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Original Research Article

A Study on Colour Doppler Sonography in Evaluation of Erectile Function- Our Experience in a Tertiary Healthcare Centre

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ABSTRACT

Background: The study aims at studying the role of colour doppler sonography in evaluation of erectile function in patients referred for clinical impotency or as a part of medicolegal examination. It also aims at detecting the vasculogenic cause and classifying it into arteriogenic, venogenic or indeterminate results and thus helping the clinician in predicting the clinical outcome and deciding the therapeutic options. It also aims at screening the young patients with erectile dysfunction as a prognostic indicator for future cardiovascular events.
Methods: This is a cross-sectional single center (Civil Hospital, Ahmedabad) study done between July, 2017 and July, 2019 including 66 patients between 11 to 70 years. Patients were referred by urologists, physicians or surgeons. All patients had undergone colour doppler sonography after informed consent and results were interpreted based on spectral doppler indices.
Results: Among 66 patients, 42 % patients showed normal doppler findings, 24% arteriogenic, 23% venogenic and 8% with mixed/indeterminate results. Among 3 patients with peyronie's disease, 1 patient showed arterial insufficiency. 1 patient was found to have intervascular shunting as a cause of arterial insufficiency. The incidence of vasculogenic cause of erectile dysfunction was found to be increased with age. We were able to plot the hemodynamic changes in different age groups with normal results and thus able to study the temporal evolution of erectile hemodynamics with age.
Conclusion: Colour doppler study is an important tool for evaluating the erectile function and thus guiding the clinicians for predicting the clinical outcome and choosing therapeutic options. Presence of vasculogenic erectile dysfunction should be considered an important medical condition and a prognostic indicator for future cardiovascular event.
Keywords: Colour Doppler; erectile dysfunction

INTRODUCTION

Normal erectile function is essential for physical, mental and psychological health of a male and his partner. In the patients presenting with impotency, there is need to find out if there is organic cause of erectile dysfunction so as to guide the appropriate treatment. It is also necessary to test the potency of sexual assault accused as part of medico-legal examination. Penile Doppler is playing a key role in evaluation of erectile function in these clinical and medico-legal settings. The aim of this study was to study the temporal evolution of penile haemodynamic changes with age in subjects with normal results; to assess if

there is vasculogenic cause of impotency; to differentiate vasculogenic cause into arteriogenic, venogenic, mixed /indeterminate; to evaluate the extent of fibrosis calcification and penile hemodynamic in preoperative evaluation of patients with Peyronie's disease; to screen the patients with silent coronary artery disease in patients diagnosed with arteriogenic erectile dysfunction.

MATERIALS AND METHODS

This study was done over a period of 2 years between July, 2017 to July, 2019 in department of radio-diagnosis and imaging Civil Hospital, Ahmedabad. Total 66 patients were included in this cross-sectional study. The patients were referred for Doppler by urologist, physician or surgeon. The patients presented with either clinical impotency or were a part of medicolegal examination for evaluation of penile hemodynamics.

Detailed history of patients was taken according to preformed proforma. History of risk factors including diabetes, hypertension, tobacco chewing, smoking, alcohol and any other systemic illness was obtained. Informed consent of the patient was taken and the procedure was explained to the patient prior to examination. Privacy was ensured during the examination.

Penile ultrasound and Doppler was performed on Samsung Accuvix XG Sonography and colour Doppler machine using high frequency probe 7.5 -12 hz. Cavernosal artery, its diameter, flow velocity, dorsal artery and vein and any anatomic variant like intervascular connections were noted. Presence of any calcified plaques, their size, extent and number were noted.

60 mg of papaverine (2 ml ampule) was injected by urologist at the base of penis under ultrasound guidance using insulin syringe. Penile massage was given for proper distribution of the drug. Penile tumescence was observed and graded according to IIEF-5 (international index of penile function) score. Cavernosal artery diameter and spectral waveform was measured after the injection at 5-minute intervals up to 30 minutes. Peak systolic and diastolic velocities with passage of time was recorded. Patient was kept under observation for 3 to 4 hours and observed for complete detumescence.

RESULTS

Total 66 patients were included in the study. The age range was 11 to 70 years. Majority of the patients 70% were between 20 to 50 years (Table 1).

