

FREQUENCY OF VASCULOGENIC ERECTILE DYSFUNCTION WITH COLOR DOPPLER SONOGRAPHY FOLLOWING INTRACAVER-NOSAL INJECTION OF PROSTAGLANDIN E1

Amanullah Khan, Muhammad Misbah Tahir, Muhammad Imran Siddiqui, Roomi Mahmud

Department of Radiology, Liaquat National Hospital Karachi, Pakistan.

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ABSTRACT

OBJECTIVE: To determine the frequency of vasculogenic erectile dysfunction with color Doppler sonography following intracavernosal injection of prostaglandin E1. **SUBJECT AND METHODS:** 77 patients of erectile dysfunction who underwent color doppler sonography at department of diagnostic radiology, Liaquat National Postgraduate Medical Centre from December 2013 till November 2014 were enrolled in this study. The penile color doppler sonography was performed on Toshiba Aplio using 7 MHz linear array probe following intracavernosal injection of prostaglandin E1 20 mcg. **RESULTS:** Vasculogenic erectile dysfunction was observed in 48 (62.3%) cases. Out of 48 cases, arterial insufficiency was seen in 10 (20.8%) and venous insufficiency was observed in 38 (79.2%) cases. Rate of vasculogenic erectile dysfunction was significantly higher in 46 to 50 years of age. **CONCLUSION:** In our study predominant cause of erectile dysfunction is vasculogenic which can be diagnosed efficiently by Color Doppler sonography following intracavernosal injection of prostaglandin E1.

Key Words: Vasculogenic erectile dysfunction, Color Doppler Sonography, prostaglandin E1.

Introduction

Sexual dysfunction is a common disorder among men worldwide. In 1995 approximately more than 152 million men suffered from erectile dysfunction (ED) and it is presumed that this number will rise to approximately 322 million by the year 2025.¹⁻³

Organic causes are the most frequent (50-90%) causes of erectile dysfunction. Organic impotence in the presence of normal endocrine balance and intact nervous system is vascular in origin in about 50-70% cases and is mostly due to combined arteriogenic and venogenic causes. Pure arteriogenic impotence accounts for about 30% of cases and isolated venogenic impotence is found in about 15% of patients. Rarely, organic impotence is caused by

structural abnormalities of the penis such as Peyronies disease.⁴

In the second Princeton consensus, Jackson et al⁵ concluded that a man with ED and no cardiac symptoms is a patient with cardiac (or vascular) disease until proven otherwise. Because of similar pathophysiology ED may serve as an indicator of silent cardiovascular disease requiring further evaluation in this regard. After intracavernosal injection of a vasodilatory agent like prostaglandin E1, color Doppler sonography combined with spectral interrogation is performed to assess cavernosal arteries and dorsal vessels. It is one of the most effective methods for differentiating Psychogenic and Vas-culogenic causes of erectile dysfunction.⁶ It is of immense implication as most of vasculogenic causes of erectile dysfunction are treatable.

Correspondence : Dr. Amanullah Khan
Department of Radiology,
Liaquat National Hospital,
Karachi, Pakistan.
Cell: 0300-2726295
Email: manikhhan46@yahoo.com

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Materials and Methods

It was a prospective cross sectional descriptive study carried out at the department of radiology Liaquat National hospital and Postgraduate Medical Centre, between 1st December 2011 to 30th November 2012. Purposive non probability sampling was done. Sample size was 77 patients with prevalence of vasculogenic erectile dysfunction 15%, margin of error= 8% and 95% confidence interval. All patients who were referred to us with history of erectile dysfunction for 6 months or more and between ages of 20 to 50 years were included in this study. Patients with known risk factors or disease e.g, DM, Hypertension, Kidney disease, Hormonal imbalance, Neurological disease (e.g, Stroke) and patients on drugs (e.g, Antidepressants, Anti HTN, Sedatives) and patients with Peyronies disease were excluded from the study. Inclusion and exclusion criteria were strictly followed in order to avoid confounding variables. Informed consent was taken from all patients. Relevant history was obtained from patients.

The penile color Doppler sonography was performed on Toshiba Aplio using 7 MHz linear array probe following intracavernosal injection of prostaglandin E1 20 microgram.

Pre injectional gray scale ultrasound was performed in both longitudinal as well as transverse sections to exclude Peyronies disease. A senior radiologist having 5 years experience in doppler sonography assessed all the patients in the study. During color Doppler sonography measurements of peak systolic and end diastolic velocities were obtained in each cavernosal artery at 5 minutes intervals for 30 minutes following intracavernosal injection of prostaglandin E1 20 mcg. Sampling factors, accurate gate placement and angle correction were optimized for consistent and reproducible results. Spectral wave forms from the cavernosal artery were measured at the base of the penis as velocities are highest here and angle correction is optimal.

