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Ultrasound diagnosis of varicocele in the adolescent: Our experience from Benin

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ABSTRACT

Background: The diagnosis of varicocèle is clinical. In order to improve diagnosis of varicocele, we compared the clinical with the ultrasound findings in schoolboys with the condition. This is because the conditions can affect testicular growth. **Patients and Methods:** It was a cross-sectional, descriptive study of schoolboys aged from 10 to 19 years who had varicocele. Among 2724 boys examined, 149 had varicocele and only 81 had scrotal (18 with Doppler) and renal ultrasound examination. **Results:** Among the 81 adolescents who were clinically diagnosed with varicocele and also with the aid of ultrasound scan, 25, 36 and 20 had grade 1, 2 and 3, respectively. Testicular hypotrophy (TH) was clinically noticed in 17 cases. At ultrasonography, varicocele was bilateral in 87.66% and unilateral in 12.34% (P = 0.01) with 32 adolescents (39.51%) showing TH compared with 20.99% being diagnosed with TH using clinical examination alone (P = 0.01). In 50 schoolboys (61.73%) with unilateral varicocele, a subclinical type was discovered at other side. Renal ultrasound revealed abnormalities in 4.93% of cases. Doppler ultrasound helped in finding varicoceles along the top edge of the testis (n = 15) and under tunica albuginea (n = 3). **Conclusion:** TH due to varicocele is better studied by ultrasound.

Key words: Adolescent, Doppler, ultrasound, Varicocele

INTRODUCTION

Genitourinary malformations such as varicocele are often ignored by adolescents and their parents. The specific problem of varicocele in adolescent comes from its impact on testicular growth and spermatogenesis.[1,2] It may be primary, due to a vascular malformation including spermatic veins' valvular insufficiency or secondary to renal or adrenal tumour or renal vein thrombosis.[3] The diagnosis of varicocele is mainly clinical. However, ultrasound is used to complete clinical data and to obtain a more accurate measurement of testicular size.[1]

It is documented that ultrasound diagnosis of varicocele was superior to clinical diagnosis. But, the routine use of ultrasound is not available for the majority of our patients. Additionally, parents are not usually to carry out ultrasound study of suspected hydroceles in their children.[1]

The assumption that varicocele is rare in our setting, and the poor knowledge that it lead to male infertility, motivated this study.

PATIENTS AND METHODS

This was a descriptive, cross-sectional of secondary schools boys in Cotonou, aged between 10 and 19 years, with varicocele. Scrotal and renal ultrasound examinations were carried out. The study was approved by our hospital ethical board. The sample minimal size, calculated using Schwartz formula, was 2701. Sampling was randomly conducted with selection of 30 clusters of schoolboys. Among 2724 students who were examined, 149 had varicocele; only 81 students underwent ultrasonographic examination of the scrotum (with 18 of them undergoing Doppler) and kidneys. Data were analysed for Varicocele grade and testicular volume; on imaging of the scrotum and kidneys were: Varicocele side and grade, testicular volume and associated disorders. The grade of varicocele was based on the Dubin and Amelar classification, in which grade 1 indicates a varicocele that is not visible but detected only by Valsalva manoeuvre,

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grade 2, not visible but palpable without a Valsalva manoeuvre and grade 3 visible through the scrotum without a Valsalva manoeuvre.[4]

Testicular volume (TV) (ml) was estimated using the empirical formula of Lambert:[5]

TV = (0.71 × width × length × height)/1.000. The dimensions of the testes were measured manually with the patients lying on their back with flexible tape measure because we don't have an orchidometer. Ultrasound was used to assess the dilated veins that appeared as anechoic tubular structures, winding along the spermatic cord and whose average diameter was greater than 3 mm. The size of each vein increased during the Valsalva manoeuvres or on standing.[6] It helped us to accurately measure the testicular volume and, therefore, to be able to assess the arrest of testicular growth.

The Doppler was performed, using a high frequency linear probe (7.5-15 MHz transducers), on the patient lying and standing without and then with Valsalva's manoeuvre. In case of varicocele, reflux during spontaneous inspiration is noted, the Valsalva's manoeuvre causes a flow reversal over 2 seconds, usually for the duration of apnoea, the phenomenon is repeatable.[7] Testicular hypotrophy (TH) was defined clinically by a difference of at least 2 ml compared to contra-lateral testis or a decrease volume below normal values for age.[8] Testicular hypotrophy was also evaluated by ultrasound using the testicular atrophy index (TAI). The TAI of the affected testicle was calculated as: TAI = (contra-lateral testis volume — affected testis volume)/ contra-lateral testis volume × 100 and expressed as a percent.[9]

We considered 20% and higher testicular atrophy index (TAI) to be statistically significant to confirm testicular atrophy in a patient.[10]

Data were analysed using Epi-info software, and proportions were compared using Chi-square test with P value ≤ 0.05 for statistical significance.

