IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 13, Issue 3 Ver. I. (Mar. 2014), PP 54-61
www.iosrjournals.org

Evaluated of Testicular Tumors using Doppler Sonography

Abdullah Hamdan[1, 3], Mohamed Yousef[1,2], Mohammed A. AliOmer[1,3], Alsafi Abdulla[1]

[1]*College of Medical Radiologic Science, Sudan University of Science and Technology. P.O.Box 1908, Khartoum, Sudan*

[2]*Taibah University , College of Medical Applied Sciences, Department of Diagnostic Radiologic Technology, Fax: 8475790 P.O: 30001 Almadinah Almunawwarah , KSA*

[3]*Radiologic technology department ,college of applied medical science , Qassim university , Buraduh , KSA*

Abstract : *This study aimed to determine the gray scale and color Doppler sonographic features of the most common and some of the least common scrotal lesions. Between October 2012 to May 2013, 100 patients the age range of new born to 85 years old the mean 30.95, with scrotal symptoms, who underwent scrotal ultrasonography (US), were retrospectively reviewed. The clinical presentation, outcome, and US results were analyzed. The presentation symptoms including scrotal pain, painless scrotal mass or swelling, and trauma. Sonographic features that were reviewed included the size and echogenicity of the tumors, presence of cystic areas or calcifications,and distribution pattern of detectable blood flow on color or power Doppler imaging..This study revealed that of 100 patients the age range of new born to 85 years old the mean 30.95 (7%) presented with Testicular torsion , (10%) with epididymitis, epididymo-orchitis (13%), abscess (5%) ,encysted hydrocele (8%), varicocele (10%), Spermatocele (5%) , testicular malignancy (13%), orchitis (4%), hematoma 8 (8%), Scrotal hemia 6 (6%), undecended testis 8 (8%) and lymphoma (3%). Operation (orchio-dectomy) was done for 6 pateint (one for testicular torsion ,second one inguinal hernia and undecended testis, ,two of seminoma and one unsenimotous disease). Color Doppler ultrasonography accurately diagnosed all cases of epididymitis or epididymo-orchitis, spermatic cord injury, testicular torsion, varicocele, and hydrocele .US provides excellent anatomic detail, The study concluded that Color Doppler ultrasonography is an excellent, a safe, and reliable method for evaluating patients with scrotal diseases. It aids in diagnosis of testicular tumors and reduces the number of unnecessary exploratory operations. It is especially important in conditions like testicular torsion where immediate diagnosis is required.*

Keywords: *Testicular torsion, epididymitis,color Doppler, scrotum gray scale sonography, testicular disease.*

I. INTRODUCTION

Testicular ultrasonography is a useful noninvasive tool in both adult and pediatric patient groups. It serves as a good screening and diagnostic tool and helps dictate further management in the appropriate clinical setting. Testicular ultrasonography has a wide range of applications, varying from acute scrotal pain to more chronic and nonspecific symptoms.[1, 2]

Scrotal ultrasound (US) is a readily available imaging modality that demonstrates detailed scrotal anatomy without the associated risk of ionizing radiation, with relatively low cost, easy portability, and a lack of need for sedation. Thus, US is an ideal imaging modality for the pediatric scrotum. There is a need, however, for the radiologist to be familiar with the normal findings in children, the appropriate technique, and the US findings of pediatric scrotal pathologies. Many scrotal pathologies have similar clinical presentations and physical examination of the scrotum can be limited by pain or hydrocele.[3] Thus, US examination combined with color Doppler interrogation can add important information for the guidance of treatment. In cases of acute scrotal pain, US can reliably differentiate between testicular torsion and other pathologies.[4,5]Scrotal US can differentiate between solid and cystic masses and localize the mass as either testicular or paratesticular.[6] US can also help to evaluate other pathologies including hydrocele, varicocele, and cryptochydism.

