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Original Research

To assess the role of Penile Colour Doppler in the evaluation of Erectile Dysfunction

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ABSTRACT:

This study was conducted in the Department of Radiodiagnosis, Mahatma Gandhi Medical College and hospital, Jaipur on cases referred from departments of Urology, General Surgery, Endocrinology, Internal Medicine and Psychiatry for Penile Color Doppler Ultrasonography between January 2020 and January 2022. In this study, a total of 12 patients were examined. Maximum number of patients were in the 21-25 years age group (5 patients; 41.66%), followed by equal numbers in 26-30 years age group (2 patients; 16.66%) and 31-35 years age group (2 patients; 16.66%). The age groups of 16-20 years, 46-50 years and 61-65 years had one patient each. Erectile Dysfunction in younger age groups is generally due to performance anxiety, hesitancy or some other unrelated factor indicating that the penile erection mechanism and the penile doppler study are normal and that there is no organic cause. However, this study also indicated that the problem of arterial insufficiency is being found more commonly in the younger age groups than what was found in the past and this rising trend might be due to irregular and stressful lifestyle. Patients belonging to the middle and higher age groups who have complaints of erectile dysfunction are more likely to have an abnormal penile doppler study outcome indicating that Erectile Dysfunction in them is most likely to be due to some pathological cause.

Key words: Erectile Dysfunction; Penile Colour Doppler Ultrasonography.

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INTRODUCTION

Erectile Dysfunction (ED) is defined as the persistent inability to achieve, maintain, or both achieve and maintain a penile erection sufficient to engage in satisfactory sexual activity. Such dysfunction is likely to have a significant impact on quality of life, affecting both physical and psychosocial life. The cause of Erectile Dysfunction may be organic (neurogenic, hormonal, vasculogenic, or drug induced), psychogenic, or mixed. Erectile Dysfunction most commonly has a mixed cause that involves both psychogenic and organic components. Further, it is important to note that chronic illness, certain medications, and a condition called Peyronie's disease can also cause Erectile Dysfunction. Various surgical procedures such as those for the prostate, bladder, and colon cancer may also be contributing factors.[1- 3]

Erectile dysfunction (ED) can also occur as a common side effect of a number of prescription drugs. While these medications may treat a disease or condition, in doing so they can affect a man's hormones, nerves or blood circulation, resulting in Erectile Dysfunction or increasing the risk of Erectile Dysfunction. Common medications that may list Erectile Dysfunction as a potential side effect include diuretics, antihypertensives, antihistamines, antidepressants, parkinson's disease drugs, tranquilizers, muscle relaxants, hormones etc. Other drugs or agents that can cause or lead to Erectile Dysfunction include recreational and frequently abused drugs such as alcohol, amphetamines, barbiturates, cocaine, marijuana, methadone, nicotine and opiates. These drugs not only affect and often suppress the central nervous system, but can also cause serious damage to the blood vessels, leading to permanent Erectile Dysfunction.[4- 7] Most of the research studies on the role of penile color Doppler in the evaluation of erectile dysfunction have been carried out in foreign countries, and only few have been done in our

country. Therefore there was a need to carry out this study.

MATERIALS & METHODS

This study was conducted in the Department of Radiodiagnosis, Mahatma Gandhi Medical College and hospital, Jaipur on cases referred from departments of Urology, General Surgery, Endocrinology, Internal Medicine and Psychiatry for Penile Color Doppler Ultrasonography between January 2020 to January 2022. The mandatory approval from Institutional Ethics Committee was obtained before the start of the study.

Inclusion criteria

1. Patients referred from various departments having complaint of Erectile Dysfunction and willing to undergo Penile Color Doppler examination.
2. Patients giving informed written consent.

Exclusion criteria

1. Patients with Peyronie's disease (PD).
2. Patients with history of drug allergy.
3. Uncooperative or unstable patient.
4. Patients not giving consent.

Data acquisition: After clinical evaluation, once a patient fulfilled the inclusion and exclusion criteria for this study, he underwent Penile Color Doppler Ultrasonography evaluation after giving written consent.

This study assessed the role of Penile Color Doppler Ultrasonography in patients with erectile dysfunction. The procedure was explained to the patients, and written and informed consent was obtained from all patients before enrolment into the study.

Machines used for Penile Color Doppler Ultrasound Examination -

- SEIMENS ACUSON NX3 elite (7-12 MHz probe)
- TOSHIBA XARIO 100 (7-12 MHz probe)

As high frequency probes provide good spatial resolution especially for superficial structures, hence such probes are used for penile doppler ultrasonography as penis is a superficial structure and hence high frequency probes are ideal for its grey-scale and color-Doppler ultrasound examination.