Table 1: Baseline details

Variables	**66 patients**
Age group (years)	
10-20	7
21-30	18
31-40	13
41-50	15
51-60	9
61-70	4
Distribution of findings	
Normal	26(39.4)
Abnormal	37(56.1)
Peyronie arterial	1(1.5)
Peyronie Normal	2(3)
Distribution of penile Doppler findings	
Normal	26 (39.4)
peyronies with Normal	2 (3)
Arteriogenic	15 (22.7)
peyronies with Arteriogenic	1 (1.5)
Venogenic	15 (22.7)
Immature	2 (3)
Indeterminate	5 (6.1)

Table 2: Distribution of dysfunction in age groups

Age group (Years)	Normal	Arteriogenic	Venogenic
10-20	4	0	1
21-30	13	3	2
31-40	3	4	3
41-50	5	2	5
51-60	5	5	1
61-70	0	1	3

In the flaccid state mean cavernosal artery diameter was 0.7 mm and the mean systolic and diastolic velocities was 6 cm and 0.4 cm, respectively. 42% patients were found to have normal penile Doppler study. Three patients were of peyronie's disease out of which 2 patients had normal penile Doppler but one had arteriogenic insufficiency. 24% patients were found to have arteriogenic and another 23% patients were found to have venogenic cause. In 8% patients there was mixed/inconclusive picture. Two patients below 15 years

showed immature vascular hemodynamics. Between 40 to 60 years age group the proportion of patients with venous insufficiency was relatively much more in 40 to 50 years age group and arterial insufficiency in 50 to 60 years age group however results were not statistically significant (Table 2, Figure 1). We also plotted the graph in 4 patients with normal doppler study in different age groups to show the haemodynamic changes and hence the tumescence occurred with passage of time (Figure 2). One patient had communication between cavernosal artery and dorsal artery and found to have arterial insufficiency possibly due to the shunt. No patients developed priapism in our study. Image representations of Doppler have been presented in Figure 3-6.