The testes size, shape, and echotexture depend on testosterone and change from newborns to adolescents.[7-9] In infancy, there is an increase in testosterone with a peak around 3-4 months that causes testicular volume to rise to a maximum of 0.44 (±0.03) cm. After the age of 5 months, the testicular volume steadily declines and reaches its minimum around 9 months of age and then remains approximately the same size until puberty.[10]

.Imaging modalities such as scintigraphy and magnetic resonance imaging (MRI) of the scrotum, which can be applied when ultrasonography proves inadequate, could provide a more accurate diagnosis in the evaluation of testicular perfusion than color Doppler US [11,12]. In particular MRI offers useful, and in some cases decisive, information, as it is capable of revealing unexpected findings and elucidating complex aspects. Additionally, MRI helps improve patient management, with an overall reduction in costs. Unfortunately, being

specialized, relatively expensive and not always available it is not routinely used for the evaluation of acute painful scrotum but remains an ideal choice for second-line investigation. From the view point that US is more convenient and easier to be performed in the emergency clinical settings than MRI, a contrast-enhanced ultrasound study would be the ideal tool in the assessment of testicular perfusion in patients with acute scrotal symptoms. The acute scrotum is a medical emergency defined as scrotal pain, swelling, and redness of acute onset [13,14]. The differential diagnosis includes torsion, infection, trauma, tumor, and other rarer causes. The diagnostic evaluation begins with history-taking. Scrotal abnormalities can be divided into three groups , which are extra-testicular lesion, intra-testicular lesion and trauma. Causes of scrotal pain include inflammation (epididymitis, epididymo-orchitis, abscess), testicular torsion, testicular trauma, and testicular cancer [15,16].
This study aimed to determine the gray scale and color Doppler sonographic features of the most common and some of the least common scrotal lesions.

II. MATERIALS AND METHODS

Between October 2012 to May 2013, 100 patients the age range of new born to 85 years old the mean 30.95, with scrotal symptoms, who underwent scrotal ultrasonography (US), were retrospectively reviewed. The clinical presentation, outcome, and US results were analyzed. The presentation symptoms including scrotal pain, painless scrotal mass or swelling, and trauma.

Sonographic features that were reviewed included the size and echogenicity of the tumors, presence of cystic areas or calcifications,and distribution pattern of detectable blood flow on color or power Doppler imaging underwent clinical evaluation and scrotal ultrasonography at ultrasound departments of King Fahad. and Dr Suliaman Alhabib Hospital , Al –gassim region –Saudia Arabia ,Scrotal ultrasonography and duplex ultrasonography examination were performed . The patients were collected and reported by radiologists ,Evaluation consist of clinical and sonographic variables(lesion size, location, echogenicity) using HDI 5000 or HDI 3000 system (Philips Medical Systems, Bothell, WA) or an Acuson 128XP system (Siemens Medical Solutions, Mountain View, CA) with 7- to 10- or 5- to 12-MHz linear array transducers .

III. RESULT

This study revealed that of 100 patients the age range of new born to 85 years old the mean 30.95 Figure(1) with various clinical findings Figure (3),ultrasound revealed that (7%) presented with Testicular torsion , (10%) with epididymitis, epididymo-orchitis (13%), abscess (5%) ,encysted hydrocele (8%), varicocele (10%), Spermatocele (5%) , testicular malignancy (13%), orchitis (4%), hematoma 8 (8%), Scrotal hemia 6 (6%), undecended testis 8 (8%) and lymphoma (3%) Figure (2). Operation (orchio-dectomy) was done for 6 pateint (one for testicular torsion ,second one inguinal hernia and undecended testis, ,two of seminoma and one unsenimotous disease). Color Doppler ultrasonography accurately diagnosed all cases of epididymitis or epididymo-orchitis, spermatic cord injury, testicular torsion, varicocele, and hydrocele .Ultrasound presentation of testicular diseases'(Figures(4-14) .

