.2.5. Data presentation:

The data presented by tables and figures.

Chapter four

Results

The following tables and figures represent data obtained from sample ofpatients who underwent

Table 4-1: Study group Age distribution.

Age classes	Frequency	Percentage %
18 – 20	18	18 %
21 – 23	61	61 %
24 – 26	21	21 %
Total	100	100 %

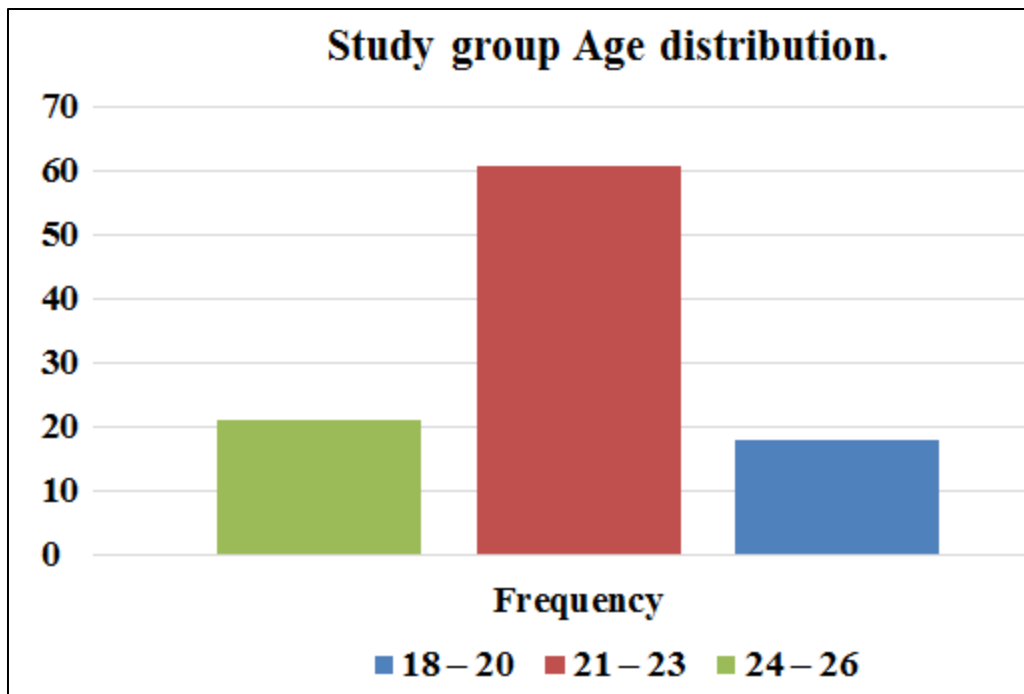


Figure 4-1: Study group Age distribution.

Table 4-2: Mean of study group Age.

Gender	Mean
Male	21.9

Table 4-3: Study group presenting complains distribution.

Presenting complains	Frequency	Percentage %
Pain	27	27 %
Swelling	12	12 %
Pain + Swelling	61	61 %
Total	100	100 %

