



Diagnostic accuracy of Color Doppler ultrasonography on Acute scrotal pathologies

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ABSTRACT

The new onset of pain, swelling, and/or tenderness of intrascrotal contents is referred to as acute scrotum. In this study we are going to examine the accuracy of CDUS, comparing the sonographical diagnoses with intraoperative findings. Total of 78 patients presenting with acute scrotal pain, swelling or tenderness who are clinically diagnosed as acute scrotum and have undergone colour Doppler sonography (CDUS) and managed operatively in the study period was selected. CDUS findings are documented for making pre-operative CDUS diagnosis. In this study the Colour Doppler sonography was found to have a sensitivity of 81.2% and specificity 83.3%. It has a positive predictive value of 88.6% and negative predictive value of 73.5%. The most important risk of Colour Doppler sonography is false-negative findings, which is 9 in this study. When accuracy was compared Doppler diagnosis have the maximum accuracy of 82.1%, than clinical diagnosis (73.1%), But sensitivity of clinical diagnosis was 97.9%, which is the maximum sensitivity got in this study.

KEYWORDS : Acute torsion; Colour Doppler sonography; acute epididymo-orchitis

Introduction

The new onset of pain, swelling, and/or tenderness of intrascrotal contents is referred to as acute scrotum¹. Several pathologic processes of the testis, scrotum or groin may cause it. The list of possible mechanisms is wide and includes inflammatory as well as ischaemic process. The most common differential diagnosis of the acute scrotum includes testicular torsion, torsion of the appendage testis or epididymis, epididymitis/orchitis. However, testicular torsion with ischemia of the testis is an emergency requiring immediate surgical therapy. The patient's history and clinical findings may make a diagnosis more likely, but occasionally even experienced surgeons may have difficulties differentiating these conditions solely on the basis of clinical signs and symptoms. In a large series of surgically treated patients, torsion appendage of testis is the most common diagnosis (40% to 60%), followed by spermatic cord torsion (20% to 30%), epididymitis (5% to 15%), and other or no pathology (~10%)¹⁰. Testicular infarction begins to appear within 2hrs of complete occlusion of testicular artery, irreversible ischemia occurs after 6hrs and complete infarction is established by 24hrs. The early and accurate diagnosis of testicular torsion remains a clinical challenge. In addition to physical examination, different imaging techniques are available. Historically testicular scintigraphy has been used in the assessment of testicular torsion. Static images in torsion demonstrate a photon deficit area in involved hemiscrotum, however a similar appearance can be encountered in suppurative epididymo-orchitis with abscess formation, testicular haematoma, haematocoele and testicular neoplasm with necrosis. Magnetic resonance imaging (MRI) has been used to differentiate acute torsion from epididymitis with high accuracy. An important limitation of MRI is that this method is impractical in acute situations.

Color Doppler sonography is the most useful and most rapid technique to establish the diagnosis of testicular torsion and to help distinguish torsion from epididymo-orchitis. CDUS can be used to visualize testicular architecture and intraparenchymal blood. CDUS findings consistent with established testicular torsion include reduced or absent Doppler waveforms, parenchymal heterogeneity, and/or altered echotexture compared with the contralateral testis. Kaye and colleagues (2008b) reported that all testes with a heterogeneous echogenicity as shown by CDUS were necrotic. CDUS in cases of appendage torsion is operator dependent and may show hyperperfusion of the epididymis with or

without an enlarged appendix testis or may appear normal. In epididymo orchitis, CDUS shows increased epididymal size and blood flow.

Materials and Methods

A Cross-sectional study was conducted for a period of one and a half years (Feb 2013- Aug 2014) at General Surgical Wards, Medical College, Thiruvananthapuram and Pediatric surgery wards, SAT hospital, Thiruvananthapuram. 68 Patients presenting with acute scrotal pain, swelling or tenderness, who have undergone Colour Doppler Sonography and operatively managed has been selected. Exclusion criteria- Inguinoscrotal hernia, Undescended testis, Patients unwilling for the study. All patients presenting with acute scrotal pain, swelling or tenderness who are clinically diagnosed as acute scrotum and have undergone colour Doppler sonography (CDUS) and managed operatively in the study period will be selected. CDUS findings are documented which includes shape, size and echogenicity of both the affected and the contralateral testis which helps to assess the perfusion of testicular parenchyma, and for making pre-operative CDUS diagnosis. The vascularity will be reduced/ absent for testicular torsion whereas it may be increased in epididymo-orchitis. Then intraoperative findings are collected and are compared with preoperative CDUS diagnosis and various parameters are assessed. The diagnosis is confirmed with intraoperative findings. Data were analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 17. Data are expressed in its frequency and percentage. To elucidate the associations and comparisons between different parameters, Chi square test was used as nonparametric test. For all statistical evaluations, a two-tailed probability of value, < 0.05 was considered significant.

Results

a. Sample characteristic's

Of total 78 patients presented as acute scrotum, maximum number of patients were in 10-14yrs, 22 patients(28%), then 15-19yrs, 19 patients(24%) and the least were in >40yrs age group, 1 patient. Of Total 78 patients operatively managed for acute scrotum, 48 patients (61.5%) were torsion testis. 22 patients(28.2%) were torsion appendix of testis, 6 patients(7.7%) were epididymo orchitis. 2 patients(2.6%) had normal intra operative findings. Of the various diagnosis obtained, among the patients operated for acute scrotum, torsion testis is the leading cause in almost all age groups.

