FREQUENCY OF SCROTAL ABNORMALITIES DETECTED BY ULTRASOUND IN INFERTILE MEN AT KING HUSSEIN MEDICAL CENTER

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ABSTRACT

Objective: To determine the frequency of ultrasonographically detected intra-and extra-testicular abnormalities and the significance of oligospermia and azoospermia in men compared with that in normospermic controls.

Methods: One hundred fifty six infertile men (117 oligospermia, sperm count <10x 10^6 /ml, and 39 azoospermia, study group) aged 23-52 years (mean ± SD, 27±7.3), and 100 control group aged 24-56 years (mean ± SD, 26±8.4) were evaluated for the presence of scrotal abnormalities using high-frequency transducers and color Doppler imaging. Testicular volume, semen parameters, and hormonal levels were recorded. Fisher's exact test was used to determine differences between the two groups.

Results: One hundred thirty three of 156 (85.3%) patients in the study group had abnormal findings at scrotal ultrasonography compared with 30% of the controls. This difference was statistically significant ($p<0.001$). These included varicocele in 53.8% vs 31% ($p<0.01$), testicular microlithiasis in 28.2% vs 2% ($p<0.001$), hydrocele in 46.2% vs 33% ($p<0.05$), epididymal cyst in 11.5% vs 3% ($p<0.05$), and epididymal enlargement in 10.3% vs 3% ($p<0.05$). Testicular tumor was not seen in any of the subjects in both groups.

Conclusion: Ultrasound shows a significantly higher frequency of intra- and extra-testicular abnormalities in oligospermia and azoospermia patients compared with the normospermic controls. Detection of these abnormalities by ultrasound may reflect their fertility status.

Key words: Infertility, Ultrasound, Scrotal abnormalities

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Introduction

Subfertile men are being increasingly investigated in an effort to find a curable cause for their infertility. This mainly involves oligozoospermic patients in whom a cause is more routinely sought in an attempt to improve the quality of the semen. It also involves azoospermia patients with a normal follicular stimulating hormone (FSH) level and a normal testicular volume in whom an obstructive cause is routinely sought. Scrotal ultrasonography with high-frequency transducers and color Doppler imaging have proved to be very reliable adjuncts to clinical examination in assessing intratesticular and extratesticular abnormalities including testicular microlithiasis, tumors, varicocele, hydrocele, and epididymal abnormalities [1-4]. With ultrasound, scrotal abnormalities have been found in 38%-59% of infertile men [1,2]. This study was conducted to determine the frequency of scrotal abnormalities among oligo- and azoospermic among the study group.

Methods

A total of 156 infertile men (117 oligozoospermic and 39 azoospermic) aged 23-52 years (mean ± SD, 27±7.3) who had a > 2-year history of infertility, were evaluated between January and July 2001 at King Hussein Medical Center (KHMC). One hundred normospermic men aged 24-56 years (mean ± SD, 26±8.4) were selected as controls. Sperm parameters (count, motility, and morphology) were considered according to recommendation of the World Health Organization

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(WHO) [5]. Each subject was studied on two different occasions separated by a 4-week interval after 5 days of abstinence. The semen sample was obtained by masturbation each time, and oligozoospermia was considered when sperm count was < 20 x 10^6/ml. Ultrasonographic scanning of the testes using a high resolution ultrasound scan machine (General Electric LOGIO 400, PRO Series, USA) with a 7.0 MHz transducer was performed in all patients to evaluate the testicular size, intra testicular and exrtatesticular abnormalities. Color Doppler US was performed to identify varicoceles, which were diagnosed on the basis of a venous diameter of 3 mm or greater, with the diameter increasing during the Valsalva maneuver or during a change from supine to upright position. Radioimmunoassay (RIA) was used to measure the plasma levels of FSH, LH and Testosterone. Data are presented as mean ± standard deviation and were analyzed using Fisher's exact test. Differences were considered significant when $p < 0.05$.