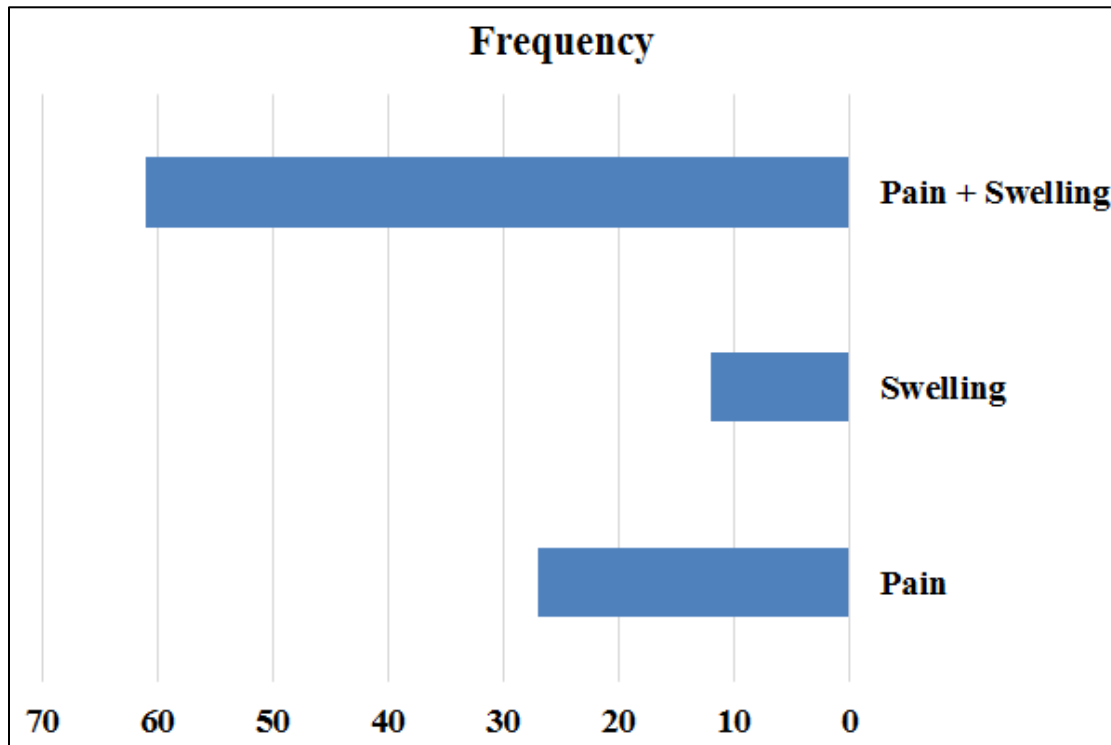


Figure 4-2: Study group presenting complains distribution.

Table 4-4: Study group Presence of Varicocele distribution.

Presence of Varicocele	Frequency	Percentage %
Yes	60	60 %
No	40	40 %
Total	100	100 %

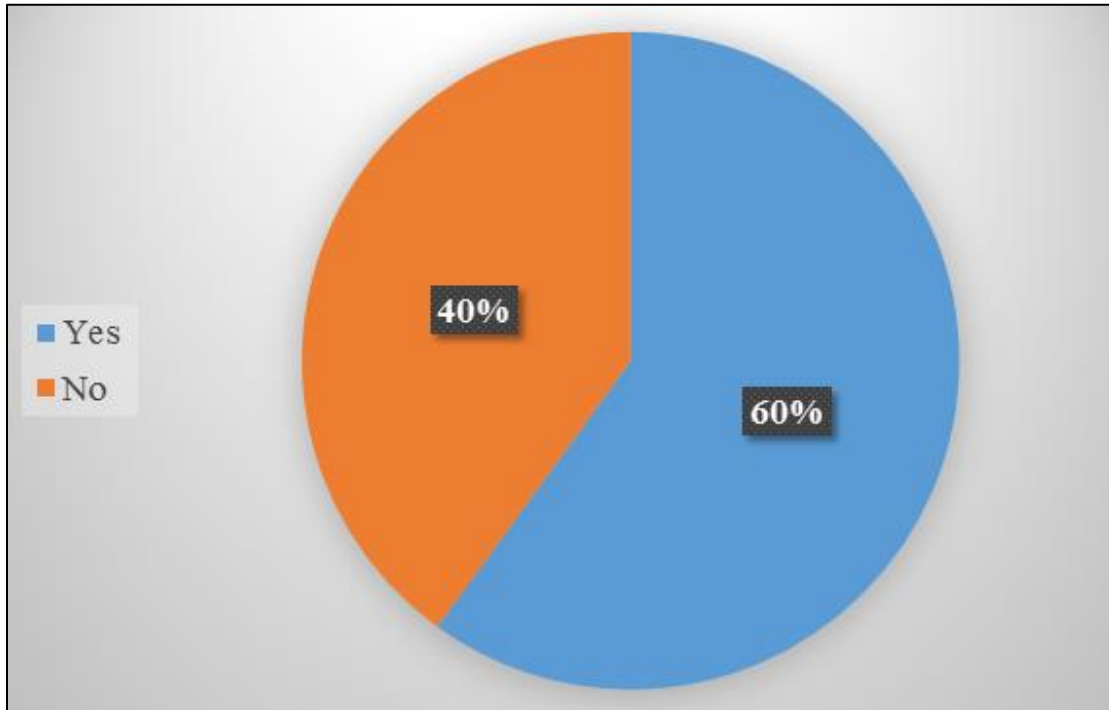


Figure 4-3: Study group Presence of Varicocele distribution.

