



Original Research Article

TO ANALYZING HEMODYNAMIC CHANGES IN PENILE DOPPLER, COMPARING SILDENAFIL AND PAPAVERINE

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ABSTRACT

Background: A lot of people come to us complaining about erectile dysfunction. These days, even those under the age of 30 frequently deal with the problem of early onset hypertension and diabetes.

Material and Methods: The study comprised 70 consecutive patients who were referred from several departments, including general medical outpatient, psychiatry, diabetology, and urology. This study was conducted at the Department of Radiology, Sri Balaji Medical College, Renigunta, Tirupati, Andhra Pradesh, India between March 2023 to Jan 2024. Every patient complained of erectile dysfunction for at least half a year. A thorough clinical history and basic blood chemistry were performed on each subject.

Results: These are a few instances of venous and arterial insufficiency patterns associated with erectile dysfunction. The individuals' ages ranged from 22 to 65 years old, with a mean age of 44. The average score of the 70 subjects on the SHIM questionnaire was 14.6. About 30% of the participants had no identified risk factors, despite the fact that diabetes and hypertension were the primary causes in the great majority of instances. Out of 70 participants, 56 responded normally to sildenafil and 59 to papaverine. Papaverine found that 21 individuals taking sildenafil had erectile dysfunction, compared to 18 who did not.

Conclusion: Tab. Sildenafil significantly increases blood flow to the penile vasculature, according to the study, suggesting it may be useful as an erectogenic agent in penile Doppler studies when paired with self-tactile stimulation.

Keywords: Sildenafil, erectogenic agent, doppler, self-tactile.

INTRODUCTION

After the age of 40, many men experience erectile dysfunction. People younger than 30 years old frequently experience the condition due to the epidemic of early onset hypertension and diabetes. Because of the stigmatisation and emotional component of the problem, it frequently remains unrecognized.^[1,2] The fact that the precise prevalence of erectile dysfunction in underdeveloped nations such as India remains a mystery lends credence to this claim. Even still, the outpatient department is still seeing an increasing number of cases, which is a sign of both the severity of the situation and the public's growing awareness of it.^[3,4]

The physiology of an erection is intricate, therefore it should come as no surprise that erectile dysfunction can have many different causes. Psychogenic, organic, and mixed are the three main categories that have traditionally been used for classification. Neurogenic, hormonal, vascular, cavernosal, and medication-induced organic reasons are among them. Because certain disorders are treatable and, in some cases, reversible, it is crucial to determine the actual reason.^[5,6]

An important part of diagnosing erectile dysfunction in a patient is using penile doppler. Following a thorough clinical evaluation and the acquisition of basic blood chemistry, it is frequently the modality of choice. Local cavernosal diseases and erectile dysfunction caused by the arteries and veins are

ruled out. A pharmaco erection and Doppler analysis of the cavernosal arteries are standard procedures. In order to achieve an erection, the traditional method involves injecting papaverine into the cavernosal canal.^[7,8]

Papaverine is the most effective erectogenic medicine on the market today, however it is intrusive and has negative side effects. Nervousness about getting an erection after an intra cavernosal injection is a real risk. Tab. Sildenafil was tested for its erectogenic effects during penile Doppler as a potential substitute for Papaverine. The study's overarching goal is to determine, through prospective evaluation, whether or if sildenafil tablets are effective for penile Doppler. The purpose of this penile Doppler study is to compare the clinical and hemodynamic parameters of injectable papaverine with those of tablet Sildenafil.^[9,10]

Inadequate mechanical blockage of the emissary venules or an arteriogenic decrease in cavernous artery input can lead to penile blood flow alterations, the most prevalent organic cause of erectile dysfunction. Although numerous diagnostic tools have been employed to assess penile hemodynamics, the gold standard now stands at intracavernous injection of vasoactive drugs followed by penile colour Doppler ultrasonography.^[11,12] There are multiple downsides to the intravenous injection technique. Anxieties and pain during injections might cause sympathetic flow, which can disrupt the erectile response and reduce the test's sensitivity and specificity. Pruritus is another possible side effect of intracavernous drugs. An erection may be helped by taking an orally administered phosphodiesterase inhibitor, which relaxes the sinusoidal smooth muscles by blocking phosphodiesterase-5. For penile Doppler ultrasonography, we looked at vardenafil as a possible substitute for intracavernous agents because it is noninvasive and has a low rate of persistent erection.^[13,14]

One distinctive feature of our current work is the extensive use of multiple sample sizes, which eliminates any room for statistical bias. The fact that it takes into account the clinical and Doppler hemodynamic response following each medication trial is another unique aspect. A thorough evaluation of a man suffering from erectile dysfunction was thus achieved.