Vasculogenic erectile dysfunction occurs when there is insufficient blood flow to the corpora cavernosa (arterial insufficiency) or when venous leakages occur that allow loss of blood from the corpora cavernosa (venous insufficiency).

Presence of either of the two was considered as vasculogenic erectile dysfunction. A peak systolic

velocity of less than 35 cm/sec on penile color Doppler sonography was labelled as arterial insufficiency. An end diastolic velocity of greater than 5 cm/sec on penile color Doppler sonography was labeled as venous incompetence.

Data was entered in statistical package for social sciences (SPSS) version 17 for the analysis purpose. Mean and standard deviation were calculated for quantitative variables i.e. age, peak systolic and diastolic velocities. Frequencies and percentages were computed for qualitative variables like vasculogenic erectile dysfunction, arterial and venous insufficiency. Stratification was done with regards to age and duration of erectile dysfunction to see the effect on these outcome variables through chi-square test. $p \leq 0.05$ was considered as significant.

Results

A total of 77 patients presenting with erectile dysfunction were included in this study. The average age of the patients was 34.55 ± 8.24 years (95%CI: 32.67 to 36.42). Age ranged from 20 to 50 years. vasculogenic erectile dysfunction was observed in 48 (62.3%) cases. Out of 48 cases, arterial insufficiency was seen in 10 (20.8%) and venous insufficiency was observed in 38(79.2%) cases.

Rate of vasculogenic erectile dysfunction was significantly higher in 46 to 50 years of age as shown in (Tab. 1). Duration of erectile dysfunction does not seem to be the significant affecting factor. Vasculogenic erectile dysfunction was seen in 25 (59.5%) patients whose duration of disease was below and equals to 1 year. Out of these 25 patients, 5 (50%) patients had arterial insufficiency and 20 (52.6%) patients had venous insufficiency. In 23 (65.7%) patients duration of erectile dysfunction was above 1 year (Tab. 2). Out of these 25 patients, 5 (50%) patients had arterial insufficiency and 18 (47.4%) patients had venous insufficiency. Arterial insufficiency and venous insufficiency were also evaluated with respect to age groups and duration of disease as presented in table 3 and 4 respectively.

	Vasculogenic ED	
	Yes n=48	No n=29
≤ 25 Years	10(76.9%)	3(23.1%)
26 to 30 Years	9(56.3%)	7(43.8%)
31 to 35 Years	11(78.6%)	3(21.4%)
36 to 40 Years	7(41.2%)	10(58.8%)
41 to 45 Years	3(37.5%)	5(62.5%)
46 to 50 Years	8(88.9%)	1(11.1%)

Chi-Square= 11.05; p=0.05
Row wise percentage were computed

Table 1: Frequency of vasculogenic ED with respect to age groups n=77

	Vasculogenic ED	
	Yes n=48	No n=29
≤ 1Years	25(59.5%)	17(40.5%)
> 1 Years	23(65.7%)	12(34.3%)

Chi-Square= 0.312; p=0.57

Table 2: Frequency of vasculogenic ED with respect to age duration of ED n=77

Age Group	Arterial Insufficiency n = 10	Venous Insufficiency n=38
	Yes n=48	No n=29
≤ 25 Years	10(76.9%)	3(23.1%)
26 to 30 Years	2(20%)	7(18.4%)
31 to 35 Years	2(20%)	9(23.7%)
36 to 40 Years	2(20%)	5(13.2%)
41 to 45 Years	0(0%)	3(7.9%)
46 to 50 Years	3(30%)	5(13.2%)

Chi-Square= 3.16; p=0.675
Column wise percentage were computed

Table 3: Frequency of vasculogenic ED with respect to age groups n=48

	Vasculogenic ED	
	Arterial Insufficiency n=10	Venous Insufficiency n=38
≤ 1 Years	5(50%)	20(52.6%)
> 1 Years	5(50%)	18(47.4%)

Chi-Square= 0.022; p=0.88
Column wise percentage were computed

Table 4: Frequency of vasculogenic ED with respect to duration of erectile dysfunction n=48

Discussion

The normal male sexual response cycle can be functionally divided into five interrelated events that occur in a defined sequence: libido, erection, ejaculation, orgasm, and detumescence. The functional classification of the male sexual cycle is the most physically quantifiable one.

In 1982 during a vascular reconstructive procedure, Ronald Virag noted that infusion of papaverine into the hypo gastric artery produced erection. In 1985 Lue et al introduced the technique of high resolution sonography and quantitative Doppler spectrum analysis.⁷ In 1986 Ishii published the first clinical series on intracavernous injection of prostaglandin E1. Prostaglandin E1 because of its efficacy and safety (low priapism rates) is the drug of choice for penile injection. The demonstration that vasoactive injections could produce penile erection without benefit of psychic or tactile stimuli revolutionized the diagnosis and treatment of erectile dysfunction by providing a direct test of end organ integrity and offering an etiology specific therapy.

