

DIAGNOSTIC ACCURACY OF DOPPLER ULTRASONOGRAPHY FOR DIAGNOSIS OF EPIDIDYMO-ORCHITIS IN PATIENTS PRESENTING WITH SCROTAL SWELLING

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ABSTRACT

OBJECTIVE: To determine the diagnostic accuracy of Doppler ultrasonography for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling. **SUBJECT AND METHODS:** It is a cross sectional study conducted in the department of Radiology, PNS Shifa hospital, Karachi from 23rd Feb 2017 to 23rd Aug 2017. A total of 75 male patients between 15-70 years of age presenting with complaint of scrotal swelling were included in the study. Patients underwent scrotal screening through Doppler ultrasound with multi-frequency probe. All the collected data was entered and analyzed on SPSS version 20. **RESULTS:** The mean age of patients was 43.27±15.49 years. In our study the epididymo-orchitis was diagnosed positive by color doppler ultrasound (CDUS) in 45(60%) patients. The sensitivity, specificity, positive predictive values, negative predictive values and diagnostic accuracy of CDUS findings were 96.26%, 92.47%, 93.64%, 95.56% and 94.5% respectively. **CONCLUSION:** CDUS for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling is very important and reliable technique with high values of diagnostic accuracy.

Keywords: Epididymo-orchitis, Doppler ultrasonography.

Introduction

Scrotal pain, swelling, and redness of acute onset with regional signs and general symptoms is termed as "acute scrotum". Causes of acute scrotum include epididymo-orchitis, torsion of testis, torsion of testicular and epididymal appendices, incarcerated inguino-scrotal hernia, testicular tumor, idiopathic scrotal edema, tense hydrocele and trauma.¹

Epididymo-orchitis is usually caused by urinary tract pathogens or by a sexually transmitted disease.² It is common among men of middle ages with an incidence of 19.7%.¹ However, in developing countries

its incidence is 37.7% among patients presented with scrotal swelling.³ Typical signs and symptoms includes severe pain of scrotal region with swelling and fever, urgency and dysuria.^{4,5}

Number of techniques are used for detection of the epididymo-orchitis like contrast-enhanced ultrasonography, real-time sonoelastography, radionuclide scanning of the scrotum is and ultrasound including color Doppler ultrasonography and gray scale ultrasonography.⁶ Detection of epididymo-orchitis via gray scale ultrasonography showed that among 150 cases,

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54% of patients were identified with the problem of epididymitis, 16.66% of patients were found to have epididymo-orchitis and 16% of patient were identified as normal. However, in combination of color Doppler with gray scale ultrasound about 58% were identified with a problem of epididymitis, 22% of patients having epididymo-orchitis and only 6% of subjects were identified as normal. It is therefore stated that combined color Doppler and gray scale study is better than alone gray scale ultrasound in distinguishing many causes of pain of scrotal region.⁷

Validity of any technique / test is based on its sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV). The perfect diagnostic test would properly identify cases with disease and without disease with an accuracy of 100%.⁸ Color Doppler ultrasonography (CDUS) is the imaging technique of choice for assessing the malfunctioning of scrotal region with complete sensitivity of CDUS in identifying scrotal problems was 98% with 66.7% specificity. Color Doppler ultrasound is also helpful to find differentiation of torsion from epididymo-orchitis or epididymitis with the purpose to avoid the misdiagnosis of testicular torsion.⁹ Patients with acute pain of testicular region with the swelling of scrotum are torsion of epididymitis, testicular appendix, epididymo-orchitis, abscess of scrotum etc may be identify with CDUS. However, the CDUS fail to discriminate between infection and torsion.^{10,11}

Rationale of this study is to find the diagnostic accuracy of Doppler ultrasonography for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling. Similar work has been done in finding role of Doppler USG for diagnosis of epididymo-orchitis globally but no local study has been done in this regard.

Objective

To determine the diagnostic accuracy of Doppler ultrasonography for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling.

Materials and Methods

A descriptive cross-sectional study conducted at Radiology department, PNS SHIFA hospital, Karachi.

Study was approved by institutional review committee. The duration of study was six months. Sample size of 75 cases was calculated with 95% confidence level, and taking expected percentage of epididymo-orchitis i.e. 37.7% and sensitivity i.e. 86.1% with 11% margin of error and specificity i.e. 85.7% with 10% margin of error of Doppler USG.

