

COLOR DOPPLER SONOGRAPHY AND SCINTIGRAPHY IN THE ASSESSMENT OF VARICOCELES

VARİKOSELİN İNCELENMESİNDE RENKLİ DOPLER SONOGRAFİ VE SİNTİGRAFI

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ABSTRACT

Purpose: The aim of this study was to compare color Doppler ultrasonography, scrotal blood pool scintigraphy and physical examination in the diagnosis of infertile patients with varicocele. **Methods:** We evaluated 30 infertile patients with varicocele, who were determined by color Doppler ultrasonography (CDUS). The results of CDUS were compared with those of physical examination and scrotal blood pool scintigraphy. **Results:** Twenty-one patients were diagnosed as left varicocele and 9 patients had bilateral varicocele by CDUS. Of the 30 patients, 20 were found to have left varicocele of varying severity, and 3 of them were also associated with bilateral varicocele by physical examination. Meanwhile, of the same patients examined by scintigraphy, 22 had left varicocele and 5 had bilateral varicocele. There was no correlation between varicocele grade and retrograde flow with CDUS ($r=0.174$, $p=0.358$). When considering scintigraphic evaluation, there was a good correlation between the grade of varicocele and venous uptake ($r = 0.657$, $p=0.001$). In only 4 of 7 subclinc cases, CDUS examination showed evidence of varicocele before being diagnosed as varicocele by scintigraphy. **Conclusion:** CDUS and Scintigraphy techniques may provide a simple, useful and noninvasive modality for the accurate diagnosis of varicoceles. Additionally, scintigraphic evaluation is highly representative of the grade of varicocele. On the other hand, CDUS does not involve radiation and intravenous injection and is also cheaper than blood pool scintigraphy, and can be performed in a short time.

Key Words: Blood Pool Scintigraphy, Color Doppler Ultrasonography, Varicocele.

ÖZET

Amaç: Varikoselin fertil hastalarda renkli Doppler ultrasonografi, kan havuzu sintigrafisi ve fizik muayene sonuçlarını karşılaştırmak. **Method:** Çalışmamıza renkli Doppler ultrasonografi ile varikozel saptanan 30 infertil hasta dahil edildi. Renkli Doppler ultrasonografinin sonuçları, fizik muayene ve skrotal kan havuzu sintigrafisi bulguları ile karşılaştırıldı. **Sonuçlar:** Fizik muayene ile 30 hastanın, 20'sinde değişik derecelerde sol varikozel, 3'ünde de bilateral varikozel bulundu. Renkli Doppler ultrasonografi ile 21 hastada sol varikozel, 9 hastada da bilateral varikozel saptandı. Aynı hastaların sintigrafik incelemesi sonucu 22'sinde sol varikozel, 5'inde ise bilateral varikozel bulundu. Renkli Doppler ultrasonografide varikozel derecesi ile retrograd akım arasında ilişki saptanmadı ($r=0.174$, $p=0.358$). Sintigrafik inceleme gözönüne alındığında, varikozel derecesi ile venöz tutulum arasında anlamlı ilişki vardı ($r=0.657$, $p=0.001$). **Yorum:** Renkli Doppler ultrasonografi ve sintigrafik varikozel teşhisinde basit, kullanışlı, noninvazif ve geçerli teşhis yöntemleridir. Ayrıca sintigrafik inceleme, varikozel derecesini de yüksek oranda belirleyebilmektedir, radyasyon ve intravenöz enjeksiyon gerektirmez.

Anahtar Kelimeler: Kan Havuzu Sintigrafisi, Renkli Doppler Ultrasonografi, Varikozel.

INTRODUCTION

Varicocele is a varicosity of veins of the pampiniform plexus to a reflux of blood via the internal spermatic vein (1). This can result from an absence or incompetence of the venous valves, collateral bypass vessels and/or increased pressure gradient between the inferior vena cava and the left renal vein (2, 3). In most cases, the varicocele involves only the left side; right sided varicosity is usually smaller (4-7). By means of various imaging techniques, it has been possible to distinguish between a palpable enlargement of the pampiniform plexus, defined as clinical varicocele, which may be staged as grades I, 2 and 3 by the classification of Dubin and Amelar (8) and subclinical varicocele defined as reflux through the internal spermatic vein, without any palpable distension of the pampiniform plexus (9). Many of the papers published on the topic deal with the associated alterations of spermatogenesis and consequently highlight the ability to detect subclinical varicocele, since this is considered by some to be as important as clinical varicocele in decreasing fertility (10-12). Color Doppler sonography is a reliable and noninvasive diagnostic method which may be used in the evaluation of varicocele testis to determine whether one should operate or not (13). The entire procedure including vessel identification, diameter measurement and calculation of flow velocity may be completed within a few minutes. Radionuclide scrotal scintigraphy has been introduced recently for diagnosis of varicocele (14). However, it is less recognised that this method can also yield information about local hemodynamics in testicular vessels.