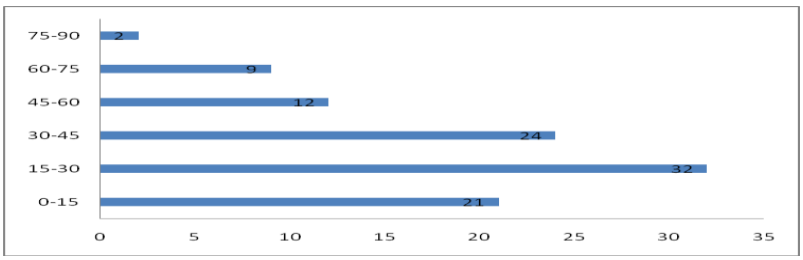

Figure (1) shows patient age

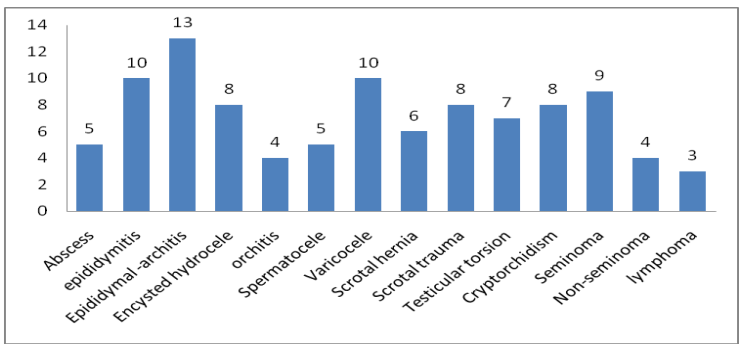

Figure (2) shows ultrasound Findings

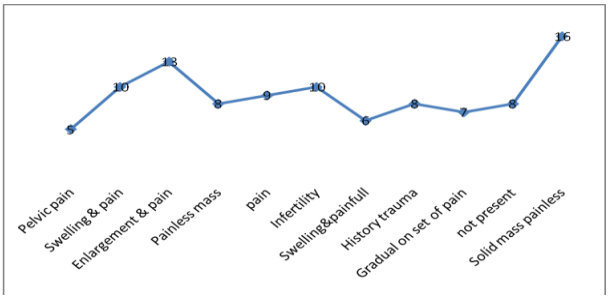

Figure (3) shows shows Clinical findings

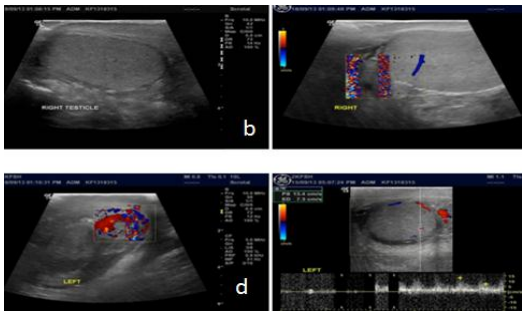

Figure (4) shows scrotal ultrasound image of 23 years patient with normal size ,echotexture and vacularty of Rt testis and epididymis . Enlarged size of left testis with no abvious vascularity by color Doppler and power Doppler. Enlarged edematous left epididymis with increased vascularity suggestive acute epdidmytis . Testicular tortion.

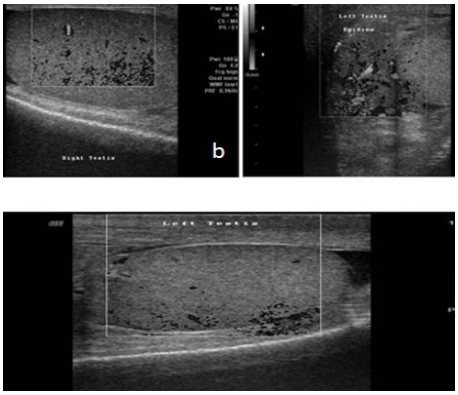

Figure (5) shows scrotal ultrasound image of 85 years .both testis show normal size , uniform echopattern and intact capsules .lt testis shows increased vascularity with increased vascularity and size of the left epididymis.normal appearance of right testis and epididymis. mild degree of hydrocoel with debris is seen in left scrotum. no evidence of varicocele . left epididymoorchitis

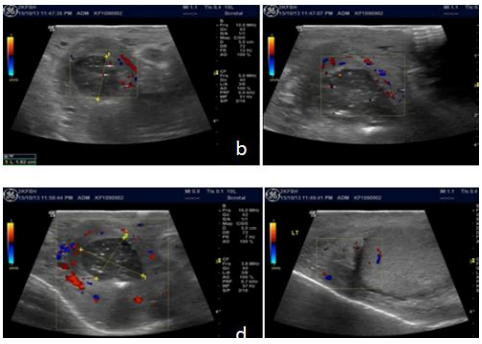

Figure (6) shows scrotal ultrasound image of 70 years old .Markedly thickened (2.3 cm) hyper vascular scrotal wall, more on the right side. Alocalized hypoechoic collection is seen at the inter testicular region showing echogenic debris within ,measuring about 2.1 cm *1.9 cm . Finding are impressive of diffuse scrotal wall inflammatory process with midline encysted collection (abscess).