In present study frequency of vasculogenic erectile dysfunction with color doppler was observed in 48 (62.3%) cases. Out of 48 cases, arterial insufficiency was seen in 10 (20.8%) and venous insufficiency was observed in 38 (79.2%) cases. In another study by Bari V et al (3) it was observed that vasculogenic causes were noted in 23 patients (33%), 12 with arterial insufficiency and 11 with venous leak. The lowest peak systolic velocity in arterial insufficiency patients was 10-13 cms/sec and highest velocity achieved was 22 cms/sec. In patients with venous leak, the end diastolic velocity was above 6 cms/sec

and highest velocity recorded was 16-17 cms/sec. In Hussain⁸ et al study consisting of 40 patients ED due to organic causes was found in 18 patients. Venous leak was identified as a cause among 9/18 (50%) patient and arterial insufficiency in 6/18 (33%) patients. One patient (5.6%) each had mix picture of venous leak and arterial insufficiency, low flow priapism and Peyronie's disease respectively.

Vascular insufficiency seems to be the most common cause of organic male sexual dysfunction.⁹ Erectile dysfunction (ED) secondary to excessive venous leakage is being reported with significant frequency in clinical studies.¹⁰ Penile diseases, such as congenital malformation, Peyronie's disease, priapism and phimosis may interfere with erectile function. Vasculogenic ED patients have more markedly impaired endothelial and smooth muscle functions compared with patients having similar risk factors but no ED.¹¹ A survey carried out by Shabsigh et al revealed that prevalence of co morbidities, such as vascular diseases, increased with ED severity, which may suggest that ED is an indicator of health standard.¹²

PGE-1 (alprostadil) , a metabolite of arachidonic acid causes smooth muscle relaxation resulting in vasodilation in man. It also has an α -2 adrenergic blocking effect and hence has the potential of reducing sympathetic overtone in patients with psychogenic erectile dysfunction.

The overall erectile response to prostaglandin intra corporeal injections is about 70%.¹³ Pain is the most common side effect, occurring in 13-80% of patients and is dose-related. Other side effects associated with PGE-1 injections include local corporeal haematoma or ecchymosis (8%), prolonged erection to between 4 and 6 hours (5%), priapism of greater than 6 h (1%), penile oedema (2%), and fibrosis (2.3%).¹⁴ Venous ligation results in initial recovery of erectile function within the first 6 months of the surgery as reported in 60% to 70% of patients.¹⁵ However, the long-term success rate of penile vein ligation is poor, with only about 20% of patients able to have normal intercourse more than 1 year after surgery.¹⁶

In our study rate of vasculogenic erectile dysfunction was significantly higher in 46 to 50 years of age. In Hussain et al⁸ study among 40 patients, 26 (65%) were aged > 40 years which is in accordance with the fact that erectile dysfunction most commonly occurs at a later age group.^{17,18} It is difficult to esti-

mate the real prevalence due to different epidemiological criteria used in the studies to define ED. The Massachusetts male aging study showed that the prevalence is 52% in men between ages 40 and 69 yrs.¹⁹ Other studies reported values as low as 4.6% for men under 25 yrs old, and 37.6% for men over 74 yrs.²⁰ Nevertheless, it is common in the elderly population as well as the young.

Erectile function is an important question in lawsuits for divorce, rape, and damages. Lawyers may abuse the assertion of ED in lawsuits for divorce and rape. Doppler evaluation is of considerable help in such cases. The investigation, interpretation, and characteristics of medicolegal cases may differ in countries with different cultures. The availability of effective and well-tolerated oral medications has dramatically changed the clinical approach to erectile dysfunction. Pharmacotherapy is the preferred cost-effective first-line therapy in the vast majority of patients.²¹ It is important that we diagnose the treatable causes of erectile dysfunction in which vascular causes are an important entity. Doppler ultrasound plays an important role in diagnosis and treatment planning. Local expertise development is essential in this area and can result in significant contribution to mankind. Management of erectile dysfunction needs team approach with team dynamics involving urology, endocrinology, psychiatry, vascular surgery, diagnostic and interventional radiology. Awareness at grassroot level including general practitioners and public will also improve the scope of disease.

Conclusion

Color Doppler evaluation of erectile dysfunction is an effective method for differentiating vasculogenic causes of erectile dysfunction. This is important because many of these cases are treatable. Management of erectile dysfunction requires a team approach with multidisciplinary involvement and awareness at medical and public level.

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