Phelography is generally accepted as the "gold standard" for the depiction of varicocele (11). However, it is invasive, uncomfortable and not physiologic. Therefore, other diagnostic methods, such as Doppler ultrasound and scintigraphy have been proposed, with the aim of finding an imaging modality as sensitive as phelography. We have attempted to compare these techniques to detect clinical and subclinical varicoceles, and correlate the results with physical examination.

MATERIALS and METHODS

We studied 30 male patients with infertility,

who were diagnosed as having a varicocele by CDUS. The mean age was 30.1 ± 7.4 (range 21-48 years). The presence of clinical varicocele was confirmed by physical examination of each patient in the upright position of a palpable or visible collection of veins in the spermatic cord.

All color Doppler (CDUS) examinations of the scrotum were performed according to a set protocol by certified ultrasonographers under direct supervision of a radiologist. All patients were evaluated by a 7.5-Mhz linear-array transducer and a color Doppler flow imaging system (Toshiba SSA-340A). Scanning was performed with the patient supine during the valsalva maneuver, while the veins of the pampiniform plexus were investigated bilaterally in both the longitudinal and transverse planes, the diameter of dominant vein demonstrating overlay. Examinations were done during normal respiration and were repeated with the valsalva maneuver. Venous diameter within the pampiniform plexus was measured and results obtained from these evaluation were classified criteria: 0 = 0-2 mm, I = 2-3 mm, II = 3-5 mm and III = > 5mm. Afterwards, by using the color image as a guide to represent the flow, the Doppler sample volume cursor was placed accurately within the spermatic vein, and the Doppler angle correction cursor was adjusted to match the axis of flow. The detection of a definite retrograde venous flow in the pampiniform plexus during the valsalva maneuver was

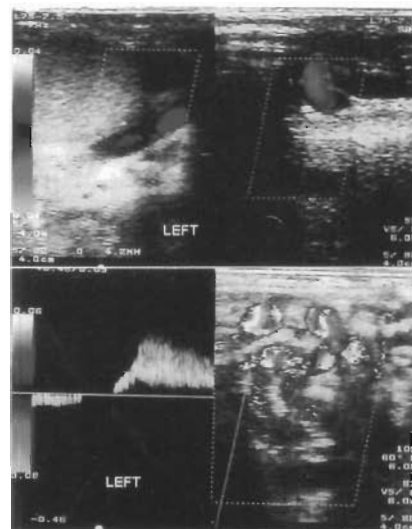


Fig. 1: An example of CDUS demonstrating: Tortuous tubular structures, >2mm vein diameter and retrograde flow.

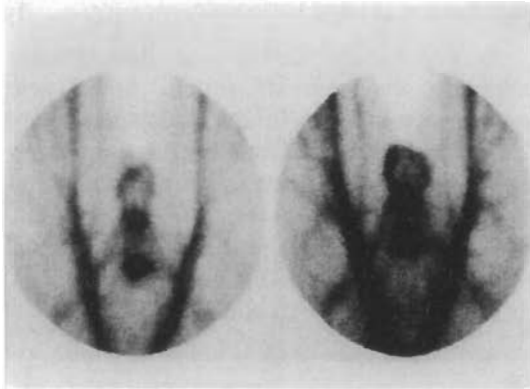


Fig. 2: An example of blood pool scintigraphy demonstrating: Grade II (moderate uptake)

considered as a manifestation of altered blood flow through the internal spermatic vein. The flow velocity and flow volume of the retrograde venous flow present in the spermatic vein were measured during spontaneously respiration and the valsalva maneuver (Fig. 1).