RESULTS

The prevalence of varicocele was 5.47% (149/2724). The mean age of boys with varicocele was 16.50 years ± 3.20 (12 to 19). Prevalence varied with age and was higher (8.65%) in patients 18 years old (P = 0.03).

From 149 adolescents with varicocele, 7 (4.70%) were in pre-pubertal and 142 (95.30%) in post-pubertal stage.

Among the 81 students diagnosed clinically and at ultrasound with varicocele, 25, 36 and 20 had grade 1, 2 and 3, respectively. Approximately 69.10% of adolescents had grade 2 and 3 varicoceles, which were also clinically visible. Testicular hypotrophy (TH) was clinically noticed in 17 cases.

At ultrasound, varicocele was more often bilateral than unilateral: (71/81) 87.66% vs. (10/81) 12.34% (P = 0.00) and if unilateral, they always were on left side.

Among them, 32 students (39.51%) showed TH. All cases of clinical testicular hypotrophy were confirmed ultrasonographically after calculation of TAI [Table 1]. This means that ultrasound is important for testicular hypotrophy diagnosis.

The genitourinary abnormalities observed included subclinical vaginal hydrocele (n = 17), cyst of the epididymis head (n = 1), contra-lateral cyst of the spermatic cord (n = 2) and testicular micro-lithiasis (n = 3) [Figure 1]. TH appeared to increase with the degree of varicocele [grade 1 (8/25), grade 2 (13/36) and grade 3 (11/20)], but this was not statistically significant (P = 0.25) as shown is Table 2. Ultrasounds can helped to diagnose more cases of TH (39.51%) as compared to clinical examination alone (20.99%) with P = 0.01. In 50 schoolboys out of 81 who did ultrasound exam (61.73%) with unilateral varicocele, a subclinical varicocele was discovered at other side as presented on Table 3. Renal ultrasound revealed abnormalities in 4.93% of cases. These included homolateral single kidney (n = 2), bilateral renal hypoplasia (n = 1) and contra-lateral pelvic kidney (n = 1). Doppler ultrasound helped in finding varicoceles along the top edge of the testis (n = 15) and under the tunica albuginea (n = 3). Doppler sonography confirmed the diagnosis of varicocele in 18 cases, showing at spectral analysis, a significant reflux of longer than 2 seconds to the Valsalva's manoeuvre.

DISCUSSION

This study was conducted in Cotonou, the economic capital of Benin, where the two paediatric surgery services and the single urology service of the country are located. From our daily surgical practice and consultation, varicocele is a rare condition. But,

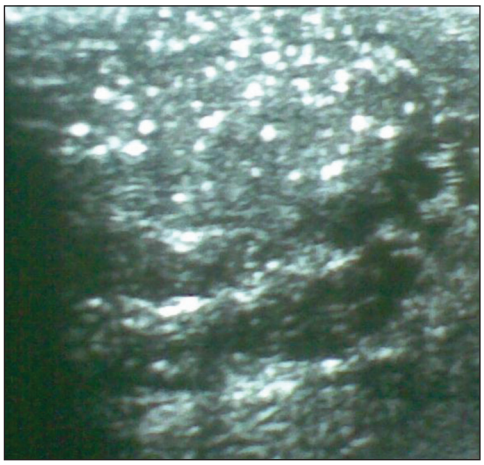


Figure 1: Testicular micro-lithiasis in varicocele at grade 2

Table 1: Ultrasonographic evaluation of testicular hypotrophy

Age (years)	Patients (*n*=32)	Volume of contra-lateral testis (ml)	Volume of affected testis (ml)	Mean difference of testis volume (ml)	TAI (%)
12	3	6.92	5.44	1.48	21.50
13	4	8.71	7.13	1.58	21.80
14	3	8.25	6.41	1.84	22.30
15	11	13.90	10.35	3.55	25.70
16	4	13.46	9.46	4.00	29.40
17	3	12.48	9.26	3.22	26.90
18	2	17.41	13.82	3.59	20.60
19	2	16.78	11.76	5.02	30.60

