

EFFICACY AND SAFETY OF LOW-INTENSITY EXTRACORPOREAL SHOCKWAVE THERAPY FOR TREATMENT OF VASCULAR ERECTILE DYSFUNCTION IN NIGERIAN MEN: REPORT OF A STUDY IN IBADAN, SOUTH-WEST NIGERIA.

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ABSTRACT

Background: Low Intensity Extracorporeal Shock Wave Therapy (LI-SWT) has been found to be effective in men with vascular erectile dysfunction (ED) but its efficacy and safety has not been investigated in a predominantly black population so we sought to study this.

Materials and Methods: Men with vascular erectile dysfunction (ED) were

using the five-item International Index of Erectile Function (IIEF) score after which they were treated with 12 sessions of LI-SWT. Treatment efficacy was evaluated immediately after treatment, at 1 month and 6 months after using the IIEF questionnaire. 30 persons were recruited out of which 22 completed the study. **Results:** Mean IIEF score improved from 8.27 ± 2.741 at baseline (pre-treatment) to 10.43 ± 8.43 one month post treatment and was sustained six months post treatment at mean IIEF score of 10.70 ± 8.84 .

A larger no (86.4%) had an improvement of at least 5 in the IIEF score from baseline to 6 months -post treatment. None of the participants reported any adverse effects of treatment.

Conclusion: Low intensity shock wave treatment is a useful addition to the medical armamentarium for the treatment of vascular ED.

Keywords: Erectile dysfunction, Efficacy, Extracorporeal shockwave therapy, Nigeria.

INTRODUCTION

Erection is a complex process involving several system interactions. Blood increment to cavernous tissues necessary for a rigid erection is huge and even small hemodynamic disturbances could produce sexual dysfunction.¹

Erectile Dysfunction (ED), a common disorder affecting men, is defined as the inability to achieve and maintain erection adequate for satisfactory sexual intercourse. Erectile dysfunction (ED) is a common problem in persons with diabetes.² The prevalence of ED in men with Type 2 diabetes mellitus (DM) varies from 35-90% , a proportion that is higher in patients with DM when compared to the general population.³ The prevalence of ED amongst Nigerian men with Type 2 DM is reported to range from 34-74%.⁴

Many studies have reported that erectile dysfunction is much more common in men with hypertension compared to those without hypertension. Reasons for this include penile circulatory disability due to atherosclerosis and antihypertensive drugs, especially some diuretics, beta blockers and methyl dopa. These could all have a negative effect on erectile function.⁶ In

a study in South-West Nigeria, prevalence of ED was higher in hypertensives compared to normotensives.⁷ Phosphodiesterase 5 inhibitors (PDE5-I) are available and efficacious in treating erectile dysfunction but do not produce satisfactory results in a significant number of men.⁸

In addition, their effect and use is still related to and limited to the sexual act and is not curative.

Erectile dysfunction occurring in persons with diabetes is less responsive to PDE5- I. A study in persons with diabetes showed that less than 50% responded to PDE5-I. The effects of PDE 5-I on ED is short-term. Before the advent of extracorporeal shock wave therapy, invasive treatments, like vacuum devices, intracavernous injections and use of penile prostheses were the second or third line of treatment for patients with poor response or with contraindication to PDE5-I.

Low intensity Extracorporeal Shock Wave Therapy (LI-SWT) is an innovative approach to vasculogenic ED, using a device that uses advanced acoustics

technology. The mechanism underlying the efficacy of shock wave treatment is vasodilation and angiogenesis leading to improved blood flow to the penis. It has been postulated to cause cell membrane microtrauma and mechanical stress. This results in the release of angiogenic factors, such as vascular endothelial growth factor (VEGF), nitric oxide synthase (NOS), von Willebrand factor (vWF), fibroblast growth factor (FGF), TLR3, and the pro-inflammatory cytokines IL-6 and IL-10, result in increased angiogenesis and vascularization of target tissues⁹.

This technology has proven to be effective in persons with ischemic heart disease and vascular ED, LI-SWT utilizes low-intensity extracorporeal shock waves, focusing on blood vessels and encouraging neovascularization in the penile shaft and crus. The low-intensity shock waves help relieve vascular deficiency, a common cause of erectile dysfunction. Advantages of this therapy are its non-invasiveness, and no requirement for sedation or anaesthesia, hence can be done on outpatient basis. Others include absence of adverse and systemic effects, pain-free and lacking requirement for use of pharmaceuticals¹⁰.

