

Scrotal Doppler ultrasound during evaluation for infertility

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(Ann. Coll. Med. Mosul 2006; 32(1&2): 46-50)

Received: 1st Mar, 2006; Accepted: 29th Nov, 2006

ABSTRACT

Aim: the aim of the study is to clarify the incidental intra scrotal pathological findings during evaluation of infertile males depending on the clinical examination and Doppler ultrasonic scanning.

Patients and methods: A prospective case series study conducted in the radiology department of Al Batool teaching hospital from Feb. 2000 – Feb. 2003, where most of the patients referred from the infertility unit of the same hospital and evaluated by Doppler ultrasonographic scanning with (SIEMENS, SONOLINE Versa Pro, 7.5 MHz Linear array transducer) in supine and some times in erect position.

Results: The data of 1660 patients analyzed to different pathologies, their ages ranged from (18-60) years with mean of 23 years. One thousand and four hundreds sixty patients (88%) were primarily infertile and two hundreds patients (12%) were secondarily infertile, seven hundreds and sixty six patients (46%) had abnormal findings on clinical and ultrasonic examinations of their genitalia, while nine hundreds and sixteen patients (54%) were normal. The distribution and the frequency of different discovered abnormalities were studied; varicocele was found in (42.7%) of the patients and followed by testicular atrophy in (33.8%).

Conclusion: Varicocele and testicular atrophy are the most common causes of primary as well as secondary male infertility and the color Doppler US is superior to physical examination in evaluating patients with infertility.

Key words: infertility, testicular atrophy, varicocele, color Doppler ultrasound

الخلاصة

الهدف: لاستكشاف الأسباب المرضية في كيس الصفن و التي من الممكن أن يكون لها علاقة وحالة العقم لدى المرضى العقيمين

طرق البحث: تمت الدراسة في مستشفى البتول التعليمي للولادة والأمراض النسائية و قد شملت جميع المرضى المحالين من مركز العقم إلى شعبة السونار والأشعة التشخيصية لتقييم الخصية ومحتويات كيس الصفن فيما قد تكون من الاحتمالات المسببة للعقم و للفترة من شباط 2000 وحتى شباط 2003. بلغ عدد المرضى 1660 مريضاً تراوحت أعمارهم بين (18 – 60) ، تبين أن نتائج فحص 894 مريضاً سلبية والباقي كانت نتائجهم موجبة وتم اكتشاف العديد من الحالات المرضية إلا أن حوالي الخصية كانت من أكثر الحالات شيوعاً يليها ضمور الخصيتين، وتبين انه دقة تصوير الصغيرة الوريدية للخصية ومن ثم المساعدة في تشخيص الحالات الأولية للدوالي بواسطة الدوبلر الملون هي عامل مهم في المساعدة بالعلاج المبكر للمرضى.

الاستنتاج: جهاز الدوبلر الملون يعتبر من الأجهزة المساعدة في سرعة تشخيص المرضى الذين يعانون من العقم.

Infertility is defined as failure of a couple to have conception after one year of unprotected intercourse; primary infertility is the term used to describe a couple who has never achieved pregnancy, secondary infertility refers to a couple who has previously succeeded in achieving at least one pregnancy⁽¹⁾.

Diagnostic ultrasound (US) is exceptionally well suited for studying the scrotum due to its wide availability, relatively low cost, non-invasiveness, and absence of patients' discomfort and lack of ionizing radiation. When the clinical diagnosis is in question, sonography is a reliable adjunct in differentiating intra-testicular and extra-testicular causes of scrotal enlargement and evaluating various etiology of a painful scrotum⁽²⁾.

Scrotal US with high-resolution probe and the use of Doppler color imaging have proved to be very reliable in detecting inflammatory changes in the deep genital tract and to detect quantifying the venous reflux in the spermatic veins⁽³⁾.

In addition, it has now become the most reliable test to detect non-palpable reflux or confirm questionable reflux and is more sensitive than clinical examination and can detect up to (93%) of the reflux (clinically undetected) cases. Color Doppler ultrasound has superseded ordinary US in measurement of the venous diameter, when the latter shows too much overlap between continent and incontinent veins. A spermatic vein exceeding 3mm in diameter can have normal continence and a vein less than 2mm can be incontinent; between 2 and 3 mm the overlap is such that US is not reliable⁽³⁾.

Male members of infertile couples may send for scrotal US to evaluate their testicular size and parenchyma, epididymal integrity (partial or complete agenesis or obstruction) and to search for the presence of varicocele⁽⁴⁾. Coincidentally, improvement in US technology has resulted in a new generation of high frequency transducers producing exquisite details of the scrotal structures and their vasculatures. Optimum results are obtained when using high frequency linear array transducer operating in the range (7.5 - 10 MHz)⁽⁵⁾.

