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ORIGINAL ARTICLE

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Comparison of focused and unfocused ESWT in treatment of erectile dysfunction

Recep Eryilmaz[a], Şeyhmus Kaplan[b], Rahmi Aslan[a], Murat Demir[c] and Kerem Taken[a]

[a]Department of Urology, School of Medicine, Yuzuncu Yil University, Van, Turkey; [b]Department of Sports Medicine, School of Medicine, Van Yuzuncu Yil University, Van, Turkey; [c]Department of Urology, Van Educational Research Hospital, Van, Turkey

ABSTRACT

Recently, extracorporeal shock wave therapy (ESWT) is more commonly used in noninvasive treatment of erectile dysfunction (ED). There is no definitive treatment protocol on the use of ESWT. In this study, we aimed to compare focused and unfocused ESWT in ED. We created two groups, each including 20 patients with similar demographics. Focused ESWT is performed in one group, while unfocused ESWT is performed for the other group. Patients are assessed with IIEF-5 and EHS. Mean score of IIEF-5 was increased by 6.3 ± 3.3 ($p < .05$) from 9.6 ± 2.9 to 15.0 ± 5.0 in 3-month follow-up in the unfocused group. In the focused group, IIEF-5 score increased by 5.34 in average from 10.01 ± 2.5 to 15.4 ± 3.1. In conclusion, IIEF-5 score was significantly higher in the unfocused ESWT group than the focused ESWT group.

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Erectile dysfunction; LI-ESWT; focused ESWT; unfocused ESWT

Introduction

Erectile dysfunction (ED) is one of the most common disorders in male and is often associated with other age-related comorbidities [1].

The descriptive data show that increased severity of ED within late-onset hypogonadism patients correlated with an increased waist circumference, hyperglycemia, hypertriglyceridemia, hyperlipidemia, and a history of diabetes mellitus. Severe ED functions as a prognostic indicator of comorbidities in men with late onset hypogonadism [2].

The prevalence of ED in the general population ranges from 30 to 65% in men aged 40–80 years. Current medical treatments, including phosphodiesterase type 5 (PDE5) inhibitors have variable efficacies and there remains an ongoing need for well-tolerated and clinically durable therapeutic options for treatment-refractory men. Emerging evidence has suggested that low-intensity extracorporeal shockwave therapy (LiESWT) may offer benefit for patients with ED [3].

Recently, low-intensity extracorporeal shock wave therapy (LI-ESWT) emerged as a treatment option for male sexual dysfunction [4]. Extracorporeal shock wave therapy (ESWT), is a treatment method for the application of high-level sound waves to the body. The main mechanism of ESWT is considered that can stimulate angiogenesis and restore blood flow to the disorder area, through promoting regeneration, and repair [5]. Since LI-ESWT provides treatment effect for ED, it instills hope that it is superior to other symptomatic treatments [6,7].

Low-intensity extracorporeal shock wave therapy (LI-ESWT) is a noninvasive therapy and recently, it is used for the treatment of ED. It boosts neovascularization and blood circulation in cavernosal tissues to improve the erectile function [8].

The principal mechanism of ESWT stimulates angiogenesis by promoting regeneration, repair, and restores blood supply to the diseased body part [9].

Recently, many studies have shown that ESWT can provide satisfactory therapeutic effects for ED [4,10].

The best treatment regimen is not known regarding intensity and timing of energy and number of treatment sessions. However, it is obvious that LI-ESWT is already adapted to the clinical application [11].

ESWT is used as a new method in the noninvasive treatment of ED. There are many publications in this literature. However, the comparison of focus and unfocused ESWT exists in the literature. Our study is the first study in this field. In our study, we aimed to compare focused and unfocused ESWT to determine more efficient ESWT method for ED.

Material and methods

After consent is obtained from local ethics committee (Decree No. 02/19.12.2018), 40 patients with ED were

CONTACT Recep Eryilmaz recepuro@hotmail.com Department of Urology, School of Medicine, Yuzuncu Yil University, Van, Turkey
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enrolled who applied to our outpatient clinic and who have been used phosphodiesterase 5 inhibitor (PDE5I) before application for the treatment of ED, but gained no benefit and also were diagnosed with vascular insufficiency in penile Doppler ultrasound; patients are divided into two groups with equal size and demographics. Focused LI-ESWT is performed in one group, while unfocused LI-ESWT is performed for the other group. (focused ESWT is the ESWT format used with focused probe on penile tissue. Unfocused ESWT is the ESWT format used with unfocused probe on penilw tissue) Patients received low-intensity extracorporeal shock wave therapy (Electronica Pagani, Italy) twice a week for 6 weeks at outpatient settings did not give local or systemic anesthesia. In each treatment session, 1800 LI-ESWT shocks at energy setting of 0.15 mJ/mm^2 were delivered to six foci (two foci on the dorsum of corpus cavernosum, two foci at bilateral distal segment of bilateral crural areas, and two foci at proximal segment of crural areas; 300 shocks per focus). Treatment protocol is applied as two sessions of LI-ESWT per week for 3 weeks then no treatment is given for 3 weeks; and ultimately, LI-ESWT is started again in two sessions per week for 3 weeks.