94.9% patients reached the tertiary centre after 12hrs. 2.6% patients reached before 6hrs. previous history of similar illness was present for 3.8% patients. Only 9% patients had a history of trauma prior to the condition. Out of 48 patients finally diagnosed as torsion testis, 87.5% patients had prehn's sign negative. Out of 48 patients finally diagnosed as torsion testis, cremasteric reflex was absent in 77.1% patients and it was present in 83.3% of patients with other diagnosis. 56.3% patients diagnosed as torsion testis had an abnormal position of testis. 96.7% of the patients with other diagnosis had a normal position of testis.

Table 1: Comparison between Doppler diagnosis and final diagnosis

	Final Diagnosis	Final Diagnosis				Total
		Torsi on Testis	Epidydim orchitis	Torsion appendix of testis	Normal	
Doppler diagnosis	Torsion Testis	39	2	1	2	44
	Epidydim orchitis	6	4	9	0	19
	Torsion appendix of testis	0	0	7	0	7
	Normal	3	0	5	0	8
	Total	48	6	22	2	78

Of the total 48 patients diagnosed as torsion testis, Doppler diagnosed 39 cases. 5 cases were missed. Of the total 19 cases of epididymo orchitis, Doppler diagnosed only 4 cases. 15 cases were missed. All 7 cases of torsion appendix of testis were diagnosed by Doppler. All cases reported by CDUS as Normal study were found to be wrong, of which 3 patients had torsion testis. Of the total 78 patients, CDUS diagnosed 44 patients to have torsion testis. Out of which 5 patients was found to have no torsion during surgery. 34 patients were diagnosed as other acute scrotal pathologies, out of which 9 patients had torsion testis.

The sensitivity and specificity of the Colour Doppler sonography (CDUS) in diagnosing torsion testis can be found out as follows:

Sensitivity of Doppler sonography: 81.2%

Specificity of Doppler sonography: 83.3%

Positive predictive value: 88.6

Negative predictive value: 73.5

Accuracy: 82.1%

This sensitivity and specificity were compared with the various clinical methods by which the diagnoses were obtained.

Table 2: Analysis of different parameters in diagnosis of torsion testis

	Diagnosis of torsion								
	TP	TN	FP	FN	Sensitivity	Specificity	PPV	NPV	Accuracy
Position of testis	27	29	1	21	56.70	96.6	96.4	58	71.8
Spermatic cord	30	23	7	18	62.50	76.6	81.1	56.1	67.9
Prehn's sign	42	13	17	6	87.50	15	71.1	33.3	66.7
Cremasteric reflex	37	25	5	11	77.10	83.3	88.8	69.4	71.5
Clinical diagnosis	47	10	20	1	97.90	33.3	70.1	90.9	73.1
doppler diagnosis	39	25	5	9	81.20	83.3	88.6	73.5	82.1

When we compare the various clinical signs, maximum sensitivity is for prehn's sign and least sensitivity for position of testis. But specificity is least for prehn's sign and maximum for position of testis. Accuracy is maximum for position of testis. When any one of the clinical sign is considered as torsion testis, the sensitivity of the clinical diagnosis will become 97.9% and specificity will become 33.3%. The accuracy will be 73.1%. Comparing it with Doppler diagnosis which has an accuracy of 82.1%.

Discussion

This study was done in 78 patients admitted in MCH Trivandrum and SAT Hospital, who underwent CDUS and surgical exploration for acute scrotal conditions. All cases were evaluated clinically and with investigatory facilities available in this institution and data analyzed.

The following points were noted. 61.5% of surgically managed acute scrotum was torsion testis. It was the leading cause of acute scrotum in all age groups. Out of 78 patients studied, 48 patients were torsion testis. When age distribution of torsion testis was analyzed, it was found that the peak age at occurrence is 15-19yrs. 60.4% of the patients come in the age group of 10-19yrs. 83.3% of cases occurring after the age of 10yrs. In previous studies, it was found to be 86 to 93%. There was a definite left sided predominance (60.3%) as seen in many previous studies.

Even though time is the most important factor for testicular salvage, 94.9% patients reached our institution only 12 hrs after onset of symptoms. Previous history of trauma, which is a proven risk factor in many studies, was present in 9% of the patients All the patients presented with scrotal pain, out of which 47.9% patients have an associated symptom of nausea or vomiting. In various studies, nausea and vomiting occurs as an associated symptom in 10 to 60% of the patients.

In this study the Colour Doppler sonography was found to have a sensitivity of 81.2% and specificity 83.3%. It has a positive predictive value of 88.6% and negative predictive value of 73.5%. In many previous studies also, the sensitivity of CDUS is disappointing which varies from 60% to 90%. The most important risk of Colour Doppler sonography is false-negative findings, which is 9 in this study. There are many reasons for false negative findings which include limited experience of sonographer, technical issues, and intermittent nature of torsion.

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