To induce penile erection, Papavarine was preferred over Prostaglandin E1 as the relaxation of the erectile tissue and the vasodilatation obtained with papaverine are generally more evident, probably because of the higher quantity of nitric oxide (NO) involved.

Ultrasound Protocol

Penile Doppler US, when used for evaluation for ED, must be performed with the penis in both flaccid and erect states. Therefore, intracavernosal injection of vasoactive drugs is required.

Phases in Penile Colour Doppler Ultrasonography

A. Flaccid State

Phase 0 - Monophasic waveform with minimal diastolic flow.

B. Filling

Phase 1 - Increased PSV and EDV

C. Tumescence

Phase 2 – Decrease in diastolic flow with classic dicrotic notch.

Phase 3 – Decrease in diastolic flow approaching 0 cm/sec.

D. Full Erection

Phase 4 – Diastolic flow reversal.

E. Rigidity

Phase 5 – Decrease in PSV and EDV

Evaluation parameters (ep)

- Peak Systolic Velocity (cm/s)
- End-Diastolic Velocity (cm/s)
- Resistive Index (RI)

RESULTS & DISCUSSION

Table 1: Distribution of Number of Patients According to Age

Age	Number of patients
16-20 years	1
21-25 years	5
26-30 years	2
31-35 years	2
36-40 years	0
41-45 years	0
46-50 years	1
51-55 years	0
56-60 years	0
61-65 years	1

Table 2: Distribution of Number of Patients According to Presenting Complaints

Presenting Complaints	Number of patients
Difficulty in achieving erection (including one case of concomitant Premature Ejaculation and one case of Depression)	7
Difficulty in maintaining erection	3
Penile Deformities	1
Others	1

Table 3: Distribution of number of patients according to Peak Systolic Velocity (PSV)

PSV	Number of Patients
16-20 cm/s	1
21-25 cm/s	2
26-30 cm/s	0
31-35 cm/s	0
36-40 cm/s	1
41-45 cm/s	0
46-50 cm/s	1

51-55 cm/s	2
56-60 cm/s	2
61-65 cm/s	2
66-70 cm/s	1

Table 4: Distribution of number of patients according to End Diastolic Velocity (EDV)

EDV	Number of Patients
1 cm/s	0
2 cm/s	3
3 cm/s	5
4 cm/s	3
5 cm/s	0
6 cm/s	0
7 cm/s	1
8 cm/s	0
9 cm/s	0
10 cm/s	0

Table 5: Distribution of number of patients according to Resistive Index (RI)

RI	Number of Patients
0.66 - 0.70 RI	1
0.71 - 0.75 RI	0
0.76 - 0.80 RI	0
0.81 - 0.85 RI	2
0.86 - 0.90 RI	0
0.91 - 0.95 RI	7
0.96 - 1.0 RI	2

Table 6: Distribution of number of patients according to Associated Co-morbidities

Associated Co-morbidities	Number of Patients
Diabetes	1
Hypertension	1

Table 7: Results of patients as per outcome of Penile Doppler Ultrasonography test

Result	Number of patients
Normal	9
Arterial Insufficiency only	2
Venous Leak only	0
Arterial Insufficiency and Venous Leak both	1
TOTAL	**12**

In this study, a total of 12 patients were examined. Maximum number of patients were in the 21-25 years age group (5 patients; 41.66%), followed by equal numbers in 26-30 years age group (2 patients; 16.66%) and 31-35 years age group (2 patients; 16.66%). The age groups of 16-20 years, 46-50 years and 61-65 years had one patient each.

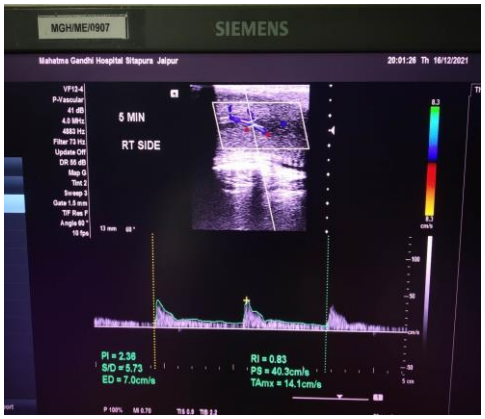

Image showing increased systolic flow (increased PSV) and increased diastolic flow (increased EDV) in the Filling phase – Normal Waveform.