Sampling technique was non-probability consecutive sampling. Male patients of age between 15-70 years presenting with complaint of scrotal swelling were included in the study. Patients with inguinoscrotal hernia (on clinical examination) and undescended testis (on clinical examination) and patients who do not agree to take part in study were excluded. A total of 75 patients fulfilling selection criteria were enrolled in the study, referred to Radiology Department, PNS Shifa Hospital, Karachi.

Informed consent and demographic detail (name, age, marital status and duration of symptom) was noted. Then patients underwent scrotal screening through Doppler Ultrasound with multi-frequency (7 to 9 MHz) transducer using LOGIQ 500 (GE Wipro) ultrasound machine by a single Radiologist and sagittal and transverse images were obtained. Results were noted and patients were labeled as positive or negative.

All data was entered and analyzed in SPSS version 20.0. The quantitative variables i.e. age, and duration of symptoms was presented as mean \pm standard deviation. The qualitative variable i.e., epididymo-orchitis (on Doppler) was presented as frequency and percentage. 2 x 2 table was generated to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of Doppler USG. Data was stratified for age, marital status and duration of symptom. Post-stratification, 2 x 2 tables were generated to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of Doppler USG

Results

In the present study total 75 patients were enrolled. The mean age of the patients was 42.91 ± 5.65 years with minimum and maximum ages of 15 & 69 years respectively.

In this study, 43 (57.3%) patients were married and 32 (42.7%) were unmarried. Mean duration of symp-

toms was 6.77 ± 3.52 days with minimum and maximum duration values of 1 & 12 days respectively. The epididymo-orchitis was diagnosed positive by CDUS in 45 (60%) patients and CDUS diagnosed negative in 30 (40%) patients (Tab.1). CDUS image of scrotum showing enlarged heterogeneous epididymal head and swollen testis with increased vascularity suggestive of epididymo-orchitis (Fig.1). The sensitivity, specificity, PPV, NPV and diagnostic accuracy of

		Frequency	Percent
CDUS	Positive	45	60.0
	Negative	30	40.0
	Total	75	100.0

Table 1: Frequency distribution of epididymo-orchitis with CDUS

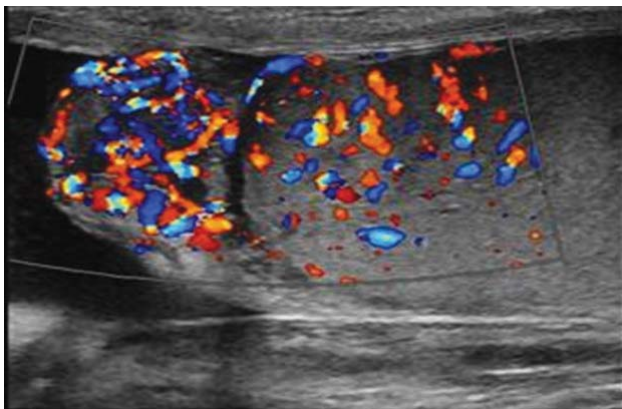


Figure 1: CDUS image of scrotum demonstrating enlarged heterogeneous epididymal head and swollen testis with increased vascularity suggestive of epididymo-orchitis.

CDUS findings was 97.7%, 90.6%, 93.3%, 96.7% and 94.7% respectively (Tab.2). In patients aged ≤ 50 years, the sensitivity, specificity and diagnostic

		Clinical		Total
		Positive	Negative	
CDUS	Positive	42	3	45
	Negative	1	29	30
Total		43	32	75

Sensitivity 97.7%, specificity 90.6%, PPV 93.3%, NPV 96.7%, diagnostic accuracy 94.7%

Table 2: Comparison of CDUS with clinical findings

accuracy of CDUS was 96%, 90.5% & 93.5% respectively. In patients aged > 50 years, the sensitivity, specificity and diagnostic accuracy of CDUS was 100%, 90.9% & 96.6% respectively (Tab.3). In

married patients, the sensitivity, specificity and diagnostic accuracy of CDUS was 95.8%, 84.2% & 90.7% respectively. But in unmarried patients, the sensitivity, specificity and diagnostic accuracy of CDUS was 100%, 100% & 100% respectively. In ≤ 6 days duration of symptoms, the sensitivity, specificity and diagnostic accuracy of CDUS was 94.7%, 92.9% & 93.143 respectively. In > 6 days duration of symptoms, the sensitivity, specificity and diagnostic accuracy of CDUS was 100%, 88.9% & 95.2% respectively (Tab.4).

