

Study of erectile dysfunction of penis by usage of colour doppler in Maharashtra population

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Abstract

Background: Erectile dysfunction is an inability to achieve and maintain erectile rigidity sufficient for satisfactory sexual performance. It is either organic or psychogenic in origin. This study was aimed at establishing vasculogenic causes among patients being evaluated for ED using colour Doppler. **Method:** 50 (fifty) patients having ED since last six months were studied. After the examination in flaccid state, papavarine was injected and gray scale and colour Doppler sonography using ultrasound unit with a high frequency wide band 6-13 MHz linear array transducer was done. The clinical response of intra-Cavernous injection was also evaluated. Sensitivity, specificity, NPV, PPV of PSV in were studied. PSV less than 25 (<25 cms/sec) after papavarine injection is criteria for insufficiency (abnormality). **Results:** Out of 50, 14 (28%) patients were abnormal and 36 (72%) were normal. At 10 minutes after papavarine injection sensitivity was 91.5 % , specificity was 92.8, NPV was 96.8% and PPV was 80.9%. **Conclusion:** The patients with ED benefit from colour Doppler ultrasonography which is safe, cheap and non-ionising diagnostic modality before initiating therapy as ED treatment.

Keywords: Erectile dysfunction, Peak Systolic Velocity, Intracaval injection, flaccid, Maharashtra.

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INTRODUCTION

Inadequate penile erection also known as erectile dysfunction (ED), the most common sexual disorder in men. It is defined as the inability to achieve and maintain penile erection of adequate value to perform satisfactory sexual activity. Although exact prevalence of this disease in male population is still not completely known, various studies reported the prevalence of ED to 2.6%¹ and to be 52% among non-institutionalised aged between 40 to 70 years.² ED is either organic, psychogenic or both in origin. Organic causes are found in 80-90% of patients and include vasculogenic, neurogenic, anatomic and endocrine causes.³ Diabetes mellitus, coronary artery disease and systemic hypertension are systemic problems that could

affect penile erection and should be ruled out clinically. Hemodynamic dysfunction is responsible for most of the cases due to venous incompetency or arterial insufficiency with relatively small number of patients suffering from a psychological aetiology alone. Arteriogenic ED is either due to impaired cavernous smooth muscle relaxation or arterial inflow stenosis, which invariably leads to compromised filling of corpora bodies. The aim of the colour Doppler evaluation in ED is to exclude vasogenic causes which can be managed by medical and / or surgical means by colour Doppler blood velocity measurements of deep cavernosal arteries, could be performed before and after intra cavernosal injection of vasodilating agents and 75% increase in vessel diameter is good indication of normal arterial flow into cavernosal artery.⁴ Hence ED of flaccid penis was studied using penile colour Doppler sonography.

MATERIAL AND METHOD

Fifty (50) male adult patients regularly visiting to Vedanta Institute of Medical Sciences hospital Palghar-401606, Maharashtra were studied.

Inclusive Criteria: The patients with ED complaints referred by the urology and Medicine department.

Exclusion Criteria: Who had a history of penile and/or urethral surgery and pelvic surgery. Neurological,

hormonal and psychological disorders causing ED were excluded from the study.

Method: Male patients having ED since the last six months and subjected to evaluate the impotency was examined physically and psychologically.

The routine investigations were carried out and patients were examined with greyscale and colour Doppler sonography using an Aero scan Ultrasound unit with a high frequency wide 6-13 MHz linear array transducer in a quiet comfortable room to ensure privacy. Greyscale sonograms were obtained in longitudinal and transverse planes. The probe was placed longitudinally along the proximal part of the penis. Arterial diameters were measured by placing the cursor on cavernous arteries, colour Doppler ultrasonography was then performed to display blood flow through the cavernous arteries. By using the colour image as a guide to the location and direction of flowing blood, the Doppler sample volume cursor was placed accurately in the cavernous arteries at the base of the penis and Doppler angle correction was adjusted to match the correct axis off low. The resulting angle corrected velocity waveform was displayed on the monitor and PSV were measured and recorded. Both cavernosal arteries were evaluated in every patient. After scanning the penis in the