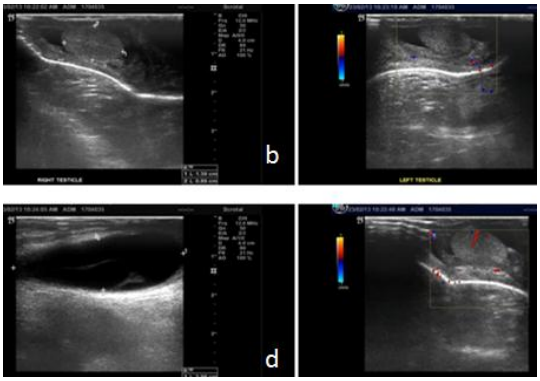

Figure (7) shows scrotal ultrasound image of 24 Years. Both testes appear normal in size and echopattern. No focal lesions detected. Right testicle = 1.4 x 0.9 cm. Right epididymis = 0.71 x 0.51 cm. Left testicle = 0.9 x 0.64 cm. Left epididymis = 0.56 x 0.4 cm. Well defined cystic lesion with internal septation seen in the lower part of the left inguinal region extending to the left hemiscrotum measuring about 4 x 1.3 cm which mostly representing encysted hydrocele. Impression: Well defined cystic lesion with internal septation seen in the lower part of the left inguinal region extending to the left hemiscrotum mostly representing encysted hydrocele. process with midline encysted collection (abscess).

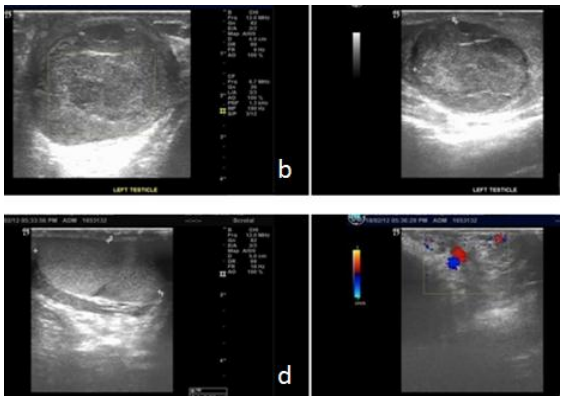

Figure (8) shows scrotal ultrasound image of 1 year. Findings: The right testes appear enlarged with isoechoic heterogeneous lesions involving most of the right testes measures about 4.0 x 2.5cm. There is vascularity noted inside the lesion. The right epididymis appear normal in configuration. The left testicle is small and appears undescending in the distal of inguinal canal measuring 0.9 cm x 0.6 cm. The vascularity is unremarkable. The left epididymis appear unremarkable.

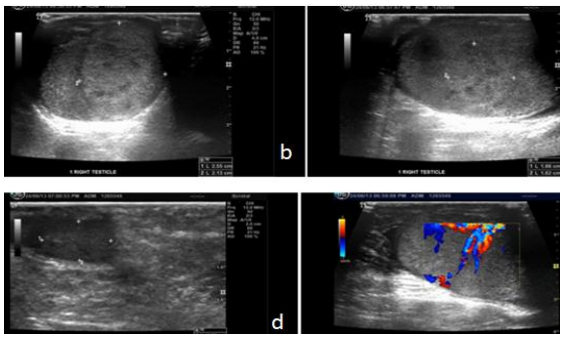

Figure (9) shows scrotal ultrasound image of 31 years . There is well defined heterogeneous hypoechoic mass lesion occupying most of the left testicle with evidence of calcified fociand cystic component measuring about 3.15 x 2.73 cm. Homogenous right testicle with no focal lesion could be detected . Right testicle measuring 2.33 x 1.8 x 3.6 cm. Right epididymis measuring 1 x 0.81 cm. Bilateral mild hydrocele is noted. Left-sided mild dilated and tortuous left pampiniform plexus with Valsalva maneuver the largest diameter measuring about 0.3 cm which mostly representing small left sided varicocele.

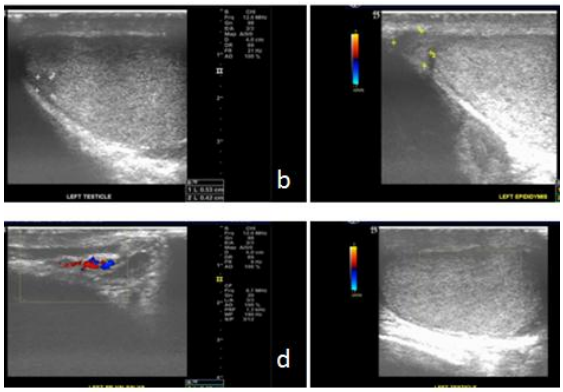

Figure (10) shows scrotal ultrasound image of 29 Years . Heterogeneous appearance of both testes with multiple variable size hypoechoic lesions scattered in both testes. Right testis = 3.3 x 3.9 cm. Right epididymis = 1.5 x 1.2 cm Left epididymis 1.03X1.07cm. Left testis = 4.3 x 3.0cm. Minimal right sided hydrocele. Increased vascular enhancement on both sided No evidence of significant varicocele or hydrocele. Impression: Bilateral multiple variable sizes hypoechoic lesions scattered in both testicles which may be inflammatory ??Tumoral, lymphoma ,leukemia, , ???.inflammatory process