Since LI-ESWT was penetrating deep enough to cover bilateral corpus cavernosa, application for bilateral regions varied to reach maximal penile treatment.

Erectile dysfunction is evaluated with erectile hardness score (EHS) and IIEF-5 before and 3 months after LI-ESWT. EHS was the main outcome criterion for the efficiency of LI-ESWT. A successful treatment is defined as EHS $\geq$3 that indicates sufficient erection for vaginal penetration and no adverse effect of LI-ESWT, such as penile pain or ecchymosis, is noted in the treatment.

Unless otherwise is specified, quantitative data is expressed as mean ± standard deviation (SD). Categorical data is expressed as number (n) and percentage. Patients of unfocused LI-ESWT group were compared with patients of focused LI-ESWT group with Chi-Square test and Fisher's exact test, while quantitative variables are compared with Student's t test. A p values below .05 was considered statistically significant for all statistical analyses. All statistical analyses were performed with SPSS v. 22.

Results

Mean score of IIEF-5 was increased by 6.3 ± 3.3 ($p < .05$) from 9.6 ± 2.9 to 15.9 ± 2.3 in 3-month follow-up in the unfocused group. EHS score increased by 1.61 in average from 2.01 ± 0.95 to 3.72 ± 0.63. Sufficient erection for vaginal penetration is observed in 13/20 patients who were treated with unfocused ESWT. No effect was observed in seven patients of the unfocused ESWT group. In the focused ESWT group, IIEF-5 score increased by 5.34 in average ($p < .05$) from 10.01 ± 2.5 to 15.4 ± 3.1. EHS score increased by 1.32 from 2.1 ± 0.73 to 3.4 ± 0.55. Sufficient erection for vaginal penetration was obtained in 10/20 patients who were treated with focused ESWT. No complication was observed both groups after ESWT. Demographics, laboratory, and statistical data of patients were given in Table 1.

Table 1. Demographics, laboratory and statistical data of patients.

	Unfocused ESWT (n:20)	Focused ESWT (n:20)
Age (years)	45.6	44.3
BMI	27.4	26.5
Total testosterone (nmol/dl)	12.6	13.1
Smoking status	(85.4%)	(83.6%)
Hypercholesterolemia	43.7%	45.2%
Hypertension	(63.7%)	(67.1%)
Diabetes mellitus	(55.6%)	(53.7%)
Treatment with PDE5I	100%	100%
Before ESWT IIEF-5 score	9.6 ± 2.9	10.01 ± 2.5
After ESWT IIEF-5 score	15.9 ± 2.3	15.4 ± 3.1
Before ESWT EHS score	2.01 ± 0.95	2.1 ± 0.73
After ESWT EHS score	3.72 ± 0.63	3.4 ± 0.55
Success of ESWT	65%	50%

Discussion

There is much epidemiologic evidence demonstrating risk factors for ED, such as cardiovascular disease, diabetes, lower urinary tract symptoms, and other chronic diseases In addition, modifiable lifestyle factors including physical activity, smoking, diabetes control, and obesity are also related to ED [12–14].

In our study, the patients with ED 65.32% had hypertension, 44.45% hyperlidemia, 54.40% diabetes, and 84.53% smoking.

Obesity is significantly associated with ED and this has been neither in the focus of medical practitioners nor researchers. Studies show that obese males have a 30% higher chance of developing sexual dysfunction than the people of normal weight [15].

The mean BMI of the patients in our study was 27.25. The mean of this, our patients are overweight. ED is related to weight as stated in the study.

Although the aging males' symptoms test is related to low levels of testosterone, it is also of some limited use for diagnosing hypogonadism because it has low specificity and is influenced by pathologies that are frequent during aging [16].

The mean testosterone level of the patients in our study was 12.85. None of our patients had hypogonadism. At the same time, there was no correlation between the level of testosterone and comorbidities.

The decreases of reproductive health were mainly induced by aging and aging-related comorbidities then to improve the male reproductive health. Future research should pay more attention on aging-related comorbidities and how to improve general wellness [17].

Therefore, the treatment of ED is important. The treatment of ED should be of minimally invasive treatment. As it is known, PDE5I are the first-line treatment for ED. Recently, ESWT has been used effectively in nonresponder PDE5I ED treatment [18].

