



DOPPLER SONOGRAPHY OF THE FLACCID PENIS IN SCREENING FOR ARTERIOGENIC ERECTILE DYSFUNCTION.

Radiology

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ABSTRACT

Background: This prospective study is to evaluate the potential value of sonographic measurements in the flaccid penis for the screening of arteriogenic impotence. **Methods:** A 32 males consulting for sexual dysfunction underwent sonographic examination with PSV measurements before and after oral sildenafil citrate. **Results:** The mean cavernosal PSV in flaccid penis in the patients with sexual dysfunction ranged from 6 to 16 cm/sec **Conclusions:** This simple flaccid PSV measurement is a specific tool for screening arteriogenic impotence.

KEYWORDS

Erectile dysfunction, Ultrasound, Peak systolic velocity, Receiver operating characteristic, International of erectile function, Erectile hardness grading scale

BACKGROUND

Erectile dysfunction (ED) is a common worldwide and potentially treatable problem with an incidence of 50% in the general male population aged between 40 and 70 years.¹ Common causes for ED are vasculogenic, psychogenic, neurogenic and metabolic.²⁻⁴ For diagnosis of arteriogenic causes, color Doppler ultrasound is one of the most noninvasive, simple and promising tools.^{1-3,5-8} The peak systolic velocity (PSV) of the cavernosal artery measured after the intra-cavernous injection (ICI) of vasoactive agents is a widely accepted criterion for evaluating penile circulation.^{2,6} A post-ICI PSV value more than 35 is considered as normal and value less than 25 cm/sec is recognized as a severely insufficient arterial supply.^{2,5} Another method used is oral sildenafil citrate induced penile Doppler study. Post medication PSV more than 25 cm/s is considered as normal. Currently growing number of male are anxious about their sexual life. Above methods are time and money consuming. ICI is having few side-effects like priapism.

We have a simple parameter for evaluating the penile arteriogenic health with limited cost in terms of time and money. Doppler investigation in the flaccid state would serve the purpose. It has been reported that PSV in the flaccid penis shows significant correlation with post ICA PSV and might be predictive in the determination of arterial insufficiency.^{2,7,9} We performed this prospective study comparing PSV values in the flaccid penis with PSV values obtained after oral sildenafil and with clinical responses. Our goal was to determine the value of duplex Doppler evaluation of the flaccid penis in diagnosing arteriogenic impotence.

METHODS

The study includes 32 patients who have come for sildenafil citrate induced penile Doppler study for further assessment of erectile dysfunction. Patient age ranges from 20 to 55 years. Informed consent was obtained from the patients. Premedication flaccid penis cavernosal artery PSV was measured in all patients. Then oral sildenafil citrate was given to the patient. Post medication 45 mins and every 10 minutes upto 90 minutes, PSV reading was taken. Patients with venogenic incompetence, history of trauma and those who declined consent they were excluded from the study.

USG examination

Patient was examined using Phillips affinity 70 machine. To ensure privacy all exams were performed in a quiet comfortable room. Excessive compression with the probe was avoided. First on greyscale ultrasound the penis was evaluated in flaccid state. Colour Doppler sonography was optimised to obtain best longitudinal plane of cavernosal arteries. The Optimal site for spectral analysis was proximal part of the cavernosal arteries where the vessels curved. Spectral waveforms were obtained at the lowest pulse repetition frequency that did not produce aliasing. The lowest possible wall filter was selected, and the width of the Doppler sampling window was set at 1 mm. With proper angle correction PSV was recorded. Following this oral sildenafil citrate was given to the patient.

After oral sildenafil citrate administration patient was again scanned at

45 mins and with same doppler settings PSV was recorded. Following this every 10 minutes, upto 90 minutes, PSV reading were taken. Based on our results, we chose cutoff values as 8 cm/second, for the lowest normal pre-oral sildenafil citrate PSV in predicting arteriogenic impotence as diagnosed by post medication Doppler sonography. A post medication PSV of less than 25 cm/s associated with an abnormal clinical response was used as the diagnostic criterion for arterial insufficiency. Patients with a suspicion of venous incompetence on Doppler sonography were excluded from this series.

