

## Accuracy of Penile Doppler in Detection of Erectile Dysfunction

ZAHID NAZIR<sup>1</sup>, MUHAMMAD FARHAN SHAHZAD<sup>2</sup>, SYED SHAHEER HAIDER<sup>3</sup>

<sup>1</sup>Assistant professor of Radiology, Government Kot Khawaja Saeed Teaching Hospital, Lahore

<sup>2</sup>MO, BHU Khan Khasa Narowal

<sup>3</sup>MO, BHU Abdullahpur Kollar SKP

Correspondence to Dr. Zahid Nazir, Email: drzahidradiologist@gmail.com

### ABSTRACT

**Background:** Erectile dysfunction is one of the main fertility problems. Functional organization of male reproductive system is most substantially quantifiable one. Penile Doppler sonography is a specialized technique which can help to diagnose the problem and treatment.

**Methods:** This cross sectional study was conducted on 50 males. The patients with complaint of secondary infertility were included. Penile Doppler was done and findings were noted. Then Nocturnal penile tumescence testing was done for confirmation of erectile dysfunction.

**Results:** The mean age of patient was 35.47±8.93years. The mean duration of infertility was 3.24±1.65months. In the sample, 7(14%) had family history of erectile dysfunction. The penile Doppler had Sensitivity: 65.8%, specificity: 83.3%, PPV: 89.3%, NPV: 43.5%, accuracy: 70% for detection of erectile dysfunction.

**Conclusion:** Penile Doppler is accurate enough that it can replace interventional methods to diagnose erectile dysfunction also including prostaglandin E injection and Nocturnal penile tumescence testing.

**Keywords:** Erectile dysfunction, Penile Doppler, Nocturnal penile tumescence testing, infertility

---

### INTRODUCTION

Erectile dysfunction is defined as inability to achieve the penile erection to complete sexual intercourse satisfactory.<sup>1</sup> It is common and unbearable syndrome with physical, psychological & medicinal factors<sup>2,3</sup>. It occurs in around 52% males aged between 40-70 years with about 10% have severe condition suffering with this problem.<sup>4</sup> The physical causes can be divided into arterial inflow difficulties, structural penile abnormalities or venous occlusion mechanism difficulties<sup>2</sup>.

Penile blood flow is mostly assessed on Doppler flow to evaluate dorsal penile arteries. The ratio of penile arteries pressure to brachial arteries pressure is known as penile brachial pressure index.<sup>5</sup> The normal functional male sexual cycle can be categorized in 5 interrelated events which occur in well-defined arrangement: libido, erection, ejaculation, orgasm & detumescence. The functional classification of male reproductive cycle is most bodily quantifiable one<sup>6-8</sup>.

Penile Doppler ultrasound is a specialized tool necessitating detailed examination of topic in order to aid diagnosis and uninterrupted succeeding therapy. This method is specified in erectile dysfunction patients, who didn't respond to oral medicines<sup>2</sup>.

So we planned to conduct this study as there is not much literature available in this regard. As if penile Doppler showed more accuracy for detection of erectile dysfunction, then in future we can implement the penile Doppler as first line detection tool to detect erectile dysfunction in males with complaint of infertility.

### MATERIAL AND METHODS

This cross sectional study was done on 50 males participated in the study. The study was conducted at Government koj khawaja saeed teaching hospital, Lahore for 6 months (from January 2018 to June 2018). The patients were recruited through the outpatient department

with complaint of secondary infertility and incomplete erection. Patients with previous erectile dysfunction or having treatment of erectile dysfunction, psychiatric problem, urinary tract infection, were excluded. Informed consent was obtained and patients were assured about confidentiality of their data used for researcher purpose only. Demographic details (name, age, duration of infertility, previous number of kids, number of marriages, family history, economic status, occupation) were obtained. Then patients were underwent Doppler ultrasound by using high frequency transducer (7.5-9.0MHz, logic 500MD, GE Medical Systems). Findings were noted and patients were labeled as positive or negative for erectile dysfunction. Patients were labeled positive when after intracavernous 60mg papavarine injection, inner diameter of cavernosal artery was increased after 20minutes and Doppler spectra were obtained from proximal cavernosal arteries at penile base. Then Nocturnal penile tumescence testing was done. It involved placing several bands around penis, connected to device like Rigiscan monitor and instructed the patient to wear assembly for 2 or 3 successive nights. If erection occurs, which is expected during rapid eye movement sleep, its force and duration were measured on graph. Inadequate or absent nocturnal erections suggest organic dysfunction, while normal result indicates high likelihood of psychogenic etiology. Findings were noted and patients were confirmed for erectile dysfunction. **Statistical analysis:** Data was entered & analyzed in SPSS version 21. 2x2 table was generated to calculate sensitivity, specificity, PPV, NPV and accuracy of penile Doppler.