Table 4-5: Study group diameter of Varicocele distribution.

diameter of Varicocele (mm)	Frequency	Percentage %
2.0 – 2.2	27	45 %
2.3 – 2.5	12	20 %
2.6 – 2.8	11	18.3 %
2.9 – 3.1	6	10 %
3.2 – 3.4	4	6.7 %
Total	60	100 %

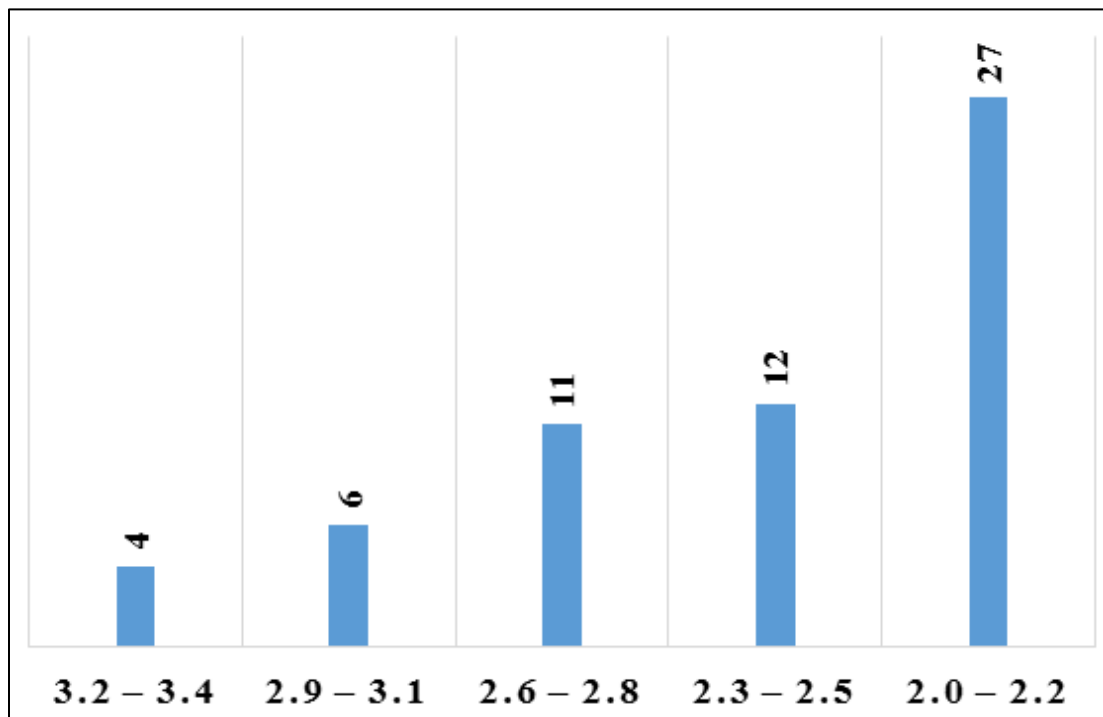


Figure 4-4: Study group diameter of Varicocele distribution.

Table 4.6 Descriptive Statistics

	Mean	Std. Deviation	N
Age	21.8833	1.84199	60
Diameter	2.4550	.36843	60

Table 4.7 Correlations

		Age	Diameter
Age	Pearson Correlation	1	-.018-
	Sig. (2-tailed)		.892
	N	60	60
Diameter	Pearson Correlation	-.018-	1
	Sig. (2-tailed)	.892	
	N	60	60