flaccid stage 30mg(1ml) of papaverine was injected into the corpus cavernosum by using a 26G needle. After 5 minutes (to allow uniform diffusion and physiologic response to the papaverine) scanning was performed again up to 30 minutes. Bilateral cavernosal artery diameters and PSV's were measured. Instructions were given to patients to return to the department if the erection does not subside within 3 hours or if excess pain developed any time after injection of papaverine. Based on the results 3 intervals values were chosen 5cm/sec, 10 cm/sec and 15cm/sec for the lowest normal pre-intra cavernosal injection PSV, PPV or PSV in flaccid penis was done in predicting arteriogenic impotence as diagnosed by post-ICI doppler sonography. A PSV less than 25cm/sec, after papaverine injection associated with abnormal clinical response, was used as the diagnostic criterion for arterial insufficiency. Patients with suspicious venous incompetence on colour Doppler sonography were excluded from the study. Duration of study was May-2019 to June-2021.

Statistical analysis: Study of peak systolic velocities (PSV) in cavernosal-arteries, correlation between right and left PSV, Comparisons between pre-ICI and post ICI values were studied. The statistical analysis was performed in SPSS software.

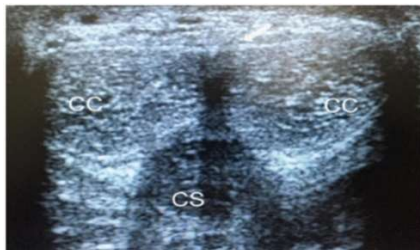


Figure 1

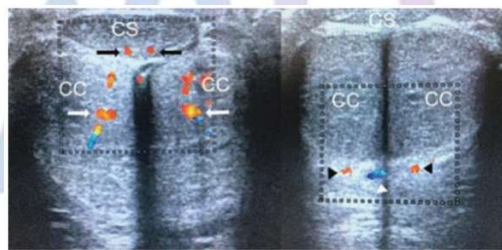


Figure 2

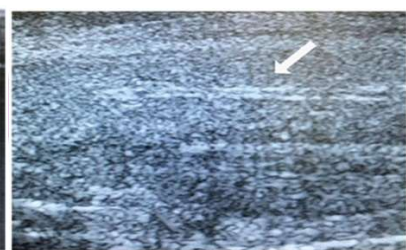


Figure 2

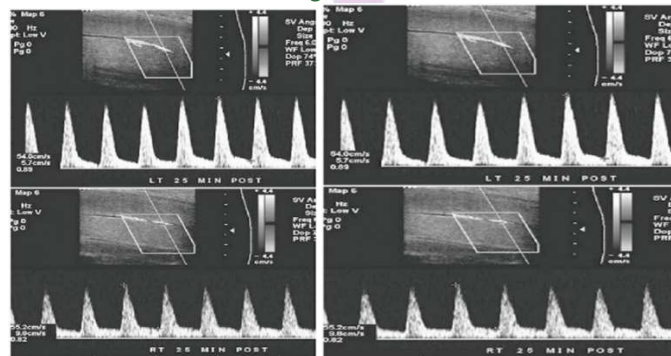


Figure 4 (A-F)

Figure 5 (A and B)

Figure 1: Transverse mid-shaft dorsal scan showing both Corpora Cavernosa (CC) surrounding by hyperechoic tunica albuginea (white arrow) and the more ventral Corpus Spongiosum (CS); **Figure 2:** Transverse mid-shaft ventral scan showing both cavernosal arteries (white arrows), both bulbo-urethral arteries (black arrows), both dorsal arteries (black arrow's heads) and deep dorsal vein (white arrow head); **Figure 3:** Cavernosal artery showing parallel hyperechoic walls (white arrow); **Figure 4 (A-F):** Arteriogenic erectile dysfunction (A-F). Sequential timed (at 5, 10, 15, 20, 25 and 30 min) recordings of spectral Doppler wave forms of the cavernosal artery after injection of prostaglandin E1 demonstrating persistent low peak systolic velocity of the cavernosal artery (<25 cm/s); **Figure 5 (A and B):** Venous leak (veno-occlusive insufficiency). Bilateral spectral Doppler waveforms (A and B) of the cavernosal arteries at 25 min post-injection of prostaglandin E1 demonstrate a high peak systolic velocity (>40 cm/s), which excludes arterial insufficiency as a cause of erectile dysfunction in this patient. However, a persistent diastolic flow velocity of more than 5 cm/s is suggestive of venous leak.