Classification of varicocele is dependent on the degree of dilatation of the veins of the pampiniform plexus on US. They are (mild) when the diameter of the veins is between 3 and 4 mm, while (moderate) when the diameter is between 4.1 and 5mm, and (severe) when it is >5.1mm⁽⁵⁾.

Varicocele is the commonest surgically treatable cause of male infertility⁽⁶⁾, with the advent of the technical innovation in both digital and real time ultrasonography; ultrasound has been proven to be increasingly effective in evaluating scrotal pathology. Color Doppler US is used to evaluate the blood flow of testis owing to its ability to visualize small vessels with low flow⁽⁷⁾. Varicocele, which is extremely common (in up to 8-16%), it is most frequently between 15 - 25 years of age and usually at the left side when it is usually asymptomatic⁽⁸⁾.

The aim of the study is to clarify the incidental intra scrotal pathological findings during evaluation of infertile males depending on the clinical examination and Doppler ultrasonic scanning.

Patients and methods

From Feb 2000 to Feb 2003, in a prospective study, all male members of infertile couples who were referred from the infertility unit at Al Batool teaching hospital, their scrota were reviewed for detection of any possible testicular abnormality by Doppler ultrasonographic scanning with (SIEMENS, SONOLINE Versa Pro, 7.5 MHz Linear array transducer).

Clinical examination for varicocele is carried out in supine as well as in erect position. The US of the scrotum is usually performed in supine position some times it is helpful to support the scrotum by a towel over the thigh and ask the patient to hold his penis supra-pubically to achieve an easier access for comparative view. Mostly with Valsava's maneuver.

The scrotal contents are very mobile, but it is important to ensure that the testis and its epididymis on each side are identified as completely as possible. They should compare for symmetry, size, texture and vascularity by color Doppler imaging. Care must be taken not to compress the testis during measurement to avoid under sizing the antero-posterior diameter and over sizing the sagittal diameter.

With current equipment fine anatomical detail are visualized including the mediastinum of the testis, the septal divisions of the testis, the normal appendix testis and the epididymis. Usually, additional scanning in the upright position is helpful⁽⁴⁾. Classification of varicocele is dependent on the degree of dilatation of the veins of the pampiniform plexus by ultrasonic scanning;

they are (mild) when the diameter of the veins is between 3 and 4 mm, while (moderate) when the diameter is between 4.1 and 5mm, and (severe) when it is >5.1mm⁽⁵⁾.

Results

One thousand six hundreds and sixty patients reviewed as they were referred from the infertility unit because of their infertility problems, their age ranged from (18 – 60) years with mean age of 23 years, primary infertility found in 1460 patients (88%) while 200 patients (12%) with secondary infertility. Seven hundreds and sixty six patients (46.1%) had positive different pathological findings; table (1) shows the different pathological findings and their frequencies, among all patients and among the patients with abnormal testicular examination results.

The side distribution and the frequency of affection of each discovered pathology are explained in table (2). In our study, we found that 327 patients out of 766 were proved to have varicocele; hence, it is the most

common pathology affecting our patients with an incidence of (42.7%). The discovered varicoceles were of mild degree in 197 patients, moderate in 150 patients, and marked degree in 97 patients, all unilateral affection while, six patients with mild, 19 patients with moderate in addition to 18 patients with marked degree, among bilateral cases as in table (3).

Testicular atrophy (smaller than normal) was the second most common pathological finding in our study and it was found in 259 patients (33.8%) when 39 patients (15.1%) were found to have right sided testicular atrophy, 72 patients (27.9%) had left sided atrophy and 148 patients (57.1%) atrophy of both testes.

The other pathological findings were hydrocele in 70 patients (9.1%), epididymal cyst in 56 patients (7.3%) and undescended testis in 40 patients (5.2%) while testicular tumor was in 7 patients (0.9%) and calcification also in 7 patients (0.9%).

Table (1): The frequency of the abnormal findings among all the patients (1660).

Cases	No.	% of all cases	% of all pathologic cases
Varicocele	327	19.69	42.7
Atrophy	259	15.6	33.81
Hydrocele	70	4.2	9.13
Epididymal Cyst	56	3.37	7.3
Undescended Testis	40	2.4	5.3
Tumor	7	0.42	0.9
Calcification	7	0.42	0.9
Total	766	46.1%	100%

Table (2): The distribution of different testicular abnormalities with their percentages.