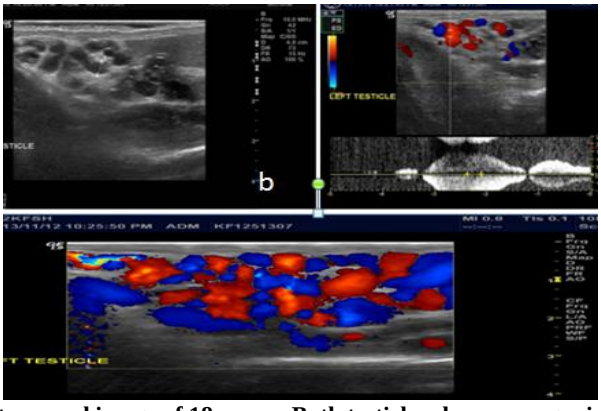

Figure (11) shows scrotal ultrasound image of 18 years Both testicles show average size, shape & echotexture with no evidences of hypo, or hyper echoic lesions.Both epidydimi show average size, shape & echotexture with no focal lesions or related cysts.Average amount of peri-testicular fluid with no evidences of hydrocele.No spermatocele.By Duplex study left testicular veins are markedly increased caliber reaching up to 5mm at maximum diameter on valsalva manouver & shows reflux with valsalva.. marked left varicocele. Increased testicular arterial flow is noted at the right testicle.

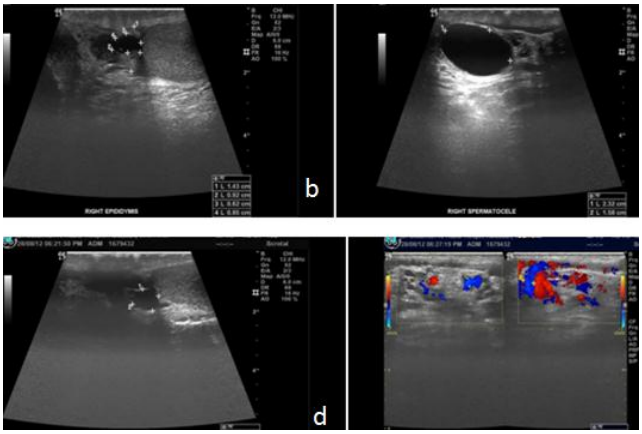

Figure (12) shows scrotal ultrasound image of 54 years .Sonographic Findings: Right testis measured 4.51 x 1.94 cm. Focal dilatation of the vein noted within the right testicle. No other focal lesion seen. Otherwise, the testis showed normal echogenicity. Left testicle measured 4.61 x 2.27 cm with normal echogenicity with slight focal dilatation of the vein. Evidence of bilateral epididymal cysts and spermatoceles..

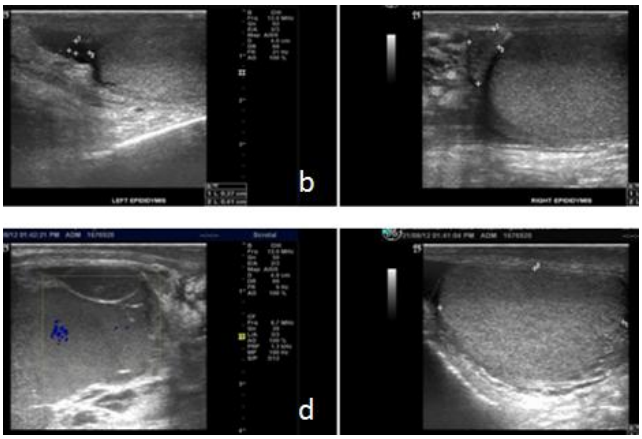

Figure (13) shows scrotal ultrasound image of 81 years .Both testes appear normal in size and echopattern. No focal lesions detected. Right testis = 4.1 x 2.24 x 3.5 cm. Right epididymis = 1.3 x 0.6 cm. Left testis = 3.7 x 2.1 x 3.7 cm. Left epididymis = 0.93 x 0.6 cm. There is a small cyst seen in the left epididymal head measuring about 0.41 x 0.3 cm. There is a large septated cyst seen in the distal part of the right inguinal region extending to the right hemi-scrotum reaching to the upper border of the right testicle with evidence of thick content measuring about 3.5 x 4.44 cm , mostly suggestive of hematoma or collection.