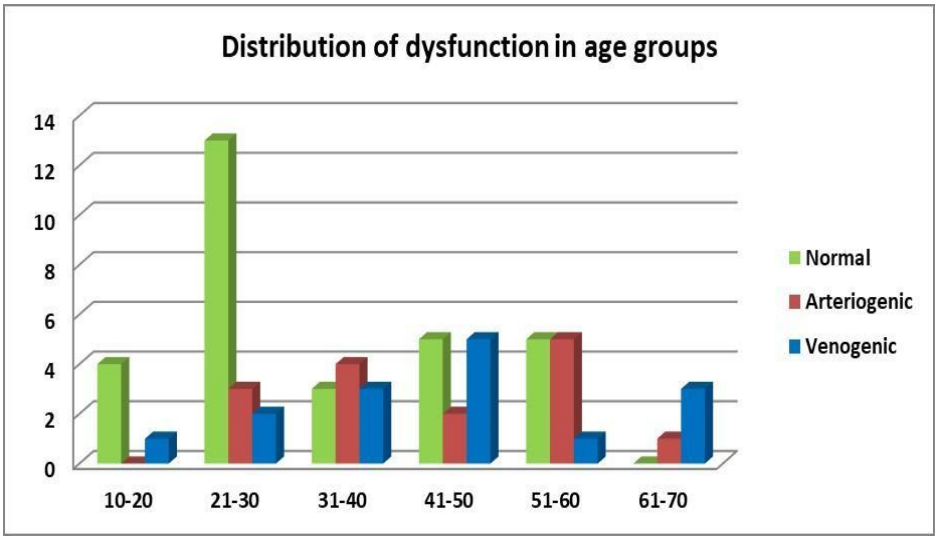

Figure 1: Distribution of dysfunction in age groups

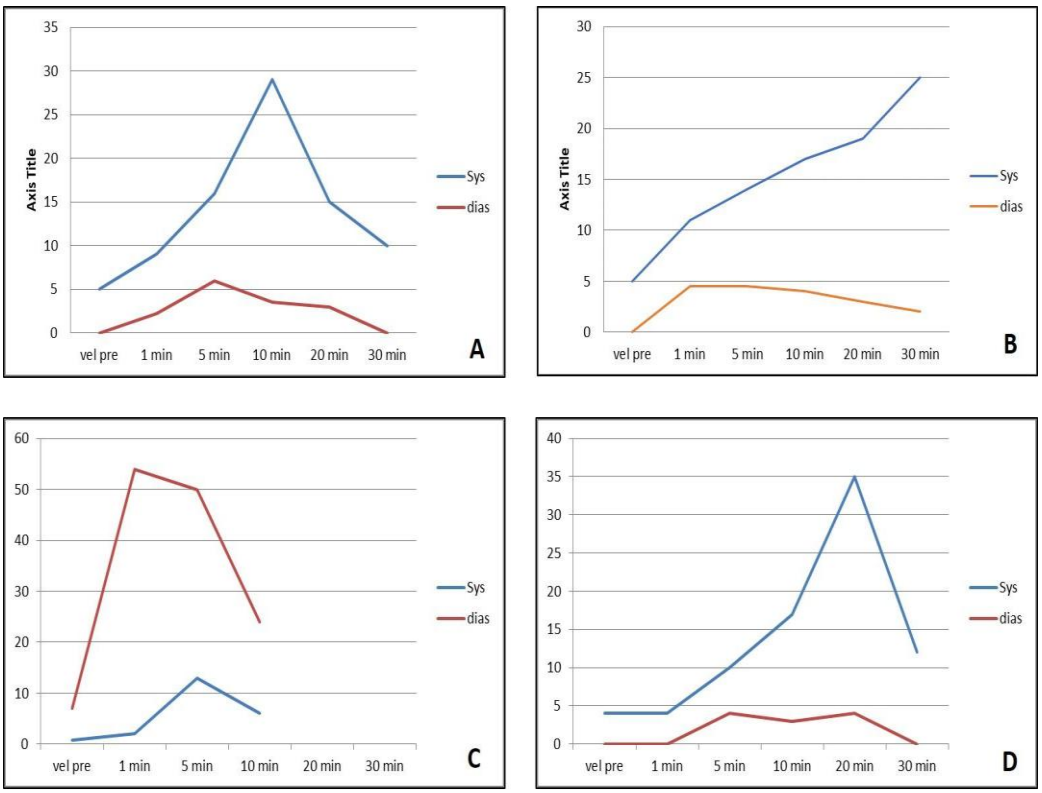

Figure 2: Hemodynamic changes with time after papaverine injection in (A) adolescent; (B) young adult; (C) middle age adult; (D) elderly with normal doppler results