Scintigraphic evaluation was performed with the patient in the upright position, the legs somewhat apart, the penis taped to the midline of the anterior abdominal wall and the scrotum located in the lower third of the field of view. First, a vial of cold pyrophosphate (PYP Sinti ÇNAM) was taken and diluted with 10 ml of sterile saline. The mixture was mixed and left to stand 5 minutes. Without injection of air into the vial, the contents were withdrawn into a 3 ml syringe, avoiding inclusion of air bubble; the

patient was injected with cold pyrophosphate (1mg stannus chloride). After 20 minutes 555 to 740 MBq (15-20 mCi) Tc^{99m} pertechnetate was injected intravenously and serial 2 sec flow images were obtained for 60 second. After 20 and 30 minutes static images were obtained (Fig. 2). The acquisition protocol was applied using a large field of view gamma camera with low energy general purpose collimator and a 20% window around 140 keV peak (General electrics Camstar AC/T, USA). Results obtained from scintigraphic evaluation were classified criteria: 0= normal study, I= mild uptake (just above background), II= moderate uptake (less than major normal vascular structures), III= intense uptake (compared to major vascular structures) in half or entire scrotum and along the internal vein.

Data were evaluated by Speerman correlation and Wilcoxon signed rank test in PC with SPSS computer programme.

RESULTS

21 patients were diagnosed as having left varicocele and 9 patients had bilateral varicocele by CDUS. Of the 30 patients, 20 were found to have left varicocele of varying severity, and 3 of them were also associated with bilateral varicocele by physical examination. Meanwhile, of the same patients examined by scintigraphy, 22 had left varicocele and 5 had bilateral varicocele (Table-1). Table 2 presents the correlations between grading by scintigraphy and CDUS. There was no correlation between varicocele grade and retrograde flow with CDUS. ($r=0.174$, $p=0.358$). When considering scintigraphic evaluation, there was a good correlation between the grade of varicocele and venous uptake

Table - 1: Varicocele rates determined by physical examination, CDUS and scintigraphy.

Methods	Left varicocele	Bilateral Varicocele	Total (%)
Physical examination	20	3	23 (76.6)
CDUS	21	9	30 (100)
Scintigraphy	22	5	27 (90)

Table - 2: The distribution of left varicocele determined by physical examination, CDUS and scintigraphy according to grade of varicocele

Grade of varicocele	CDUS (No=30)	Scin (No=27)
I	9 (30%)	6 (22.2%)
II	12 (40%)	11 (40.7%)
III	9 (30%)	10 (37%)

($r=0.657$, $p=0.001$). CDUS examination showed evidence of varicocele before being diagnosed as varicocele by scintigraphy (in only 4 of 7 subclinic cases). Although the dominant venous diameter was above 2 mm in 3 patients by CDUS, no reflux was determined in these patients.

DISCUSSION

The incidence of varicocele amongst males in the general public presents approximately one third of infertile men. Therefore, methods for investigating varicocele should be part of routine evaluations of subfertile males presenting with no clear cause for this condition. It is suggested that the most accurate method for the diagnosis of varicocele remains venography. However, it is more invasive and has higher morbidity, therefore interest in other diagnosis methods has been increased (15-17). CDUS is found to be capable of detecting a subclinical varicocele if venography is accepted as the ultimate means of diagnosis. By this method, retrograde flow in the pampiniform plexus can be sufficient criteria for diagnosis without regarding the venous diameters (18). However, in our study, although venous diameter was measured above 2 mm in 3 patients, no reflux was seen in these patients. Since the CDUS has been used frequently in clinical practice, the incidence of bilateral varicocele has been reported as 32-71.4% (19). Our findings showed the frequencies of bilateral varicocele in infertile patients 10% with physical examination, 30% with CDUS and 16.6% with scintigraphy. On the other hand, in subclinical cases, CDUS appears to be more sensitive in revealing the presence of varicocele than scintigraphy.

Scintigraphy is able to demonstrate the blood flow reflux through the internal spermatic vein, allowing the evaluation of filling rate (in the "flow phase") and varicocele volume (in the blood-pool image) (3). Sensitivity of the blood pool scintigraphy for diagnosing varicocele has been reported as 91-92% (15,20). In this study, 21 of 30 patients were diagnosed as varicocele by physical examination, however all patients were seen to have retrograde flow by CDUS. Meanwhile scintigraphic evaluation showed that venous uptake was seen in 27 (90%) patients. There was a good correlation between the grade of varicocele and venous uptake ($r=0.657$, $p=0.001$). Each of these imaging techniques yield comparable results in grading varicocele volume.

Our results show scintigraphy to be a more valid imaging technique for grading varicocele than CDUS. This may be explained by the scintigraphy being less operator-dependent than ultrasound in grading varicocele.

In conclusion, CDUS and Scintigraphy techniques may provide simple, useful and noninvasive modalities for the accurate diagnosis of varicoceles. Additionally, scintigraphic evaluation is highly representative of the grade of varicocele. On the other hand, CDUS does not involve radiation and intravenous injection, and is also cheaper than blood pool scintigraphy, and can be performed in a short time.

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