Results

Table I summarizes the demographic data of study infertile (oligo- and azoospermic) subjects compared with the controls (normozoospermic subjects). No significant differences were found in the patients' age, height or weight with regard to previous history of recurrent urinary tract infections and genitourinary surgery, or current history of drug ingestion or smoking. There were no significant differences between the two groups, but a statistically significant increase in terms of previous history of orchitis in the study group as compared with the controls was observed ($p<0.05$).

Clinical, hormonal, and seminal indices of both groups are shown in Table II. A statistically significant reduction in testicular volume, sperm concentration, FSH, and the percentage of sperms with normal morphology and forward motility was noted in the study group as compared with the controls. Table III shows the intratesticular and extratesticular abnormalities detected by US in both groups. Ultrasonic scrotal abnormalities were found in 85.3% of infertile men (133/156) compared with 32% of the controls (32/100). This difference is statistically significant ($p<0.001$). The scrotal abnormalities found in the study group as compared with the controls were as following: inhomogenesity in 4 (2.5%) patients vs. 1 (1%), testicular microlithiasis (Fig. 1) in 44 (28.2%) vs. 2 (2%), varicocele in 84 (53.8%) in both groups, hydrocele (Fig. 2) in 72 (46.2%) vs. 33 (33%), epididymal cyst (Fig. 3) in 18 (11.5%) vs. 3 (3%), and epididymal enlargement in 16 (10.3%) vs. 3 (3%). No testicular tumors were detected in our study. A statistically significant increase in the frequency of testicular microlithiasis ($p<0.001$), varicocele ($p<0.01$), hydrocele ($p<0.01$), and epididymal cyst and epididymal enlargement ($p<0.05$) in the study group was seen as compared with the controls. In our series, a history of orchitis was found in 12 patients, cryptorchidism in 7, genitourinary infection in 20, and varicocele in 84, and infertility in all patients. These findings may precipitate the formation of these microlithiasis with subsequent significant increase in the frequency of this abnormality in the study group as compared with the controls ($p<0.001$).

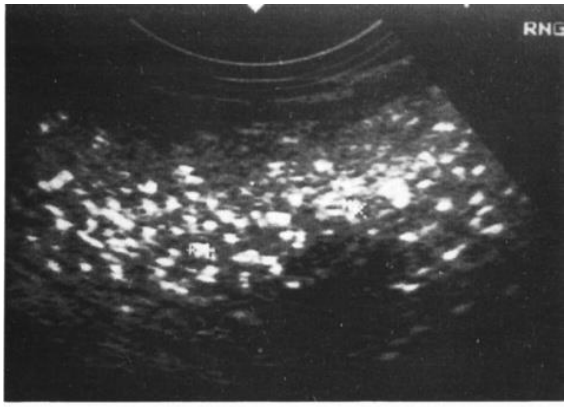

Fig. 1. Multiple, non-shadowing foci consistent with testicular microlithiasis.

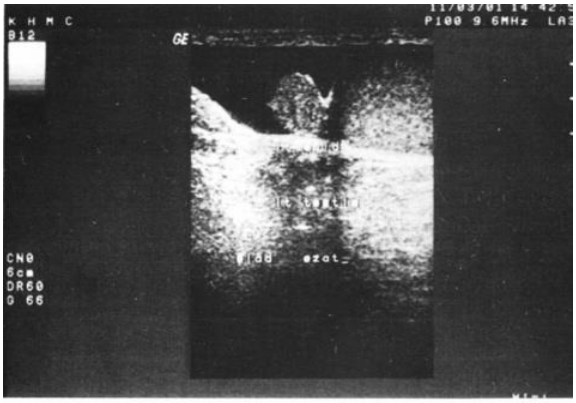

Fig. 2. A testis with hydrocele.