Table 2: Varicocele grade and testicular hypotrophy (TH) found after clinical and ultrasound examination of school children

Grade	Students with varicocele	TH at clinics n (%)	TH at ultrasound n (%)
1	25	2 (8)	8 (32)
2	36	8 (22.22)	13 (36.11)
3	20	7 (35)	11 (55)
Total	81	17 (20.99)	32 (39.51)

Chi2 = 6.58 $P = 0.01$

Table 3: Clinical findings vs. ultrasound in 81 boys

Type of examination	Clinical (n=81)	Ultrasound (n=131)
		58 left confirmed
Unilateral (n=59)	58 left	49 right subclinical
		1 right confirmed
	1 right	1 left subclinical
Bilateral (22)	22	22 confirmed

according to the literature review, we know that the prevalence of varicocele is around 15% [1] in adolescents; that's why we initiated this study in this range in urban area where the population's density is high. We also chose the students population who are used to western habits and their intellectual level could voluntarily come for medical consultation for any varicose swelling in the scrotum. In Benin, two scientific studies were devoted to this pathology. According to Gainsi *et al.*,[11] their research which was related to male sterility, and they had noted a frequency of 8.2% of varicoceles in their patients. Another author reported on the low frequency of varicocele in patients consulting for infertility in hospital area.[12]

We concluded that in Cotonou, the varicocele does not alter fertility. This could come from an underestimation or the phenomenon is rare.

The prevalence of varicocele we observed, although low compared to other authors,[1] remains important. This prevalence confirms the ignorance of teenagers, who are students, while in 69.1% of them, the lesion was grade 2 and 3. It should be pointed out that in the African context, everything related to sex is taboo and suggests that the boy for the sake of modesty should not declare his sickness. However, this attitude is dangerous since this sickness could lead to infertility. This is crucial for the reproductive capacity of boys who should be encouraged and for whom awareness should be created about it through informations, education and communication strategies. In addition, school and family physicians should routinely screen young boys for varicocele until adulthood where, according to various authors, from 15-20% of patients with varicocele consult for infertility.[2,13]

The diagnosis of varicocele is clinical.[1] However, ultrasound is helpful in improving clinical data and obtains accurate measurement of testicular size. Kacimi *et al.*[14] had systematically done both in their patients, whereas Wong *et al.*[15] used no imaging. In this current study, all cases of varicocele were confirmed by ultrasound, which has more over revealed subclinical cases in some schoolboys. At ultrasound TH appeared to increase with the grade of varicocele with no statistical difference ($P = 0.25$) as previously reported by Okuyama *et al.*,[16] even if it is not consistent with other publications.[17,18] More TH were found in our study by TAI with ultrasound compared to clinical examinations alone ($P = 0.01$). This findings highly supports the assertion that ultrasound remains the gold standard tool for testicular volume measurement as shown by many authors.[19-21] These findings confirmed the superiority of ultrasound on clinical examination, and this should guide our therapeutic indications. Better than clinical varicocele grade, TAI could be used to undergo or not varicoceletomy.[10]

Despite the weakness of the clinical examination findings, manual testicular volume measurement should be systematic and repeated periodically. Meacham[22] and Chipkevitch *et al.*[23] found concordance between clinical and ultrasound measurements, and this highlights the need of manual measurement since developing countries are poorly equipped with health care devices and technologies. Subclinical varicoceles were found in 50 schoolboys with unilateral varicocele as previously reported by several authors.[14,24,25] Testicular micro-lithiasis discovered is of interest since there are described to be associated with cryptorchidism, isolated testicular atrophy, Klinefelter syndrome and cancers.[26] These children should be regularly monitored to exclude any kind of tumours. Scrotal Doppler ultrasound confirmed diagnosis of varicocele and led to peculiar seat of the phenomena like upper edge of the testis and in sub-albuginea. Kacimi *et al.*[14] also reported on this kind of location. Renal ultrasound revealed in our study some abnormalities. And we could advice that kidney should be scanned at ultrasound while investigating varicocele.

CONCLUSION

Clinical varicoceles were confirmed with ultrasound, and more over subclinical contra-lateral were discovered in 50 cases. Among 81 schoolboys with varicocele, ultrasound showed more TH. This stresses that ultrasound is important for testicular volume measuring. Moreover, it helps diagnosing associated disorders.

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