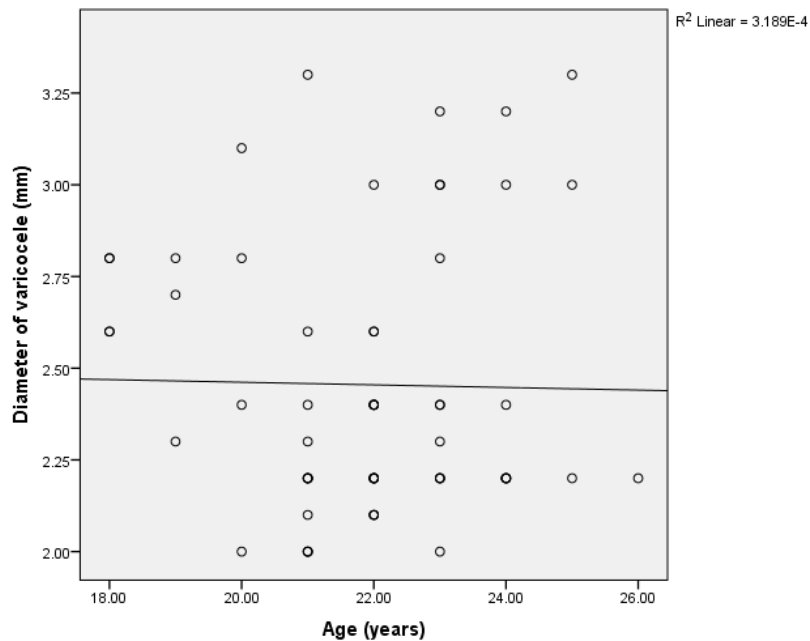


Figure 4-5: Correlation between age of patients and diameter of Varicocele.

Chapter Five

Discussion, Conclusion & Recommendations

5-1 Discussion:

The study of varicocele in Sudanese army students using ultrasound is potential important to find out the relationship between varicocele and long standing situation, however the data of trails is significant is power to demonstrate the problem, risk and the early detection to increase the response of treatment whether medical or surgical. The study evaluating the performance the increase of varicocele due to long standing, 100 patients were participate in this study, participants in this study with age range of 18–26 years, most of participants ranged in 21-23 years, there were 61%, with mean age of 21.9 years.

Most patients complain of pain, swelling or pain and swelling most of them complain of both pain and swelling 61%.

The study found 60% of patients present varicocele and 40% of patients are normal.

The diameter of varicose vein ranged from (2-3.4mm) the most diameters (2-2.2mm) with mean diameter 2.4550mm. The study found there was no linear relationship between the age and diameter of varicose vein.

5.2. Conclusion

The study concludes that the Relationship between the long standing and the varicocele during military exercises ; as fast and reliable method is high needed for early detection of this disease and this could be by ultrasound as effective method of early detection and treatment decision. The study investigates experimentally 100 cases between the long standing and the infection of varicocele estimating the disease in the patients currently in Omdurman military hospital in period from May 2019 to October 2019 random sampling technique was used. A scrotum ultrasound for these patients was examed using a linear high frequency ultrasound transducer with color Doppler ultrasound machine. The data analysis by statistical methods that include the linear and plot as well as bar chart using SPSS. The main finding of the study can be summarized as following. 60% of patients present varicocele and 40% of patients are normal. In conclusion, we are sufficiently encouraged the performance of scrotal ultrasound scan for army students for preclinical a large, randomized, trails incorporating the risk as first line test we believe that the improved detection and good prognosis of treatment for varicocele patients.

5-3 Recommendation:

- Diminishing the period of long standing for army students.
- Providing colored ultrasound machine.
- Performance periodical cycle and regular scrotal ultrasound scan for army students for early detection.
- Performance r scrotal ultrasound scan for all army students whom are presents now in the college.
- Further Studies with more samples.

References

Carol A.Krebs, RDMS , RVT et al. Ultrasound Atlas of Disease Processes. 5th edition, Appleton and Lange Simon; Norwalk (USA):1997.

Carol M. Romack, Stephanie R. Wilson, J. William Charboneau, Devorah Levine. 2018, Diagnostic Ultrasound. 4th ed. Vol(1). Elsevier MOSBY; USA.