Discernible improvement in the erectile function of the penis can be visible within two weeks after therapy begins. Recent clinical studies also revealed that patients reported a high rate of satisfaction for more than two years after treatment, without need for the use of PDE5 inhibitors.¹¹ Clinically, LI-SWT has shown significant long-term effectiveness. It has also been shown to be a safe therapy for ED.

The goal of this study is to assess the efficacy and safety of EDSWT in men with vascular ED in a predominantly black African population.

MATERIALS AND METHODS

Study Setting

This study was conducted amongst men attending the medical outpatient clinic and urology clinic of University College Hospital (UCH), Ibadan, Nigeria. UCH Ibadan is an 850 bedded tertiary health facility located in Ibadan, the largest city in the South Western part of Nigeria. It serves as a referral centre to all healthcare facilities in the city and other neighbouring towns and states.

Study Design and Data Collection

This was a descriptive cross sectional study carried out over a period of 6 months from March 2018 to September 2018. All men with hypertension and or diabetes who had vascular erectile dysfunction for at least 6 months and had stable heterosexual relationship

were eligible. Those who met the inclusion criteria and gave written, informed consent were recruited by consecutive sampling technique till the sample size of 30 was attained. The sexual health inventory for men (SHIM) score of ≤ 12 /IIEF-ED was used to diagnose ED and had stable heterosexual relationship. Men with psychogenic ED, hypogonadism, neurologic pathology or previous radical prostatectomy or penile deformity or penile surgery were excluded.

Data Collection Techniques

Upon inclusion, there was a 4 week wash out period during which respondents were instructed to be off PDE5-Is. Each participant then completed sexual function questionnaires after which they were treated with a low-energy shock wave generator (Omnispec ED 1000, Medispec, USA). LI-SWT was applied on five penile sites – base of penis, mid shaft, glans and both crura – with 300 shock waves applied to each site totalling 1500 shocks per treatment session. Three treatments were done weekly for 2 weeks (totalling 6 treatments), after which there was a 4 week interim during which there was no treatment, then 6 treatments were done thereafter in the same manner.

Patients were assessed at baseline, in the middle of the sessions (after the 6th treatment for our 12 session treatment protocol), at the end of treatment, and 1 month after the final treatment. At each time-point, patients completed questionnaires on SHIM/international index of erectile function domain (IIEF-EF domain). During the treatment, patients were instructed to maintain their normal sexual habits. A change in the IIEF-ED score of >5 over the pre-treatment value was used as the main outcome measure of treatment success.

Efficacy was evaluated immediately after treatment and at 1 month (IIEF 4) and 6 months (IIEF 5) after end of treatment by completing the same questionnaires.

Data Analysis and Management

Data was analysed using the Statistical Package for Social Sciences software, (SPSS-) version 16.0. Categorical variables are presented using frequency tables, pie charts, histograms and bar charts as appropriate while quantitative variables are presented as means and standard deviation.

Ethical approval to conduct the study was obtained from the Oyo State Ministry of Health Ethical Review board. Written informed consent was obtained from each respondent.

RESULTS

Thirty participants, all males commenced the study but only 22 completed it (1 person died before completion from a road traffic accident), 2 relocated, 5 gave no reasons for drop out). The socio-demographic characteristics are shown in Table 1. The mean age of the respondents was 53.73 ± 8.013 (range 36 – 65 years). Fifteen respondents (50%) had attained tertiary education while 7(23.3%) had only primary (elementary) school education. Majority 27(90%) were of the Yoruba tribe. All had sexual partners with whom they had regular sexual intercourse.

All had varying degrees of ED: 2(6.7%) had mild-moderate ED, 16(53.3%) had moderate ED and 12 (40%) had severe ED. Mean IIEF1 was 8.27 ± 2.741 (Table 2). The mean duration of ED was 3.67 ± 1.53 years.

Majority of respondents had hypertension 21(70%), 16 (53.3%) had diabetes, 7(23%) had both hypertension and diabetes (Table 3). Mean duration of diabetes was 6.47 ± 4.78 years, 13 (81.2%) had type 2 diabetes while the rest had type 1 diabetes.

Table 1: Socio-demographic characteristics n=30.