It was previously reported that penile low-intensity extracorporeal shock wave therapy (LI-ESWT) may treat the ED [19,20]. Potentially therapeutic effects of LI-ESWT on ED include cellular proliferation, tissue regeneration, and stimulation of angiogenesis. A diabetic rat model demonstrated that LI-ESWT promoted regeneration of neuronal nitric oxide synthase-positive nerves, endothelium, and smooth muscle cells. This effect arises out of accumulation of endogeneous mesenchymal stem cells [21]. A rat model of pelvic neurovascular injury demonstrated that LI-ESWT stimulated the angiogenesis [22].

Srini et al. [23] revealed out significant increases in IIEF and EHS scores that were used to evaluate ED in 12-month follow-up after ED with organic etiology was treated with LI-ESWT.

Randomized, double-blind, and sham control studies conducted by Fojecki et al. reported that ESWT has no clinically significant effect on ED [24].

Several reasons may be speculated for these conflicting results of LI-ESWT in the literature. They may be counted as; difference in shockwave (SW) technology (piezoelectric, electromagnetic, electrohydraulic), SW distribution (focused, linear), and number of SWs; these differences makes comparison of studies difficult and therefore, validity of meta-analyses decrease [25].

As already reported by studies mentioned above, controversial results were reported for the efficiency of ESWT on treatment of ED. The conflicting success rates of ESWT in these studies are much related to co-existing diseases of patients and device parameters. One of the device parameters is related to distribution of shockwaves delivered to the corpus cavernosum. In our study, we used both focused and unfocused ESWT for patients with ED in order to determine whether efficiency of ESWT changes depending on the shockwaves distribution or not. We observed that treatment of ED is significantly more efficient in unfocused ESWT.

Patel et al. [18] determined that following parameters affected the biological reactions: Intensity of energy flow (mJ/mm^2); number of shock; frequency of device (Hz); frequency and interval of treatment; existing tissue/progenitor cell content (influenced by age and diseases); shape and focus of shockwaves; diameter of efficient therapeutic areas; and energy weakening; they reported that these parameters influenced efficiency of LI-ESWT in ED [18].

Since unfocused probe distributes shockwaves to a larger portion of corpus cavernosum than focused probe, restoration, and tissue regeneration are more efficiently stimulated in corpus cavernosum and moreover, user errors are less likely than focused ESWT [26].

Regarding the tissue regeneration, low-intensity unfocused extracorporeal shockwave therapy (LI-ESWT) carries significant potential and encouraging evidences for the treatment of various disorders, especially including tissue trauma and diseases [5].

In our study, all parameters, excluding applying technic, are set close in both ESWT protocols and we observed statistically significant increase in IIEF-5 and EHS scores 3 months later in 13/20 patients in the unfocused ESWT group. We noted statistically significant increase in IIEF-5 and EHS scores in 10/20 patients in the focused ESWT group. From a broad point of view, success rate is 65% for unfocused ESWT group, while the figure is 50% for focused ESWT group.

These results demonstrate that different installation parameters and different LI-ESWT treatment protocols have significant effect on the therapeutic efficiency. Clinical outcomes of LI-ESWT are closely related to energy delivered to unit target area and the surface area affected by the shockwaves.

Limitations

Limitations of our study include low number of patients and the design (nonrandomized, noncontrol study) of the study.

Conclusion

Both focused and unfocused ESWT is effective in treatment of ED. We believe that unfocused ESWT is more efficient than focused ESWT in treatment of ED. Larger series on this subject are required.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

[1] Kaya E, Sikka SC, Kadowitz PJ, et al. Aging and sexual health: getting to the problem. Aging Male. 2017;20:65–80.

[2] Almehmadi Y, Yassin DJ, Yassin AA. Erectile dysfunction is a prognostic indicator of comorbidities in men with late onset hypogonadism. Aging Male. 2015;18:186–194.

[3] Campbell JD, Trock BJ, Oppenheim AR, et al. Meta-analysis of randomized controlled trials that assess the efficacy of low-intensity shockwave therapy for the treatment of erectile dysfunction. Ther Adv Urol. 2019;11:1756287219838364.

[4] Faix A, Chevallier D. Low-intensity extracorporeal shockwave therapy for erectile dysfunction: a new option? Rev Med Suisse. 2019;15(642):590–595.

[5] Zhu GQ, Jeon SH, Bae WJ, et al. Efficient promotion of autophagy and angiogenesis using mesenchymal stem cell therapy enhanced by the low-energy shock waves in the treatment of erectile dysfunction. Stem Cells Int. 2018;2018:1302672.

[6] Gruenwald I, Appel B, Vardi Y. Low-intensity extracorporeal shock wave therapy—a novel effective treatment for erectile dysfunction in severe ED patients who respond poorly to PDE5 inhibitor therapy. J Sex Med. 2012;9:259–264.