OBSERVATION AND RESULTS

Table 1: Study of peak systolic velocities (PSV) in cavernosal arteries after Intra-caval injection (post ICI) of papaverine

PSV in cm/sec	Right cavernous artery	Left cavernous artery
5.1-15.0	6	5
15.1-25.0	8	8
26.1-35.0	4	4
35.1-45.0	11	13
45.1-55.0	8	5
55.1-65.0	7	8
65.1-75.1	3	3
> 75	3	3

Out of 50 patients 14 (28%) had abnormal clinical response and 36 (72%) had normal clinical response

Table 2: Correlative study between peak systolic velocity (PSV) in cavernosal arteries in flaccid state and their clinical response after intra cavernosal injection (ICI)

PSV cms/sec	Right Cavernosal artery		Left cavernosal artery	
	Abnormal	Normal	Abnormal	Normal
0.5	5	0	5	0
5.1-10.0	8	4	8	5
10.1-15	1	24	1	22
> 15	0	8	0	9

Abnormal 14 (28%) and normal cases were 36 (72%)

Table 3: Comparative study between pre ICI and post ICI values

Pre ICI PSC Base lime value	No. of patients in post ICI				Sensitivity	Specificity	NPV	PPV
	Right cavernous artery		Left cavernous artery					
5 cm/sec	0	5	0	5	33.2	100	82	100
	36	9	36	9				
10 cm/sec	3	11	4	3	91.5	92.8	96.8	80.9
	33	3	32	11				
15 cm/sec	33	14	30	14	100	18.9	100	27.8
	3	0	6	0				

NPV= Negative predictive value, PPV=positive predictive value, 100cms/sec had lowest normal PSV had best accuracy among all three values, sensitivity 91.5% specificity 92.8%, PPV 80.9%

DISCUSSION

Present study of ED of penis by using colour Doppler in Maharashtra population. PSV was 35.1-45 was observed in 11 right cavernous artery and in 13 left cavernous artery and least PSV were observed in 12 patients (Table-1). In the correlative study between PSV in cavernous artery in flaccid state and their clinical response after intra-cavernosal injection (ICI) 14 (28%) were abnormal and 36 (72%) were normal (Table-2). In the comparative study between pre ICI and post ICI values at 10 minutes interval sensitivity was 91.5, specificity were 92.8, NPV was 96.8 and PPV were 80.9 (Table-3) (Figure-1, 2, 3, 4 and 5). These findings are more or less in agreement with previous studies.^{5,6,7} Defining arteriogenic ED (Erectile Dysfunction) is nothing but Arteriogenic Ed which is diagnosed when PSV was lower than 35 cms/sec. Peak flow rates less than 25 cms and venogenic ED was diagnosed when PSV was higher than 30 cm/sec.

Arteriogenic venogenic ED was diagnosed when PSV was lower than 35 cm/sec and concomitant ED was higher than 5 cm/sec. Arteriogenic impotence is among the most important cause of ED. Colour Doppler sonography examination is a noteworthy diagnostic tool for detecting, failure of the penile arterial supply.⁸ It is reported that, flow in the cavernosal arteries in the flaccid state could determine. Non-diabetic patients with vasculogenic impotence have high accuracy rate. The penis was also assessed for the presence of non-vascular abnormalities such as plaques, area of fibrosis and defects in the tunica albuginea.⁹ Medical treatment involves the use of oral phosphor-diesterase 5 inhibitor (PDE 5i). When oral therapy fails intra cavernosal injections, intra urethral suppositories, vacuum erection devices and penile prosthesis may be implored zotaro-limuseluting peripheral stents of internal iliac artery and internal pudenda artery is a treatment of option for arteriogenic ED in the presence

of a proximal fixed obstruction to arterial front.¹⁰ But it is not advisable in veno-occlusive disease as it has venous leakage. Open surgical ligation of deep dorsal vein and collaterals is an option with variable success rates.

SUMMARY AND CONCLUSION

The present study of ED in patients with flaccid penis using penile colour Doppler sonography helps to rule out vascular insufficiency. It is a worthy diagnostic tool to rule out the cause of ED if vasogenic or any other related causes but this study demands further patho-physiological, genetic, angiological, neuro-muscular, hormonal, nutritional studies because exact causes and mechanism of ED is still unclear.

This research paper was approved by Ethical committee of Vedanta Institute of Medical Sciences Palghar-401606 Maharashtra.

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