MATERIAL AND METHODS

The study comprised 70 consecutive patients who were referred from several departments, including general medical outpatient, psychiatry, diabetology, and urology. This study was conducted at the Department of Radiology, Sri Balaji Medical College, Renigunta, Tirupati, Andhra Pradesh, India between March 2023 to Jan 2024. Every patient complained of erectile dysfunction for at least half a year. A thorough clinical history and basic blood chemistry were performed on each subject.

Inclusion Criteria

- Individuals with erectile dysfunction who have a clinical diagnosis;
- SHIM score of less than 21

Exclusion Criteria

- Individuals taking nitrates
- Congestive heart failure.

RESULTS

Erectile dysfunction patterns associated with arterial and venous insufficiency are illustrated below. The individuals' ages ranged from twenty-two to sixty-five, with a mean of forty-four. Out of 70 participants, an average score of 14.6 was recorded on the SHIM questionnaire. Even though high blood sugar and hypertension were the leading causes in most cases, about 30% of the participants had no identified risk factors. When given Papaverine, 59 of 70 participants showed no abnormalities, while 56 were given Sildenafil. Out of the 21 patients who took Sildenafil, 18 were found to have erectile dysfunction according to Papaverine. The following themes were divided into four categories according to the Erection Hardness Grading scale.

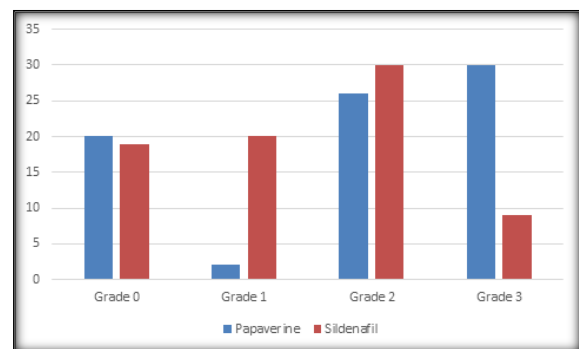


Figure 1: Clinical grading

Four individuals in our series experienced priapism, a known adverse consequence of papaverine. Of these four, two required surgical intervention. No cases of priapism were reported after using sildenafil. Mild fleshing and giddiness were two of the extremely minimal side effects of both of these medications. After looking over the data, we found out: Despite Inj. Papaverine's far higher success rate in producing a high-quality erection, Sildenafil has a sensitivity level of more than 90%. Unfortunately, Sildenafil does not distinguish between erectile dysfunction caused by arterial and venous pattern insufficiency, which is a drawback. In our study, all individuals who experienced erectile dysfunction as a result of venous insufficiency with Papaverine were classified as having arterial insufficiency with Sildenafil. Compared to injectable papaverine, Sildenafil had better sensitivity, patient compliance, and less side effects when screening for erectile dysfunction using penile Doppler.

Table 1: Clinical grading

Grades	Papaverine	Sildenafil
Grade 0	20	19
Grade 1	2	20
Grade 2	26	30
Grade 3	30	9

DISCUSSION

Papaverine (77% of individuals) and Sildenafil (73% of patients) both produced normal Doppler studies. The percentage of individuals responding normally differed by 3% between the two medications. There was no statistically significant change seen with this little variation. The number of people who normally respond to each of these medications was thus determined to be equal. To conclude, using Papaverine as a gold standard, Sildenafil achieves a sensitivity of 91%. When administered with Papaverine, venous insufficiency caused erectile dysfunction in four patients. However, Sildenafil only detected arterial pattern of insufficiency in all four of these instances. The lack of ability to distinguish between arterial and venous patterns of insufficiency diminishes one's diagnostic confidence, despite Sildenafil's strong sensitivity.^[15-17]

From a statistical standpoint, comparing is more reliable since it uses a bigger sample amount. The addition of self-tactile stimulation in conjunction with Sildenafil is another key distinction between our study and the one that employed audiovisual stimulation. The majority of patients reported feeling at ease while using self-tactile stimulation. The study found that compared to Papaverine, the percentage of patients who responded normally to Sildenafil was much lower. Both proportions were found to be statistically comparable in our analysis. When looking at clinical erection grading using an erection hardness grading scale, only 8 patients taking Sildenafil achieved very good erection grades, compared to 31 individuals taking Papaverine. Statistical analysis revealed that a higher proportion of individuals got very good clinical grades of erection when using Papaverine compared to Sildenafil.^[18-20]