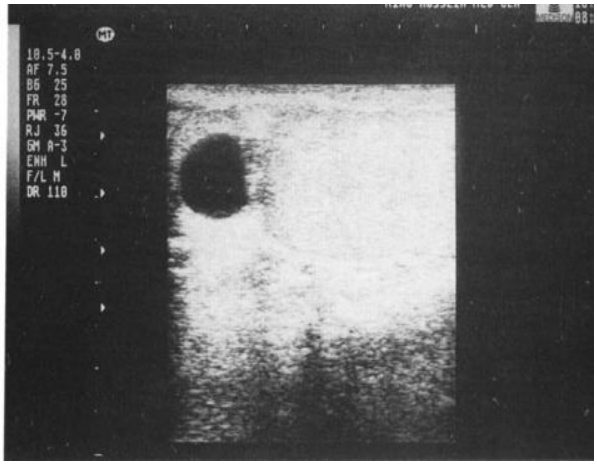

Fig. 3. An epididymal cyst.

Discussion

Approximately 20% of cases of subfertility are due to a male factor only, and in another 27%, the causes can be identified in both men and women. Therefore, male factor subfertility plays a role in approximately 50% of subfertile couples [5]. Many causes have been reported for male factor subfertility, but most remain in conclusive. During the last few decades, there has been much discussion about the evidence of decreased human semen quality defined as sperm density or sperm count, motility, and morphology [6.7]. In addition to reports of decreasing seminal quality, there is also evidence of increased associated abnormalities in the human male genitourinary tract that can be detected ultrasonographically such as testicular cancer, cryptorchidism, microlithiasis, varicocele, hydrocele, and epididymal abnormalities [1,4].

Our data showed that the overall frequency of these abnormalities detected by ultrasound in the study group was 85.3% compared with 32% of controls, reaching a statistically significant difference. This frequency is higher than 38%-59%, which has been previously reported [1-3]. This discrepancy may be due to the fact that most of our patients are soldiers and because of the hard work and exercises which predispose them at increased risk for testicular trauma, strain, and exposure to environmental agents with subsequent increase in the frequency of these abnormalities, since microlithiasis and acquired hydrocele were reported to be related to a previous trauma [4]. Furthermore, the limitation in the two mentioned studies was that the investigators studied a group of infertile men without using a control group of fertile subjects. On the other hand, all patients in our study group were oligospermic and azoospermic who are suspected to have a higher frequency of scrotal findings.

Varicocele was the commonest ultrasonographic finding in the study group (53.8%), which is higher than that reported in the controls (31%). In a recent study, Kondoh *et al* [8] found that even a subclinical varicocele detected by scrotal sonography had a detrimental effect on spermatogenesis. They noted a significant improvement in the postoperative semen characteristics of this group of patients. Doyle and Hirsh [9] reported that the high retrograde flow in some varicocele may affect the physiology of the testis, leading to increased temperature, lower testosterone, and increased PO_2 as there are arteriovenous connections in the pampiniform plexus affecting the semen parameters. Impaired spermatogenesis has been reported in 18% of 120 hydrocele cases, where the pressure of the liquid in tunica vaginalis, the warm environment or a drop in testicular circulation due to edema surrounding the tunica vaginalis have been suggested as possible causes [10].

Of importance, up to 50% of acquired hydrocele are the results of trauma [4]. Although tubal infections are a major cause of infertility in women, the impact of genitourinary infection on semen parameters and male fertility was reported [11,12]. The presence of leukocytes in a concentration of $> 1x\ 10^6$ in the ejaculate is often used for the determination of an infection of the male sex glands. These studies showed that semen samples of subfertile men contain more leukocytes than fertile controls and that the semen quality is decreased with elevated concentration of leukocytes. In the present study, the positive history of recurrent urinary tract infection and orchitis might be responsible for the significant increase of epididymal enlargement detected by US in the study group. These findings are consistent with those reported previously [2,13]. Our findings also included epididymal cysts, which were found in 11.5% of the study group versus 3% in the controls. This difference was statistically significant ($p<0.05$). It is possible that these cysts might have affected the seminal parameters by causing obstruction either partial or complete, since all patients in the study group were either oligospermic or azoospermiac