Pathology	Pathology No	Abnormal %						Total % (1660)
		right		left		Bilateral		
		No	%	No	%	No	%	
Varicocele	327	20	6.1	264	80.8	43	13.1	19.69
Atrophy	259	39	15.1	72	27.8	148	57.1	33.81
Hydrocele	70	21	30	35	50	14	20.9	9.13
Epididymal Cyst	56	17	30.3	34	60.7	5	8.9	7.3
Undescended Testis	40	23	57.5	10	25	7	17.5	5.3
Tumor	7	4	57.1	2	28.5	1	14.2	0.9
Calcification	7	3	42.8	4	57.1	-	-	0.9

Table (3): The distribution of varicoceles according to their size, site and degree.

Site	Degree					
	Mild (3-4mm)		Moderate (4.1 - 5mm)		Marked (>5.1mm)	
	No	%	No	%	No	%
Left	37	11.4	134	41	93	28.4
Right	0	0	16	5.2	4	1.3
Bilateral	6	1.8	19	5.4	18	5.5
Total	43	13.2	169	51.6	115	35.2

Discussion

Although the diagnosis of varicocele is made by clinical examination, the limitation of this physical examination is demonstrated in a multicenteric study sponsored by the World Health Organization (WHO) making its sensitivity in doubt⁽³⁾. The use of ultrasound has become an important component and superior to the clinical examination during evaluation of males with infertility. The color Doppler US has now become the most reliable test, more specific and sensitive method to detect non-palpable reflux⁽⁷⁾ or confirm questionable reflux⁽³⁾, owing to its simplicity, sensitivity and as being a non invasive modality⁽¹²⁾.

In the study of Mecham and Townsend for the association between the male sub-fertility and varicocele, they evaluated 34 asymptomatic young patients, and they found (15%) had varicocele by physical examination and (18%) of the patients by standard scrotal ultrasound, while (35%) had flow reflux by the color Doppler US⁽¹⁵⁾.

In our study, we found that 327 patients out of 766 proved to have varicocele; hence, it is the most common pathology affecting our patients, in an incidence of (42.6%).

On the other hand, Cathy et al found in his study that the incidence of varicocele among their patients was (41%)⁽¹⁰⁾, while Nussinovitch et al in their 1478 patients study, they found that the incidence of varicocele was (68.8%)⁽¹¹⁾.

Aydos et al during evaluation of 39 infertile patients they found 18 patients with positive physical examination for varicocele and 21 patients with negative results. On reevaluating them by the color Doppler US, they found (13 out of the 21 patients) were having reflux⁽⁷⁾.

The left sided varicocele affection was predominating in 264 patients in an incidence of (80.8%) while only 20 patients (6.1%) with right sided varicocele and bilaterality was found in only 43 patients (13.1%).

Nussinovitch et al found (90%) of their patients had left sided varicocele and (10%) of them had bilateral⁽¹¹⁾. Petro's et al detected left sided varicocele in (93%) of their patients⁽¹⁶⁾. Nussinovitch et al found 1097 patients (74%) had mild degree, 303 patients (20.5%) had moderate and only 78 patients (5.34%) had severe degree⁽¹¹⁾.

Testicular atrophy was the second most common pathological finding in our study and it was found in 259 patients (33.8%) when 39 patients (15%) were found to have right sided

testicular atrophy. 72 patients (27.8%) had left sided atrophy and 148 patients (57.1%) had atrophy of both testes.

Kuplei and Arikan found 29 (46%) out of 63 patients discovered to testicular atrophy due to varicocele⁽¹⁸⁾.

Pierik and Dohle stated that the incidence of testicular abnormality was (38%) of their patients, as varicocele in (29.7%), testicular tumor (0.5%), testicular calcification (0.9%), epididymal cyst (8.3%) and hydrocele (3.2%)⁽¹⁹⁾.

While in the study of Nashan and Behre when they reported the result of studying of 658 patients, (40%) of their patients their US examination revealed testicular abnormality as (21%) were varicocele, (7%) were hydrocele (7%) were epididymal cyst and (0.6%) were testicular tumor⁽²⁰⁾.

Conclusions: Most of the infertile males are complaining of varicocele as detected by the US, and with left side predomination in (80.8%); nearly half of the patients (50.7%) show moderate degree of dilatation.

- Varicocele is the most common cause of primary as well as secondary infertility.
- Primary: secondary infertility ratio is (37:1).
- Testicular atrophy is the second most common cause of infertility as it is found in 259 patients, most of them (148 patients) having bilateral affection of both testes.
- Testicular atrophy was more common in the left side than the right and this may be explained by the fact that varicocele is a common finding in the left side that affect the function of the testis by the chronic hyperthermic effect on the testis.
- The color Doppler sonography is a valid and superior procedure to the physical examination in the evaluation of male members of infertile couples.
- The color Doppler US as it is sensitive and can detect minor changes of fluid flow within the vessels it seems to be a good method for evaluation of patients suspected to have mild degree of varicocele and reflux of blood within the veins of pampiniform plexus that can not be detected by clinical examination alone.

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