Image showing diastolic flow reversal in the Full Erection phase – Normal Waveform

There were a total of 8 patients (66.66%) in the younger age group (16-30 years), out of which 6 had a normal penile doppler study indicating that they had a normal penile anatomy and normal physiology of erection and hence their complaint of difficulty in achieving erection was probably because of performance anxiety or hesitancy or some other unrelated factor. The remaining 2 patients of this age bracket had an abnormal outcome of penile doppler ultrasound (arterial insufficiency), out of which one had a history of trauma to the pelvic region which was most likely the cause of his complaint of erectile dysfunction. The other patient had no other significant clinical history, and his complaint of erectile dysfunction was probably due to irregular lifestyle, poor dietary habits, lack of exercise and rising levels of stress all of which are now increasingly found in the young population also. Further, one of the patient of this age bracket also had a legal case (divorce) pending against him indicating that probably false allegations of impotency had been made against him.A total of 4 patients (33.33%) were in the middle and higher age groups (31-65 years). Out of these, 2 patients were in the middle age group aged 34 years and 35 years and they had a normal penile doppler study, and the other two patients aged 50 years and 61

years belonged to the higher age group. One of the patient aged 61 years had a history of depression and was found to have a normal penile doppler ultrasound study, indicating that this patient had psychogenic Erectile Dysfunction wherein depression was the factor responsible for his complaint of erectile dysfunction. The other patient of the higher age group aged 50 years had a history of anti-hypertensive medications since 5 years, and he was found to have concomitant arterial insufficiency and venous leak on penile doppler ultrasound. This is in line with the fact that Erectile Dysfunction is a common side effect of anti-hypertensive drugs. It is also known that ED due to some actual pathological cause is mostly found in higher age groups as patients in the higher age group with complaints of ED are more likely to have arterial insufficiency or venous leak. Patients in the younger age group have ED due to issues such as performance anxiety, hesitancy etc.; or they have had to undergo a penile Doppler study due to some ongoing legal cases. However, in this study a rising trend of arterial insufficiency was also found in the young population which was probably due to irregular lifestyle and high levels of mental & emotional stress.With respect to the presenting complaints of the patients, maximum patients had a complaint of difficulty in achieving erection (total 7 patients; 58.33%). One of these patients had a concomitant complaint of Premature Ejaculation, and one patient had a history of depression. Second highest number of patients (total 3 patients; 25%) had a complaint of difficulty in maintaining erection. Penile deformity (hypospadiasis) was present in 1 patient (8.3%); and the remaining 1 patient (8.3%) underwent penile Doppler study due to other reasons (pending legal case).With regards to PSV values, a total of 9 patients (75%) had normal PSV values (PSV > 30 cm/sec at 30 min after Papavarine injection) which included patients with normal penile Doppler study. A total of 3 patients (25%) had low PSV values (PSV < 25 cm/sec at 30 min after Papavarine injection) which were diagnostic of arterial insufficiency. One of these patients had low PSV values and high EDV values both at 30 minutes after Papavarine injection, indicating that he had concomitant arterial insufficiency and venous leak.With regards to EDV values, a total of 11 patients (91.66%) had normal EDV values (EDV < 5 cm/sec at 30 min after Papavarine injection). Out of all the total patients, 1 patient (8.3%) had abnormal EDV values (EDV > 5cm/sec at 30 min after Papavarine injection) with concomitant abnormal PSV values indicating that ED in this patient was due to arterial insufficiency and venous leak both.Out of all 12 patients, a total of 2 patients (16.66%) had associated co-morbidities such as diabetes (1 patient) and hypertension (1 patient). All these are lifestyle diseases which are predominantly prevalent in the higher age group (> 45 years of age).Chronic hypertension, chronic diabetes and hypercholesterolemia cause damage to arterial walls and lead to formation of atherosclerotic plauqes which damage the blood circulation in penis leading to ED. Coincidentally, none of the patients in this study was a smoker; however it is known that smoking predisposes to arterial and capillary wall damage thereby leading to ED in the long term.

CONCLUSION

Erectile Dysfunction in younger age groups is generally due to performance anxiety, hesitancy or some other unrelated factor indicating that the penile erection mechanism and the penile doppler study are normal and that there is no organic cause. However, this study also indicated that the problem of arterial insufficiency is being found more commonly in the younger age groups than what was found in the past and this rising trend might be due to irregular and stressful lifestyle. Erectile Dysfunction can also be a result of psychosomatic disorders such as depression wherein penile anatomy and physiology are normal. Patients belonging to the middle and higher age groups who have complaints of erectile dysfunction are more likely to have an abnormal penile doppler study outcome indicating that Erectile Dysfunction in them is most likely to be due to some pathological cause.

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