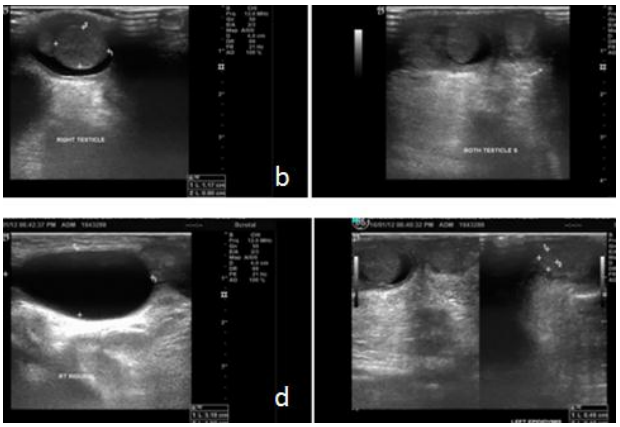

Figure (14) shows scrotal ultrasound image of 1 years . Both testes appear normal in size and echopattern. No focal lesions detected. Right testis =1.1 x 0.9 cm. Right epididymis = 0.4 x 0.3 cm. Left testis = 0.88 x 0.64 cm. Left epididymis = 0.4 x 0.4 cm. There is relatively well defined fusiform cystic structure seen at the right inguinal region measuring about 3.5 x 1.5 cm extending down to the scrotum separable from the right testicle and extent upward with a thin linear tract but connecting to the peritoneal cavity cant be well visualized. suggestive of hematoma or collection.

IV. DISCUSSION

In the early stages torsion of the gonad appendages can be easily diagnosed by physical examination and Doppler ultrasound of the scrotum. Physical examination at early stages may localize the pain to the upper pole of the testis or epididymis. Torsion of the appendix testis can be eas-ily detected by ultrasound (US) in early stages of the torsion, as an a-vascular structure, however if the patient arrives to the hospital several days after the initiation of the torsion, probably the whole gonad will be inflamed and the appendages will not be identified sonographically because of the inflammatory background, leading to a non-specific sonographic picture [17,18].Ben Chaim et al. [19] analyzed the surgical findings of 70 children undergoing exploration for acute scrotal pain. Torsion of the gonadal appendix was found in 33 (47%) of the children, as the cause for the inflammation. Hegarty et al. [20] published similar results in a series of 100 consecutive boys with scrotal pain who had scrotal surgical exploration, showing a rate of 32% of gonadal appendage torsion, and 20% gonadal nonbacterial in-flammation. McAndrew et al. [21] found a 70% rate of torsion of the appendix testis in 100 consecutive patients admitted because of scrotal pain during a period of 14 months.In this study 7 % patients represented as testicular torsion.

Epididymo-orchitis: account 13% Epididymo-Orchitis (EO) in prepubertal children was thought to be a rare phenomenon. Anderson et al. [22] Epididitis: The most common cause of scrotal pain is epididymitis, an inflammation of the epididymis . It is treatable with antibiotics. If left untreated, this condition can lead to an

abscess or loss of blood flow to the testicles. Ultrasound is also a valuable tool for evaluating the epididymis . 1o (10%) The patients represented with epididymitisassociated with hydrocele in most of cases.Orchitis Infection appeared as inflammation (Orchitis) effected testis three patients represented with Orchitis) 4(1.2%) (Figure 6).

In this study intratesticular abscess account 5 (5%) . Usually secondary epidido-orchitis . Ultrasonography is the imaging modality is demonstrated a hypoechoic lesion within the testis marked by low-level echoes and shaggy margins . Color flow Doppler demonstrated absent internal vascularity with increased peripheral hyperemia (Figure 7).

Encysted Hydrocele represented 8 (8 %). A common cause of scrotal swelling in the new bornisa congenital hydrocele caused by a patent process susvaginalis through which fluid passes.[23,24] US demonstrates fluid surrounding the anterolateral aspect of the testis that some- times extend sin to the inguinalcanal.[25] Acquired hydroceles can be seen with any type of scrotal pathology including inflammation, trauma, and tumors. Infectious or traumatic hydroceles may have internal echoesorseptations. US demonstrates a well-demarcated, possibly septated, anec- hoic mass located along the spermaticcord.[26] It is separate from the testicle and epididymis and can displace them inferiorly. (Figure8).