### RESULTS

The mean age of patient was 35.47±8.93years. The mean duration of infertility was 3.24±1.65months. There were 29 (58%) patients belonged to low socioeconomic status, 15 (30%) belonged to middle class while 6(12%) belonged to high class. In the sample 7(14%) had family history of

erectile dysfunction. There were 17(34%) patients who were doing business, 18 (36%) were doing job while 15(30%) were labor or farmer. There were 41(92%) patients who had one marriage, 6 (12%) had two marriages while 3 (6%) had three marriages. There were 29 (58%) patients who had 1-2 kids while 21 (42%) had 3-5 kids (Table 1).

The penile Doppler had Sensitivity: 65.8%, specificity: 83.3%, PPV: 89.3%, NPV: 43.5%, accuracy: 70% for detection of erectile dysfunction. Table 2

Table 1: Demographic details of patient (n=50)

Characteristics	n (%)
Age (years)	35.47±8.93
Duration of infertility (months)	3.24±1.65
<b>Socioeconomic status</b>	
Low	29 (58%)
Middle	15 (30%)
High	6 (12%)
<b>Family history</b>	
Yes	7 (14%)
No	43 (86%)
<b>Occupation</b>	
Business	17 (34%)
Job	18 (36%)
Farmer / labour	15 (30%)
<b>Number of marriages</b>	
1	41 (82%)
2	6 (12%)
3	3 (6%)
<b>Number of kids</b>	
1-2	29 (58%)
3-5	21 (42%)

Table 2: Accuracy of penile Doppler

Penile Doppler	Nocturnal penile tumescence testing		Total
Positive	25	3	28
Negative	13	10	23
Total	38	12	50

Sensitivity: 65.8%, specificity: 83.3%, PPV: 89.3%, NPV: 43.5%, accuracy: 70%

## DISCUSSION

Penile erection is a composite phenomenon, which comprises of communication of arterial, nervous, sinusoidal systems & venous. Any weakness in these systems can lead to erectile dysfunction. During 40-70years of reproductive age span, 10% males may develop complete, 17.1% mild and 25.2% moderate erectile dysfunction.<sup>9, 10</sup>

Erectile dysfunction evaluation on color Doppler is a good way to differentiate psychogenic & vasculogenic etiologies. As the therapeutic options increase and are more cause specific, urologists can recommend for tests including color Doppler sonography to generate vascular outlines. This can help to forecast the success of therapy by using one medicine or combination of one or more drugs.<sup>6</sup>

Penile Doppler ultrasound is non-invasive or minimally-invasive imaging tool, which permits the illustration of normal anatomy and macroscopic pathologic alterations in real time. Furthermore, functional

modifications in penile blood-flow, as observed in erectile dysfunction, can be examined using this modality<sup>11</sup>.

In our study, the mean age of patient was 35.47±8.93years, which is highly reproductive age group. The mean duration of infertility was 3.24±1.65months. There were 29 (58%) patients belonged to low socioeconomic status, 15 (30%) belonged to middle class while 6 (12%) belonged to high class. So the dysfunction was more common in low socioeconomic class. The penile Doppler had Sensitivity: 65.8%, specificity: 83.3%, PPV: 89.3%, NPV: 43.5%, accuracy: 70% for detection of erectile dysfunction.

Clifford et al., found that penile Doppler has 61% sensitivity and 74% specificity for detection erectile dysfunction. Color Doppler ultrasound is worthy and slightly accurate for evaluation of erectile dysfunction<sup>12</sup>.