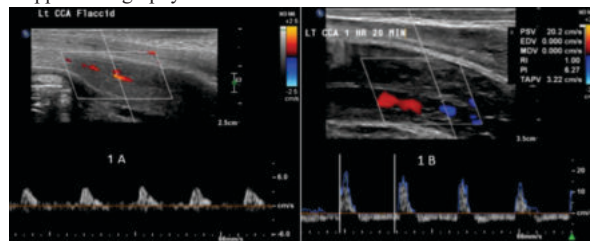


Image 1 shows PSV of left cavernosal artery (A) in flaccid state which is less than 8 cm/s and (B) in post medication state which is less than 25 cm/s suggesting arterial insufficiency.

RESULTS

We were able to identify on color Doppler sonography and record waveforms from all 64 cavernosal arteries before oral sildenafil citrate and all of them (100%) following oral sildenafil citrate.

There is a significant relationship between the flaccid penis cavernosal arteries PSV and post medication cavernosal arteries PSV. Patients with PSV less than 8 cm/s showed post medication PSV less than 25 cm/s. None of them showed normal values (more than 25 cm/s). Patient with PSV more than 8 cm/s showed mixed response.

Group of patients	Number	Penile doppler study findings
Flaccid PSV less than 8 cm/s	10	Post medication PSV less than 25 cm/s (abnormal) in all patients
Flaccid PSV more than 8 cm/s	22	14 patients show PSV more than 25 cm/s (normal); 8 patients show PSV less than 25 cm/s (abnormal)

DISCUSSION

This study was performed to determine the potential value of sonographic measurements in the flaccid penis for diagnosing arteriogenic impotence. The incidence of ED in adults is rapidly increasing.¹⁰ Although there are complicating factors, arteriogenic impotence is among the most important cause of erectile dysfunction.¹¹⁻¹³ Color Doppler sonographic examination is a noteworthy diagnostic tool for detecting failure of the penile arterial supply.^{2,5}

Impaired arterial supply due to arterial disease is expected to produce decreased blood flow velocities on spectral analysis, and therefore, post-medication PSV values have been used to identify arterial insufficiency in the penis. However, in the literature, the post medication PSV cutoff values used to distinguish normal from

impaired arterial function have varied from 25 cm/s upto 40 cm/s.^{14-19,21,22} It is generally accepted that below 35 cm/second, the likelihood and severity of arterial disease increase as the PSV decreases, with a PSV less than 25 cm/second indicating a high probability of severe arterial disease.^{14,16}

Doppler waveforms of the cavernosal arteries in the flaccid state have been mentioned occasionally. Most often, the waveforms have only 1 systolic peak without diastolic flow.^{18,19} This pattern indicates high resistance to arterial flow, typical for the flaccid state.¹⁹ On occasion, Doppler sonography of the cavernosal arteries shows a small antegrade diastolic flow. This type of waveform may be secondary to stimulation caused by penile manipulations (eg, the transducer against the patient's skin). The mean PSV of normal cavernosal arteries before oral sildenafil citrate has been reported to be 11.2–20 cm/second.^{19,21,23} Our results show that flow in the cavernosal arteries can be routinely evaluated by duplex Doppler sonography in the flaccid state. In our study, the best pre-medication PSV cutoff value was 8 cm/s.

The principal limitation of our work was the lack of correlation with pharmacoangiography, which is considered the gold standard by most authorities. As previously reported in the literature,¹⁹⁻²¹ we observed a minor degree of asymmetry in PSV values between the right and left side, which suggests that the overall blood supply is not equally shared between the 2 corpora.

Penile arteriography, penile Doppler study with the inter cavernosal injection, penile doppler study with oral sildenafil citrate are methods available for assessment of penile circulation. Flaccid penis doppler study can be useful in screening patients with erectile dysfunction. Penile Doppler study using oral sildenafil citrate or ICI should be used after assessing flaccid penile doppler.

Limitation of the study - In patients with Venogenic incompetence or Venus leakage, these findings can be cannot be applied.

CONCLUSION

In conclusion our results showed that flaccid PSV values correlate with penile doppler study outcome. The best flaccid PSV value cut-off is 8 cm/s. Flaccid PSV value less than 8 cm/s correlates with negative outcome of penile doppler. This technique may avoid excess invasive procedure and may reduce cost and the duration of the investigation.

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