Seminoma and nonseminmatous tumor about 13 % of all patients. seminoma account 9(9 %) . Demographic and clinical characteristics and ultrasound findings of patients with seminoma were compared to those of patients with non-seminoma . Ultrasound images of seminoma were more often hypoechoic, homogeneous, and lobulated than those of non-seminoma 4 patients . There was no difference in tumor size, multiplicity, presence of calcium or lesion margination . Testicular microlithiasis was more common in seminoma . Confirmation was done by advise investigation Alpha-fetoprotein and beta B-HCG, CT scan and histopathology . (Figure 9) . The histological analysis confirmed the suspected diagnosis . The clinical workup comprises physical examination, ultrasound of the testis, and computerized tomography (CT) scan of the pelvis, abdomen, and chest. Determination of human chorionic gonadotropin (hCG), α-fetoprotein (AFP) and lactic dehydrogenas (LDH) in serum before therapy is mandatory in all patients.

Lymphoma is one of the most frequent testicular tumors seen in older men. It is the most frequent bilateral testicular neoplasm, accounting only three cases. The second most frequent testicular metastatic cancer is leukemia. The ultrasonographic appearance is generally that of an anechoic mass with or without testicular enlargement, and the testicular contour is generally preserved (Figure.11).A study of 6 patients with surgically proved testicular tumors was performed to determine the appearance at color Doppler ultrasound (US) scanning. There was a general correlation of tumor size and vascularity. 2 of 4 (50%) tumors larger than 1.8 cm were hypervascular. 1 of 4 (25%) tumors smaller than 1.8 cm was hypovascular. One small, 1.2-cm-diameter seminoma was hypervascular. The histologic findings of the tumor did not correlate with the vascularity of the lesion as seen at color Doppler US. Resistive indexes ranged from .480 to 1.1 (mean, 0.80). Peak systolic velocities ranged from 8.5 cm/sec to 65.0 cm/sec (mean, 9.9 cm/sec). Intratesticular varicocele account 10 (10%) Color flow Doppler has also visualizatized intratesticular varicoceles . A Valsalva maneuver is done for some of the vessels may not show spontaneous flow. Intratesticular varicoceles adjacent to the mediastinum testis may mimic tubular ectasia; however, color flow Doppler helps to differentiate between the two (Figure 12) .5 (5 %) representing as spermatocele. 3 in right side, 2 in the left. May be associated with hydocele or orchitis and epididmitis. Spermatocele measurement range from large to small 0.6 x 0.5 cm to cm - 2.32 x 1.58 cm (. They usually sit near the top and/or behind the testicle, but appear separate from the testis. Spermatoceles are typically smooth and they are usually filled with a whitish, cloudy fluid and usually contain sperm.

In this study undescended testis account 8 (8 %) is failure of descent of the testes into the scrotum during fetal development. The defect may result in the testes being located within the abdomen, inguinal canal, or some ectopic location . More than 75 % of Undescended testis are unilateral and all of them seen small in size, in the inguinal region (Figure . 13) . If it is not present in the scrotal sac, it may have stopped on its way and lie in the inguinal canal, in which case the ultrasound examination will often see it. If it has not left the abdominal cavity, it may not be seen by sonography. If a testicle is not detected, a urologist may be consulted in order to decide whether additional imaging such as an MRI is needed to determine its location. If the testicle is found to be in the inguinal canal, it can be moved into the scrotum.

V. CONCLUSION

Ultrasound is a sensitive and accurate technique for the evaluation of testicular abnormalities, and is widely accepted as the first-line imaging technique for many common and uncommon testicular diseases

REFERENCES

[1] Fernandez-Usagre FJ, Rangel-Villalobos ME, Garcia de la Oliva A, Blanco Yun A. [Doppler ultrasonography of scrotal injury]. Radiologia. May-Jun 2007;49(3):183-7. [Medline].

[2] Cokkinos DD, Antypa E, Kalogeropoulos I, Tomais D, Ismailos E, Matsiras I, et al. Contrast-enhanced ultrasound performed under urgent conditions. Indications, review of the technique, clinical examples and limitations. Insights Imaging. Apr 2013;4(2):185-98. [Medline]. [Full Text].