[7] Vardi Y, Appel B, Jacob G, et al. Can low-intensity extracorporeal shockwave therapy improve erectile function? A 6-month follow-up pilot study in patients with organic erectile dysfunction. Eur Urol. 2010;58:243–248.

[8] Chung E, Cartmill R. Evaluation of clinical efficacy, safety and patient satisfaction rate after low-intensity extracorporeal shockwave therapy for the treatment of male erectile dysfunction: an Australian first open-label single-arm prospective clinical trial. BJU Int. 2015;115:46–49.

[9] Wang B, Ning H, Reed-Maldonado AB, et al. Low-intensity extracorporeal shock wave therapy enhances brain-derived neurotrophic factor expression through PERK/ATF4 signaling pathway. Int J Mol Sci. 2017;18:433.

[10] Zou ZJ, Tang LY, Liu ZH, et al. Short-term efficacy and safety of low-intensity extracorporeal shock wave therapy in erectile dysfunction: a systematic review and meta-analysis. Int Braz J Urol. 2017;43:805–821.

[11] Fode M, Lowenstein L, Reisman Y. Low-intensity extracorporeal shockwave therapy in sexual medicine: a questionnaire-based assessment of knowledge, clinical practice patterns, and attitudes in sexual medicine practitioners. Sex Med. 2017;5(2):94–98.

[12] Chung HS, Shin MH, Park K. Association between hand-grip strength and erectile dysfunction in older men. Aging Male. 2018;21:225–230.

[13] Amano T, Earle C, Imao T, et al. Are urge incontinence and aging risk factors of erectile dysfunction in patients with male lower urinary tract symptoms? Aging Male. 2016;19:54–57.

[14] Shigehara K, Konaka H, Ijima M, et al. The correlation between highly sensitive C-reactive protein levels and erectile function among men with late-onset hypogonadism. Aging Male. 2016;19:239–243.

[15] Dursun M, Besiroglu H, Cakir SS, et al. Increased visceral adiposity index associated with sexual dysfunction in men. Aging Male. 2018;21:187–192.

[16] Panach-Navarrete J, Martínez-Jabaloyas JM, DE-SDT Study Group. The influence of comorbidities on the aging males' symptoms scale in patients with erectile dysfunction. Aging Male. 2017;20:146–152.

[17] Yu XH, Zhao J, Zhang SC, et al. The impact of age, BMI and sex hormone on aging males' symptoms and the international index of erectile function scores. Aging Male. 2017;20:235–240.

[18] Patel P, Fode M, Lue T, et al. Should low-intensity extracorporeal shockwave therapy be the first-line erectile dysfunction treatment for nonresponders to phosphodiesterase type 5 inhibition? Eur Urol Focus. 2019. DOI:10.1016/j.euf.2019.02.004

[19] Clavijo RI, Kohn TP, Kohn JR, et al. Effects of low-intensity extracorporeal shockwave therapy on erectile dysfunction: a systematic review and meta-analysis. J Sex Med. 2017;14:27–35.

[20] Lu Z, Lin G, Reed-Maldonado A, et al. Low-intensity extracorporeal shock wave treatment improves erectile function: a systematic review and meta-analysis. Eur Urol. 2017;71:223–233.

[21] Qiu X, Lin G, Xin Z, et al. Effects of low-energy shockwave therapy on the erectile function and tissue of a diabetic rat model. J Sex Med. 2013;10:738–746.

[22] Li H, Matheu MP, Sun F. Low-energy shock wave therapy ameliorates erectile dysfunction in a pelvic neurovascular injuries rat model. Transl Androl Urol. 2016;5:977–979.

[23] Srini VS, Reddy RK, Shultz T. Low intensity extracorporeal shockwave therapy for erectile dysfunction: a study in an Indian population. Can J Urol. 2015;22:7614–7622.

[24] Fojecki GL, Tiessen S, Osther P. Effect of low-energy linear shockwave therapy on erectile dysfunction-a double-blinded, sham-controlled, randomized clinical trial. J Sex Med. 2017;14:106–112.

[25] Vardi Y, Appel B, Kilchevsky A, et al. Does low intensity extracorporeal shock wave therapy have a physiological effect on erectile function? Short-term results of a randomized, double-blind, sham controlled study. J Urol. 2012;187:1769–1775.

[26] Motil I, Kubis I, Sramkova T. Treatment of vasculogenic erectile dysfunction with Piezowave device. Application of low intensity shockwaves using novel linear shockwave tissue coverage (LSTC-ED®) technique. A prospective, multicentric, placebo-controlled study. Asm. 2016;6:15–18.