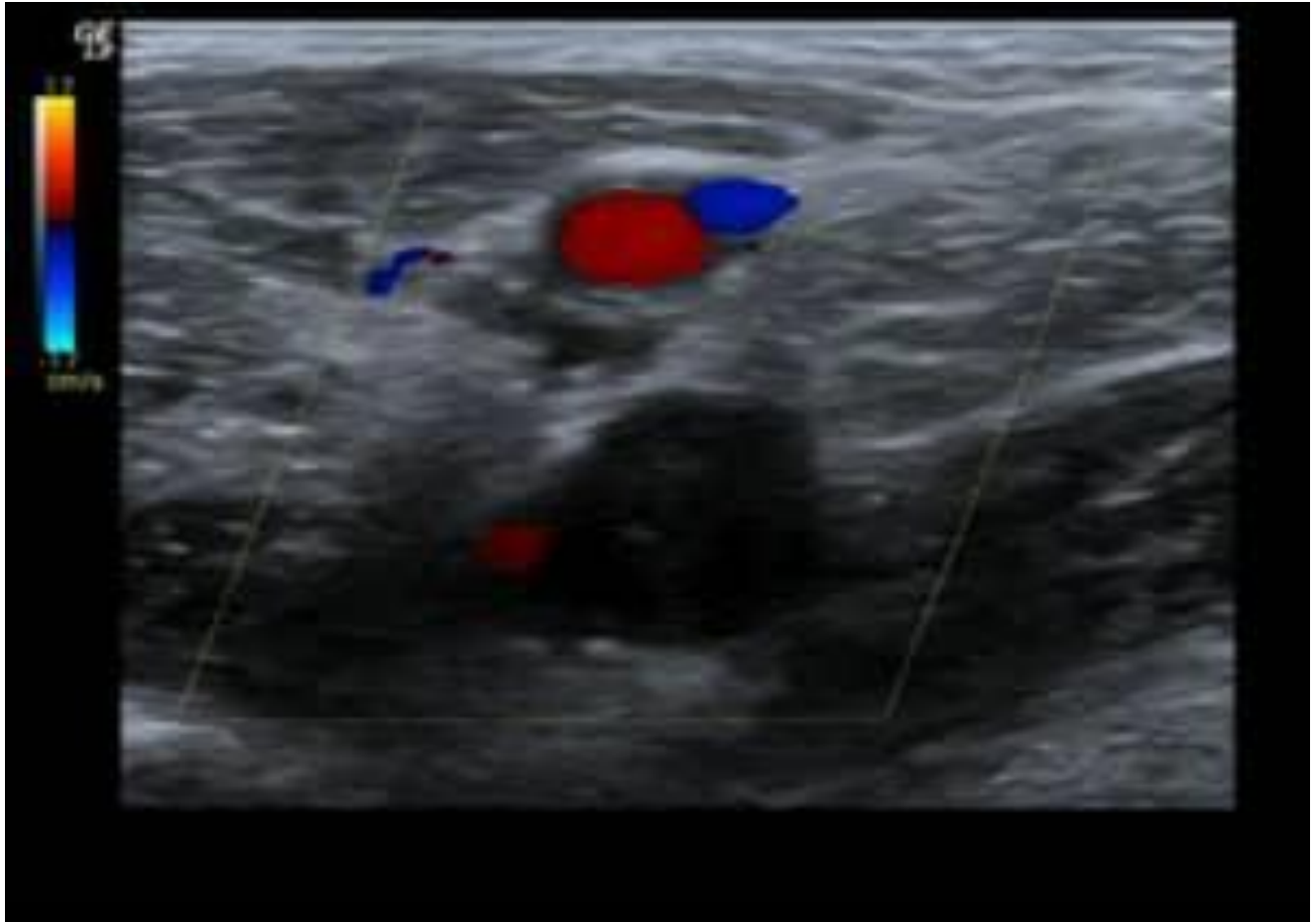
Gerhard F.Weinbauer et al. 2010. physiology of testicular function. 2nd ed. Verlag Berlin Heidelberg; Germany.

Michael McKinley, Valerie Dean O loughlin.(2006) Human anatomy. 1sted. MC Grow-Hill; New York.