[3] PearlMS,HillMC:Ultrasoundofthescrotum.SeminUltrasoundCT MRI28:225-248,2007

[4] MartinB,ConteJ:Ultrasonographyoftheacutescrotum.JClin Ultrasound15(1):37-44,1987

[5] VijayaraghavanSB:Sonographicdifferential diagnosisofacutescrotum. J UltrasoundMed25:563-574,2006

[6] WoodwardPJ,ScwabCM,etal:FromthearchivesoftheAFIP: Extratesticular scrotalmasses—Radiologic-pathologiccorrelation. Radiographics23:215-240,2003

[7] DograVS,GottliebRH,etal:Sonographyofthescrotum.Radiology227 (1):18-36, 2003

[8] KarmazynB:Scrotalultrasound.UltrasoundClin5(1):61-74,2010

[9] SiegelMJ,ColeyBD:Scrotalanatomy.In:SiegelMJ(ed):Pediatric Sonography,ed3Philadelphia,PA, LippincottWilliams&Wilkins, 580-581,2002

[10] KuijperEA,vanKootenJ,Verbeke JI, etal:Ultrasonographically measured testicularvolumesin0-to6-year-oldboys.HumReprod23 (4):792-796,2008

[11] Watanabe Y, Dohke M, Ohkubo K, Ishimori T, Amoh Y, Okumura A, et al.: Scrotal disorders: evaluation of testicular enhancement patterns at dynamic contrast-enhanced subtraction MR imaging. Radiology. 2000; 217: 219-27.

[12] Paltiel HJ, Connolly LP, Atala A, Paltiel AD, Zurakowski D, Treves ST: Acute scrotal symptoms in boys with an indeterminate clinical presentation: comparison of color Doppler sonography and scintigraphy. Radiology. 1998; 207: 223-31.

[13] McAndrew HF, Pemberton R, Kikiros CS, Gollow I (2002) The incidence and investigation of acute scrotal problems in children. Pediatr Surg Int 18:435-437

[14] Günther P, Rübben I (2012) The acute scrotum in childhood and adolescence. Dtsch Arztebl Int 109(25):449-57 quiz 458. doi: 10.3238/arztebl.2012.0449. Epub 2012 Jun 22

[15] Thinyu S, Muttarak M (2009) Role of ultrasonography in diagnosis of scrotal disorders: a review of 110 cases. Biomed Imaging Interv J 5(1):e2 doi: 10.2349/biij.5.1.e2. Epub 2009 Jan 1

[16] ogra V, Bhatt S (2004) Acute painful scrotum. Radiol Clin North Am 42(2):349-63

[17] L. E. Galejs and E. J. Kass, "Color Doppler Ultrasound Evaluation of the Acute Scrotum," Techniques in Urology, Vol. 4, No. 4, 1998, pp. 182-184.

[18] S. Strauss, R. Faingold and H. Manor, "Torsion of the Testicular Appendages: Sonographic Appearance," Jour- nal of Ultrasound in Medicine, Vol. 16, No. 3, 1997, pp. 189-192.

[19] J. Ben Chaim, I. Leibovitch, J. Ramon, D. Winberg and B. Goldwasser, "Etiology of Acute Scrotum at Surgical Ex- ploration in Children, Adolescents and Adults," European Urology, Vol. 21, No. 1, 1992, pp. 45-47.

[20] P. K. Hegarty, E. Walsh and M. O. Corcoran, "Explora- tion of the Acute Scrotum: A Retrospective Analysis of 100 Consecutive Cases," Irish Journal of Medical Sci- ences, Vol. 170, No. 3, 2001, pp. 181-182.

[21] H. F. McAndrew, R. Pemberton, C. S. Kikiros and I. Gol-low, "The Incidence and Investigation of Acute Scrotal Problems in Children," Pediatric Surgery International, Vol. 18, No. 5-6, 2002, pp. 435-437.

[22] P. A. Anderson and J. M. Giacomantonio, "The Acutely Painful Scrotum in Children: Review of 113 Consecutive Cases," Canadian Medical Association Journal, Vol. 132, No. 10, 1985, pp. 1153-1155.

[23] Karmazyn B, Steinberg R, Livne P, et al: Duplex sonographic findings in children with torsion of the testicular appendages: Overlap with epididymitis and epididymoorchitis. J Pediatr Surg 41:500-504, 2006

[24] Hormann M, Balassy C, Pumburger W: Imaging of the scrotum in children. Eur Radiol 14:974-983, 2004

[25] Karmazyn B: Scrotal ultrasound. Ultrasound Clin 5 (1):61-74, 2010

[26] Rathaus V, Konen O, Shapiro M, et al: Ultrasound features of spermatic cord hydrocele in children. Br J Radiol 74 (885):818-820, 2001