Variables	Frequency	Percentage(s)	Mean (SD)
Age			
36-45	5	16.7	53.73±8.013
46-55	13	43.3	
56-65	12	40.0	
Educational status			
Primary	7	23.3	
Secondary	8	26.7	
Tertiary	15	50.0	
Occupation			
Government employee	2	6.7	
Non-government	2	6.7	
Self-employed	18	60.0	
Retired	6	20.0	
Unemployed	2	6.7	
Tribe			
Yoruba	27	90.0	
Hausa	1	3.3	
Igbo	0	0.0	
Others	2	6.7	
Religion			
Christianity	18	60.0	
Islam	12	40.0	
Marital Status			
Single	1	3.3	
Married	28	93.4	
Separated	1	3.3	
Divorced	0	0.0	
Widowed	0	0.0	
Smoking history			
Non smoker	20	66.7	
Ex-smoker	10	33.3	
Occasionally smokes	0	0	
Smokes regularly	0	0	
Alcohol ingestion			
Does not drink alcohol	6	20.0	
Drank alcohol regularly in the past	13	43.3	
Drinks alcohol occasionally	6	20.0	
Drinks alcohol regularly	5	16.7	

Table 2: First IIEF Score (Before Treatment).

N=30

Level of ED	Frequency	Percentage(s)	Mean (SD) IIEF1
No ED (22-25)	0	0.0	
Mild ED (17-21)	0	0.0	
Mild Moderate ED (12-16)	2	6.7	8.27±2.741
Moderate ED (8-11)	16	53.3	
Severe ED (1-7)	12	40.0	
Total	30	100	

The first mean IIEF score (before treatment) was 8.27±2.741. All respondents had ED: 2 (6.7%) had mild- moderate ED, 16 (53.3%) had moderate ED while 12 (40%) had severe ED.

After treatment completion, the mean IIEF score improved to 13.73±9.944 (Table 4) with 19 (86.4%) respondents having significant improvement (change in score of 5) (Table 5). Severity of ED did not have an impact on response to treatment. (Table 6)

Table 3: Summary of respondents age, cardiovascular risk factors and IIEF scores.

Cardio vascular risk factors	IIEF1 (Baseline)	IIEF2 (After 6 treatments)	IIEF3 (After 12 treatments) **(Treatment completion)	IIEF4 (At 1month)	IIEF5 (At 6months)
D	8	13	22	8	8
D	5	7	7	6	5
D+H	11	20	24	20	21
D+H	10	24	24	20	20
H	12	19	20	13	12
H	10	17	24	24	25
D	7	15	23	11	11
D	5	10	20	16	18
H	8	22	24	10	19
D+H	6	18	24	16	11
D+H	8	13	13	13	13
D	6	20	21	6	6
D+H	5	7	5	5	5
H	7	16	22	6	5
D+H	9	14	14	13	14
D	11	15	15	15	18
H	11	11	-	-	-
D+H	5	5	-	-	-
H	10	11	15	15	17
H	8	16	-	-	-
H	5	15	15	15	16
H	5	5	-	-	-
H	11	20	24	25	25
D	5	9	-	-	-
D	16	20	-	-	-
H	10	-	-	-	-
H	8	22	23	23	22
H	9	21	25	25	25
D	11	11	-	-	-
H	6	8	8	8	5

Note: *22 respondents in total completed the treatment and were followed up

*No of cardio vascular risk factors – H – Hypertension, D – Diabetes, D+H – Diabetes and Hypertension

*Px: Patient

Table 4: Third IIEF score (after 12 treatments) N=22.

Level of ED	Frequency	Percentage(s)	Mean (SD) IIEF3
No ED (22-25)	11	50.0	
Mild ED (17-21)	3	13.6	
Mild Moderate ED (12-16)	5	22.7	
Moderate ED (8-11)	1	4.6	13.73+9.944
Severe ED (1-7)	2	9.1	
Total	22	100	