Age (years)	CDUS	Clinically		Total
		Positive	Negative	
≤ 50	Positive	24	2	26
	Negative	1	19	20
> 50	Positive	18	1	19
	Negative	0	10	10

Sensitivity 97.7%, specificity 90.6%, PPV 93.3%, NPV 96.7%, diagnostic accuracy 94.7%

Table 3: Comparison of CDUS with clinical findings stratified by age

Symptoms Duration	CDUS	Clinically		Total
		Positive	Negative	
≤ 6	Positive	18	1	19
	Negative	1	13	14
> 6	Positive	24	2	26
	Negative	0	16	16

		Symptoms duration	
CDUS	Sensitivity	94.7%	100%
	Specificity	92.9%	88.9%
	PPV	94.7%	92.3%
	NPV	92.9%	100%
	Diagnostic accuracy	93.3%	95.2%

Table 4: Comparison of CDUS with clinical findings stratified by duration of symptoms

Discussion

Color Doppler ultrasound (CDUS) is used to evaluate non-invasively the content of scrotum, inflammation (epididymo-orchitis) and their supply of blood. Evaluation via color doppler ultrasonography showed a sensitivity of nearly 100% in noticing acute type of inflammation and is therefore it is a deep-rooted imaging method for the identification of epididymitis and evade from surgery.^{12,13}

In the present study total 75 patients were enrolled. The mean age of the patients was 42.91 ± 5.65 years with minimum and maximum ages of 15 & 69 years respectively. We agreed with a study who reported that epididymo-orchitis is the most known reason of acute pain of scrotum in adult with highest occurrence in the age of 40 to 50 years. It typically results from an infection in lower part of urinary tract and is traumatic or hematogenous.⁴ It is stated it is highly prevalent in sexually lively people infected with *Neisseria gonorrhoeae* or *Chlamydia trachomatis*. However, with increase age the *Escherichia coli* is the main reason and linked with infection of urinary tract.¹⁴

According to our study the epididymo-orchitis was diagnosed positive by CDUS in 45 (60%) patients and CDUS diagnosed negative in 30 (40%) patients. However, a study showed that CDUS yielded a positive and negative predictive value of 93.9 and 70.6% for epididymo-orchitis, respectively.¹²

In our study diagnostic accuracy of CDUS for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling was 94.5%, the sensitivity and specificity was 96.26% & 92.47% respectively. One study found that sensitivity and specificity of CDUS for judgment of epididymo-orchitis were 100% and concluded that the CDUS of scrotum is a significant examination in acute scrotum and there is no need of surgery.⁴ However, another study found that CDUS produced a sensitivity and specificity of 86.1% and 85.7 % for epididymo-orchitis respectively.¹⁵

Comparison of CDUS with clinical findings indicate that the sensitivity, specificity, PPV, NPV and diagnostic accuracy of CDUS findings was 97.7%, 90.6%, 93.3%, 96.7% and 94.7% respectively. However, it is stated that only clinical investigation may lessen the NPV /negative exploration rate by 55.0 %. Though, this negative exploration percentage is lessened to 59.0% by relating finding of ultrasound with clinical valuation.¹⁶ It is therefore important to take a proper medical history of patient, appropriate evaluation clinically and scrotum ultrasound to decide the credible diagnosis.¹⁷

Comparison of CDUS with clinical findings stratified by duration of symptoms indicate that in ≤ 6 days duration of symptoms, the sensitivity, specificity and diagnostic accuracy of CDUS was 94.7%, 92.9% & 93.143 respectively. In > 6 days duration of symptoms,

the sensitivity, specificity and diagnostic accuracy of CDUS was 100%, 88.9% & 95.2% respectively. According to a study 91 % of cases were mentioned with testicular pain / epididymo-orchitis of duration of ≤ 3 days, while 8.7% cases felt pain for > 3 days. Study stated that CDUS was used if the history and symptoms showed epididymitis.¹¹ CDUS therefore improves the result and play a role in decreasing the patient morbidity. It is rapid, non-expensive, accurate, nonionizing, vital adjunct to medical assessment of scrotum.^{12,14}

Conclusion

It is concluded that in combination with clinical history and local examination, CDUS for diagnosis of epididymo-orchitis in patients presenting with scrotal swelling is a reliable technique with high value of diagnostic accuracy.

Conflict of Interest: None

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