Testicular microlithiasis is an uncommon condition in which multiple calcifications caused by deposition of laminated rings of glycoprotein and calcium in the seminiferous tubules give an ultrasonic appearance consistent with multiple, diffuse, non-shadowing foci (Fig. 1). It has been reported that testicular microlithiasis is associated with a variety of pathological conditions such as Klinefelter's syndrome, pulmonary alveolar microlithiasis, cryptorchidism, epididymo-orchitis, varicocele, tumors and infertility [1-3,14].

In infertile men, a raised concentration of follicle stimulating hormone (FSH) and a decreased testicular volume are considered a reliable indicator of germinal epithelial damage and are usually associated with azoospermia (mainly the non-obstructive type) or severe oligospermia ($< 10x10^6$ /ml) [15]. Our findings are consistent with these observations, since a significant increase in the mean of FSH, and a significant decrease in the means of testicular volume and semen parameters were noted. In conclusion, ultrasound plays a significant role in the diagnosis of intra- and extra-testicular abnormalities in oligospermic and azoospermic patients compared with the normospermic controls. Detection of these abnormalities by US may reflect their fertility status.

Limitation Of The Study

The number of controls was less than cases.

Table I. Demographic characteristics of 156 oligo-and azoospermic men and 100 normospermic controls.

Characteristics	**Study group (n= 156)**	**Control group (n= 100)**
Age (mean)+SD	27 ± 7.3	26 ± 8.5
Height (mean)+SD	170 ± 7.6	169 ± 5.4
Weight (mean)+SD	77.7 ± 8.6	79.6 ± 6.5
Smoking	73 (46.8)	45 (45)
Drug ingestion	16 (10.3)	16 (16)
History of recurrent UTI	20 (12.8)	11 (11)
History of orchitis	12 (13)*	2 (2)
History of genitourinary surgery	9 (5.8)	7 (7)
Cryptorchidism	7 (4.5)	0

Note: Data in parentheses are percentages. * $p<0.05$

Table II. Clinical, Hormonal, and Semenologic features of the study group vs controls.

Variable	Study group (n= 156)	Control group (n= 100)
Testicular volume (ml)	13 + 2.54*	17.6 + 4.82
Seminal fluid analysis		
- Volume (ml)	2.6 ± 1.3	3.2 ± 1.4
- Total sperm count	9.5 ± 5.7^	77.6 ± 16.6
- Spermatozoa (x 10^6/ml)	5.4 ± 2.5^	44.9 ± 7.3
- Normal morphology (%)	30 ± 6.4*	57.2 ± 3.1
- Forward motility (%)	28.3 ± 5.4*	60.8 ± 7.1
Hormonal profile:		
- FSH (mIU/ml)	7.3 ± 1.4*	3.6 ± 1.1
- LH (mIU/ml)	5.2 ± 0.9	3.7 ± 1.7
- Testosterone (ng/dL)	362 ± 70	498 ± 88

Note: All values are means ± SD. * $p<0.05$ (vs. controls) ^ $p<0.001$ (vs. controls)

Table III. Frequency of intratesticular and extratesticular abnormalities detected by US in the study group vs controls.

Abnormality	Study group (n= 156)	Control group (n= 100)	P. Value
Inhomogenesity	4 (2.5)	1 (1)	N.S
Testicular microlithiasis	44 (28.2)	2 (2)	0.001
Varicocele	84 (53.8)	31 (31)	0.01
Hydrocele	72 (46.2)	33 (33)	0.05
Epididymal cyst	18 (11.5)	3 (3)	0.05
Epididymal enlargement	16 (10.3)	3 (3)	0.05
Tumor	0	0	N.S

Note: Data in parentheses are percentages.
*$p<0.05$ (vs. controls) **$p<0.01$ (vs. controls) ^$p<0.001$ (vs. controls)

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