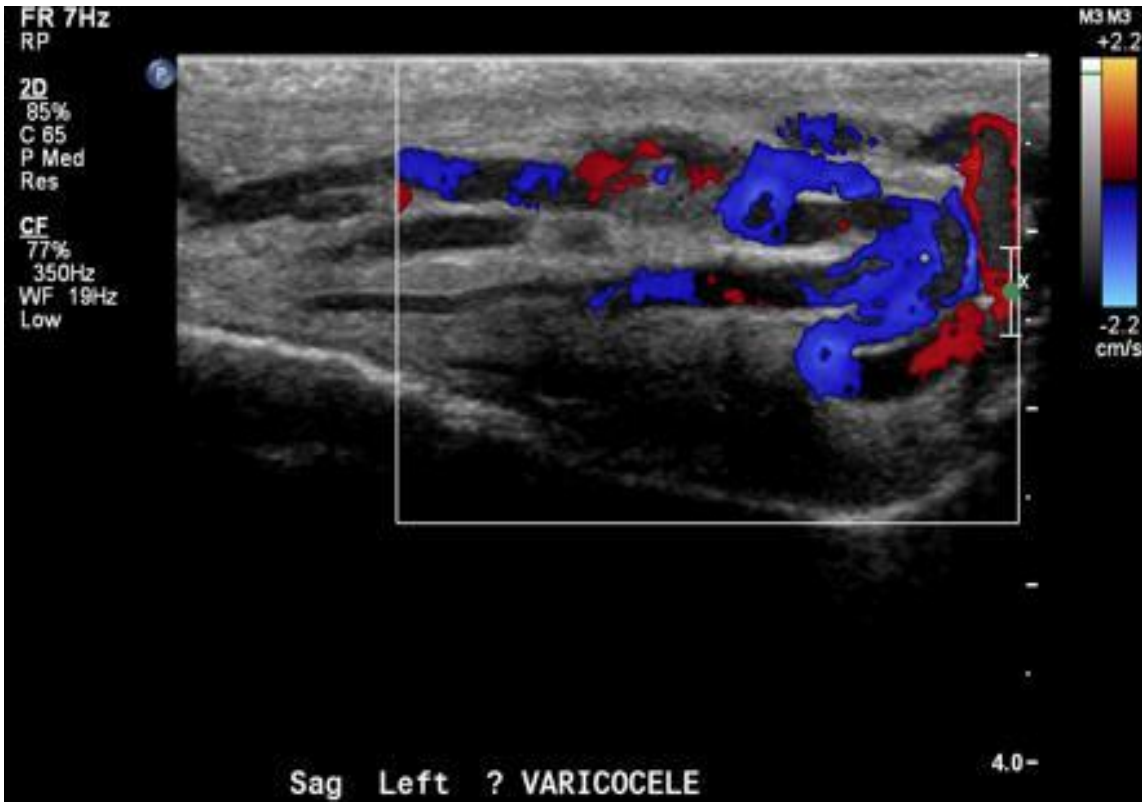
Sandra L. Hagen-Ansert, 2012. Textbook of Diagnostic Sonography. Mosby, Inc., an affiliate of Elsevier Inc.