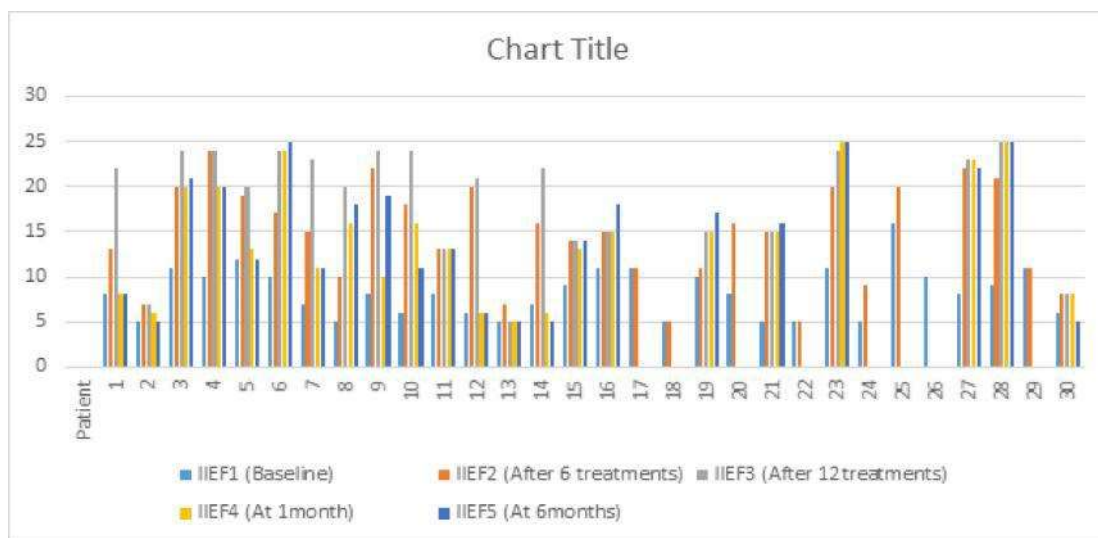


Figure 1: Bar chart representation of respondent’s response to treatment.

Table 5: Fifth IIEF score (6 month after treatment completion) N=22.

Level of ED	Frequency	Percentage(s)	Mean (SD) IIEF5
No ED (22-25)	4	18.2	
Mild ED (17-21)	6	27.3	
Mild Moderate ED (12-16)	4	18.2	
Moderate ED (8-11)	3	13.6	10.70+8.848
Severe ED (1-7)	5	22.7	
Total	22	100	

Table 6. Response to treatment among respondents (IIEF1-IIEF5). N=22 (respondents that completed the treatments)

Variable	Frequency	Percentage(s)
Insignificant improvement	3	13.6
Significant improvement	19	86.4
Total	22	100.0

*Significant improvement of ED was estimated based on increase of 5 from IIEF1-IIEF5

Table 7: Association between severity of ED and response to treatment.

Response to treatment	Severity of ED			P-value
	Mild-moderate ED	Moderate ED	Severe ED	
Significant	1	12	6	5.018
Insignificant	0	0	3	
Total	1	12	9	0.081



Figure 2: picture of the shockwave machine used for this study

None of the patients reported any pain or adverse events during the treatment and follow up period.

DISCUSSION

LI-SWT has been found to be an effective, non-invasive treatment option for ED. Several reports have documented the improvement in erectile function after Li ESWT in persons with vasculogenic ED^{9, 12,13}. In a meta- analysis of 7 randomised controlled trials, Clavijo et al reported significant increase in IIEF-EF scores after LI-ESWT¹⁴.

In a study in India, Srini et al found a significant increase in the IIEF-EF Domain scores from visit 1 to follow up 5 (12 months later). Also there were no side effects of treatment¹¹.

Results from our study in black men in Africa, showed efficacy of LI-SWT as a non-invasive treatment option for ED, as 86.4% of respondents had an improvement of IIEF scores of at least 5 from baseline (IIEF 1) , which lasts for up to 6 months post- treatment (IIEF5).

An advantage of this treatment method over PDE5Is is that it allows for spontaneity of performance as the treatment is not related to timing of sexual intercourse and does not need to be repeated before each sexual encounter unlike what obtains with the PDE5Is.

This treatment has also been found to be safe and painless as none of the respondents reported pain, swelling or any adverse effects directly related to treatment.

At 6 months post-treatment follow up, mean IIEF-5 score was 10.70 \pm 8.848 as compared to mean IIEF-1(pre-treatment) score of 8.27 \pm 2.74. Also we found that whilst 40% of participants were in the severe ED category prior to treatment, by 6 months post treatment only 16.7% were in the severe ED category showing sustenance of treatment benefits by 6 months.

Whether repeated treatment sessions over a longer period would be safe, indicated and give more lasting results needs to be investigated.

Limitations

Recruitment of bigger sample size is desirable to improve the power of positive observation made in this study.

CONCLUSION

LI-ESWT presents a non-invasive, effective and safe treatment option for the management of ED in men of African descent. It is a welcome development and shows promise of efficacy so larger, randomised controlled studies of longer duration would be welcome in this environment.

Conflicts of Interest: Dr Oluranti Adekunle solely funded the research by providing the shockwave device and financial support for the research.

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