Based on Doppler sonography findings, erectile dysfunction may be categorized into arterial & venous types. Arteriogenic erectile dysfunction includes impairment of arterial influx into cavernosum because of several reasons. However, an impaired veno-occlusive phenomena results venous leak, known as venogenic dysfunction. Peak systolic velocity is highly accurate indicator of arterial dysfunction. When Peak systolic velocity <25cm/sec with 92% accuracy, then arterial problem is diagnosed. Veno-occlusive erectile dysfunction illustrates insistent End diastolic velocity >5cm/sec during different stages of erection, and flow in Deep dorsal vein can be observed on Doppler during the complete phenomena. The identification of mixed erectile dysfunction cannot be made using Doppler ultrasound as venous competency cannot be measured in males arterial insufficiency. In fact, many older males or post-operative erectile dysfunction cases present with this unspecified form<sup>11 13, 14</sup>.

Significant scientific improvements in last thirty years have excavated the understanding of physiology & pathophysiology of erectile function. A serious assessment of current state of knowledge is important to offer perception for future research and development of new treatments<sup>15</sup>.

## CONCLUSION

Penile Doppler is accurate enough that it can replace interventional methods to diagnose erectile dysfunction also including prostaglandin E injection and Nocturnal penile tumescence testing. Now in future, we can recommend the penile Doppler for detection of erectile dysfunction in males with secondary infertility instead of going for interventional or irritating diagnostic tools.

## REFERENCES

1. Biswas S, Biswas S. A Study on Penile Doppler. *MOJ Surg* 2017;5(3):00110.
2. Halls J, Bydell G, Patel U. Erectile dysfunction: the role of penile Doppler ultrasound in diagnosis. *Abdominal imaging* 2009 Nov;34(6):712-25.
3. Cunningham GR, Rosen RC, Snyder P, O'Leary M, Martin K. Overview of male sexual dysfunction. *UpToDate [revista en Internet]* 2011;19(2).

4. Patel DV, Halls J, Patel U. Investigation of erectile dysfunction. *The British journal of radiology* 2012 Nov;85 Spec No 1:S69-78.
5. Morley JE, Korenman SG, Kaiser FE, Mooradian AD, Viosca SP. Penile brachial pressure index: a noninvasive indicator of vascular disease. *NEJM* 1988;84:445-448.
6. Bari V, Ahmed MN, Rafique MZ, Ashraf K, Memon WA, Usman MU. Evaluation of erectile dysfunction with color Doppler sonography. *JPMA The Journal of the Pakistan Medical Association* 2006 Jun;56(6):258-61.
7. Klostranec JM, Kolin DL. *The Toronto notes 2012: Comprehensive medical reference and review for the Medical Council of Canada Qualifying Exam Part 1 and the United States Medical Licensing Exam Step 2: The Toronto Notes; 2012.*
8. Kolin DL, Hong J, Raghuran K. *The Essential Med Notes for Medical Students 2012 (Formerly the Toronto Notes): The Toronto Notes; 2012.*
9. Schwartz A, Wang K, Mack L, Lowe M, Berger R, Cyr D, et al. Evaluation of normal erectile function with color flow Doppler sonography. *American Journal of Roentgenology* 1989;153(6):1155-60.
10. Suresh A, Balachandran A, Indira N, Ramprakash H. Role of penile color doppler in the evaluation of erectile dysfunction. *INTERNATIONAL JOURNAL OF SCIENTIFIC STUDY* 2015;3(7):23-32.
11. Jung DC, Park SY, Lee JY. Penile Doppler ultrasonography revisited. *Ultrasonography* 2018 1;37(1):16-24.
12. Clifford A, Toppo J. Role of penile color doppler in the evaluation of erectile dysfunction. *Indian Journal of Radiology and Imaging* 2006;16(4):891.
13. Pavlica P, Valentino M, Barozzi L. *US evaluation of erectile dysfunction. Color Doppler US of the Penis: Springer; 2008. p. 39-54.*
14. Shamloul R, Ghanem H. Erectile dysfunction. *Lancet (London, England)* 2013 Jan 12;381(9861):153-65.
15. Gratzke C, Angulo J, Chitaley K, Dai YT, Kim NN, Paick JS, et al. Anatomy, physiology, and pathophysiology of erectile dysfunction. *The journal of sexual medicine* 2010 Jan;7(1 Pt 2):445-75