This study has few restrictions. People who have reported experiencing erectile dysfunction due to any of the reasons we listed earlier will make up the sample. It is reasonable to assume that the two medications will have distinct effects on the many underlying causes of the condition. If we had chosen a more representative sample of men suffering from the same kind of erectile dysfunction, we could have avoided this problem. Equally lacking is a control group. We cannot do the trial with healthy individuals who do not have erectile dysfunction injecting themselves with Papaverine and swallowing Tab. Sildenafil.^[21-23]

One well-known side effect of Papaverine is painful priapism. Two of the four priapism cases treated with Papaverine in our series required surgical

intervention. Both were successfully treated with cavernosa spongiosal shunts and vacuum aspiration. None of the seventy participants experienced priapism while taking sildenafil. Both of these medications were associated with priapism, but they were less likely to cause additional side effects such as nausea, hypotension, and excessive perspiration. Compared to Papaverine, sildenafil has far more positive aspects when considering the pros and cons.^[24, 25]

Intracavernous administration of vasoactive drugs such as prostaglandin E1, papaverine, and phentolamine was the standard method of pharmacological stimulation prior to the development of Doppler ultrasonography. There has been no documented change in the vascular response to different combinations of papaverine. Up to 7–11% of patients treated with intracavernous agents experience side effects such as discomfort, ecchymosis, penile hematoma, and prolonged erections. Nearly half of the participants in our study reported moderate to severe pain, and 12.5 percent reported experiencing a sustained erection. A false-positive diagnosis of arterial insufficiency may occur if sympathetic activation inhibits erectile response, which can happen when patients experience severe anxiety due to the intrusive nature of intracavernous injection, according to other researchers.^[22,23] To overcome this sympathetic discharge and make the test more sensitive, our study and others like it used genital stimulation and audiovisual aids during penile Doppler ultrasonography. Our literature review indicates that we are among the first to objectively assess vardenafil's effects on the penile vascular system. As the medicine began to be absorbed, the blood flow velocity following vardenafil administration began to rise sharply, beginning at 30 minutes. After 30–120 minutes of oral administration, the plasma concentration of vardenafil is at its highest. The maximum systolic flow velocity was reached at 60 minutes, in line with the drug's pharmacokinetics. After 75 minutes, the penile blood flow velocity dropped in tandem with the plasma concentration. Vardenafil, like papaverine, increased the penile blood flow velocity. When contrasted with the effects of injecting papaverine, the slope of this rise was steeper. Oral vardenafil Doppler ultrasonography results for arterial assessment were 90% sensitive and 100% specific, matching those of the intracavernous agent. According to these findings, vardenafil has the potential to replace papaverine and other intracavernous drugs in Doppler ultrasonography by providing a sensitive and specific alternative.^[23-25] Recent investigations

have demonstrated similar outcomes when sildenafil was utilised. Pharmacological erections cannot be achieved with vardenafil alone, unlike the intracavernous drugs. Only when different sexual stimuli trigger the release of nitric oxide does vardenafil take effect. Doppler ultrasonography with vardenafil and visual and/or vaginal stimulation can induce NO release. The maximum systolic flow velocity was reached at 60 and 75 minutes when using vardenafil in penile duplex ultrasonography.^[26,27] These readings were very similar to those taken 5 and 10 minutes following injection of papaverine. We think that 60 to 75 minutes following vardenafil administration is the sweet spot for adequate vascular examination of patients during penile Doppler ultrasonography. Erectile dysfunction sufferers can benefit from this approach, which makes use of simple and dependable Doppler ultrasonography. A desirable substitute for intracavernous drugs, vardenafil has no post-administration side effects that necessitated medical attention or created a major difficulty for the patient. Measurement of the end diastolic velocity of the cavernous artery, which represents venous outflow resistance, allows for an indirect evaluation of the venous occlusion mechanism, which is made possible by this technique.^[27-29]

CONCLUSION

The study stands out because it compares tab. sildenafil to injectable papaverine in penile Doppler with self-tactile stimulation, a technique that has never been used before. The unprecedentedly high number of participants included in the sample helps to eliminate statistical bias, which is another unique aspect of this study. The study found that when paired with self-tactile stimulation, Tab. Sildenafil significantly increases blood flow of the penile vasculature, suggesting that it could be utilised as an erectogenic medication in penile Doppler.

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