Wikipedia.com

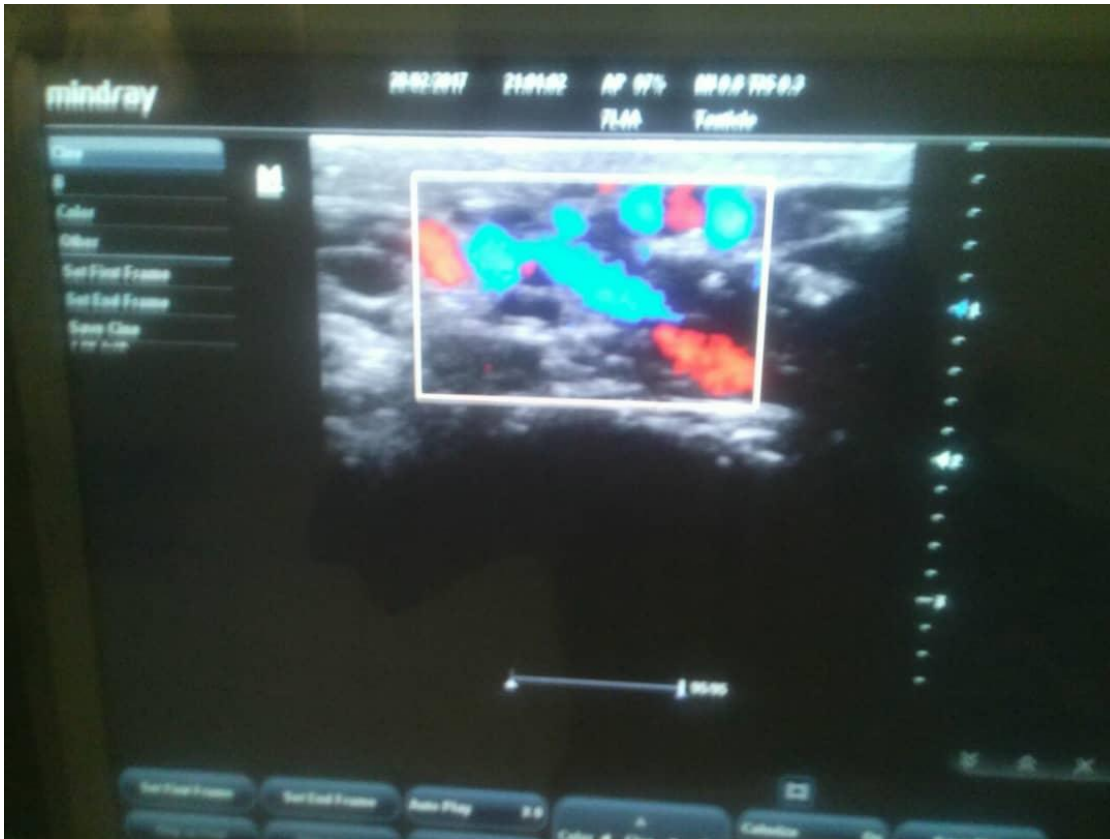
Appendix II



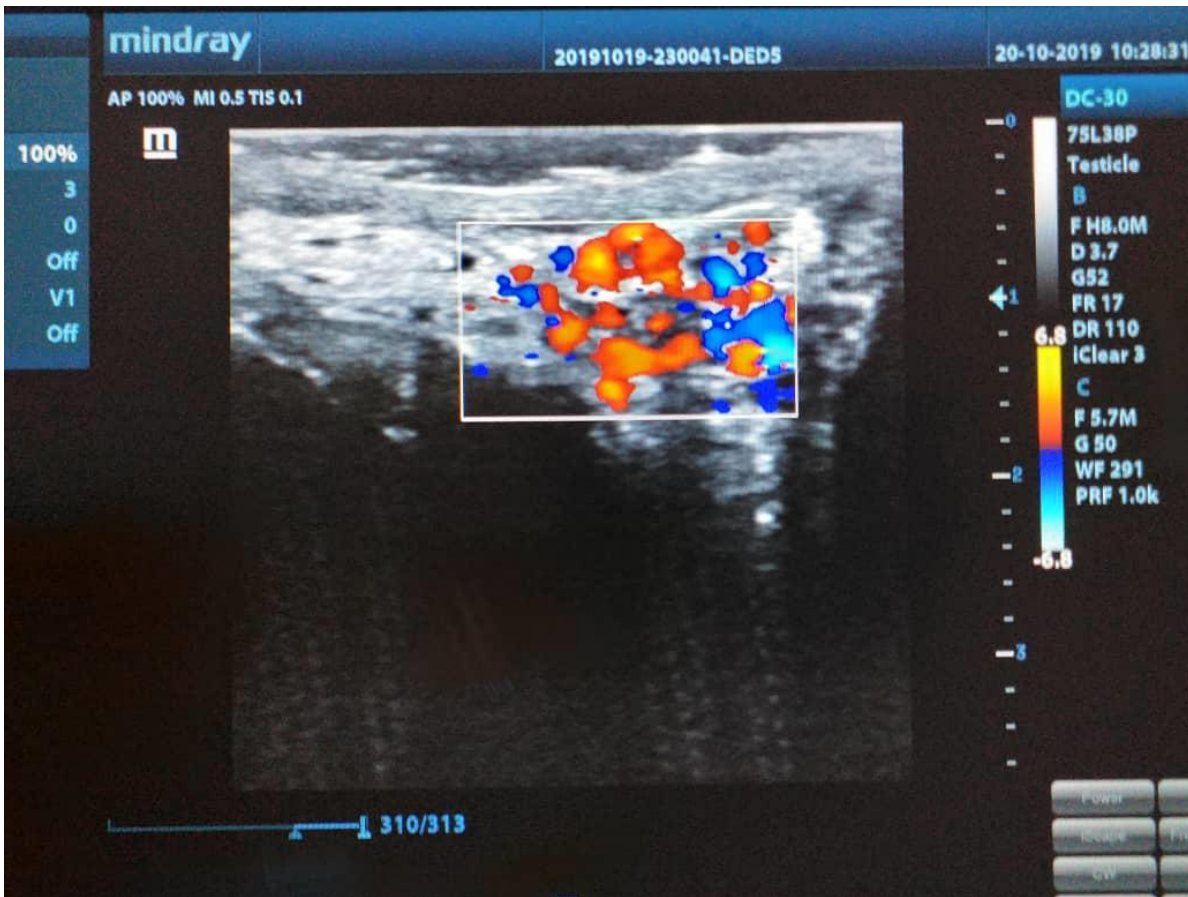
Male 21 years old complain of pain and swelling ultrasound image shows left testicular varicocele



Male 23 years old complain of pain sonograph shows left testicular varicocele



Male 20 years old complain of pain and swelling ultrasound image shows left testicular varicocele



Male 24 years old complain of swelling ultrasound image shows left testicular varicocele