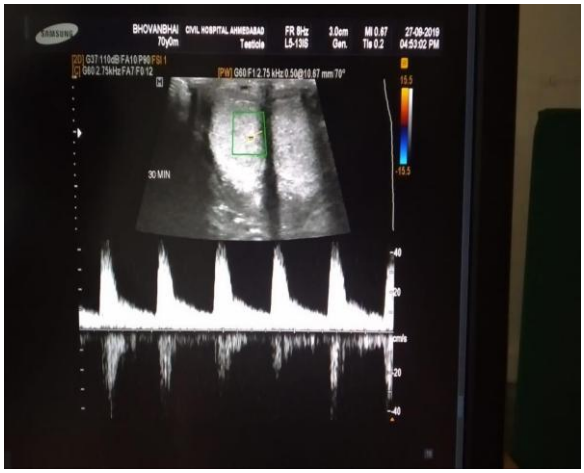

Figure 3: Doppler showing persistent venous leak at 30 min post papaverine

Figure 4: Doppler showing arterial insufficiency with decreased peak velocity

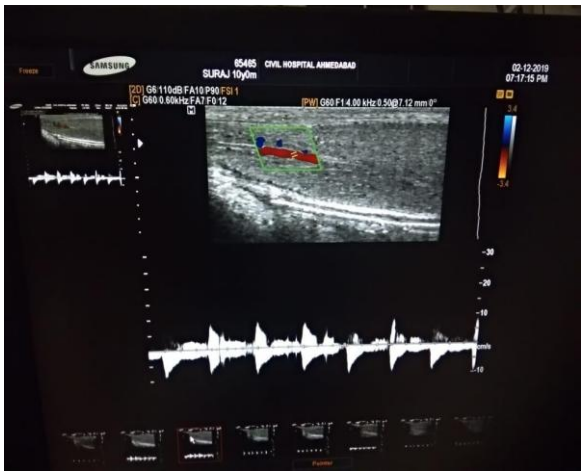

Figure 5: Doppler showing immature arterial hemodynamics in pre pubertal male

DISCUSSION

Penile erection mechanism is an autonomic mediated neurovascular event. This involves various brain activation centres, autonomic and somatic innervation which merge to form cavernosal nerve which supplies the penis and is responsible for three types of erections: psychogenic, reflexogenic and nocturnal. [1] Haemodynamic mechanism of erection involves relaxation of cavernosal and arteriolar smooth muscle followed by sinusoidal filling and resultant venous compression against tunica albuginea which results in erection that persists for sometimes followed by detumescence. [2,3]

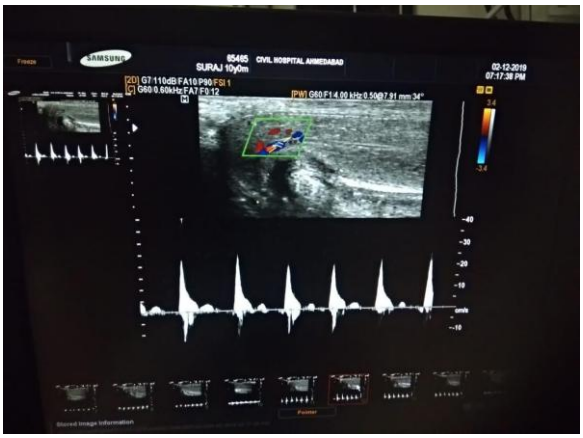

Figure 6: Normal penile Doppler

Colour Doppler sonography is minimally invasive procedure that can be performed on an outpatient basis to study the haemodynamic of erection and to find out the vasculogenic cause of erectile dysfunction. [4] Vascular insufficiency is probably the most common cause of organic male sexual dysfunction. [5] We studied 66 patients who were referred for penile Doppler study for evaluation of penile hemodynamic either as a part of medicolegal examination or with clinical erectile dysfunction. As we got a wide age range from 11 to 70 years and 42 % patients with normal results we were able to plot the normal haemodynamic response after papaverine injection in different age groups. We were able to classify the patients with positive results into different pathologic groups that is arteriogenic (peak velocity <25 cm) and venogenic (persistent end diastolic velocity of >5cm) and mixed or indeterminate where there is delayed or decreased peak velocity with persistent

diastolic flow. We found that vasculogenic cause of erectile dysfunction increases with age, the results were consistent with the study done by Som et al. [5]

In our study the Doppler study was found to be helpful in finding the other causes such as peyronies disease, its extent and severity, and vascular shunts as other causes of arterial insufficiency and thereby help in guiding the physicians for treatment options.

As the choices of therapy increases and become more etiologic specific, colour doppler sonography is useful to classify the vascular causes and help predict treatment success with one or combination of several agents. [6]

Doppler study is often indicated in solving the issues of Erectile function in medicolegal cases like rape and divorce and approximately half of the patients are referred with this indication in our study. [7] Vasculogenic erectile dysfunction patients have more markedly impaired endothelial and smooth muscle function compared with patients with similar risk factors but no erectile dysfunction. The prevalence of comorbidities such as vascular conditions increased with erectile dysfunction severity which may indicate that erectile dysfunction is a prognostic marker of overall health and for future cardiovascular event. So it should be considered an important medical condition. [6]

CONCLUSION

In conclusion it should be understood that, prevalence of vasculogenic cause of erectile dysfunction increases with age. Doppler study is helpful in classifying vasculogenic erectile dysfunction into arteriogenic venogenic or mixed/ indeterminant pattern and help to predict treatment outcome. There is evolution of hemodynamic pattern from immature haemodynamic in prepubertal to fully evolved haemodynamic in young adults with prolonged tumescence, to delayed short tumescence in elderly. Erectile dysfunction is an important medical condition and an important prognostic indicator of future cardiovascular event. Colour Doppler study is helpful in solving medico-legal issues involving erectile function.

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