EFFECT OF PELVIC FLOOR MUSCLE BIOFEEDBACK ON IMPROVED ERECTILE FUNCTION IN PATIENTS WITH LOWER URINARY TRACT SYMPTOMS: PRELIMINARY STUDY

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ABSTRACT

Objective: *This study aims to determine the effect of giving pelvic floor muscle biofeedback on improving erectile function in patients with LUTS. Improvement in erectile function was assessed by IIEF (International Index of Erectile Function), EHS (Erectile Hardness Score), and pelvic floor muscle strength. Improvement in LUTS symptoms was assessed by an IPSS (International Index of Prostate Symptoms).* ***Material &Methods:*** *This research was a randomized controlled trial study on outpatients at CiptoMangunkusumo General Hospital. The research subjects were divided into 2 groups, the treatment group received 10 sessions of pelvic floor muscle biofeedback and home exercise. The control group only received home exercise.* ***Results:*** *There were 21 LUTS patients with ED. A total of 10 subjects (50%) had mild ED, 4 subjects (20%) had moderate ED, and 6 subjects (30%) had severe ED. From the results of the study, it was found that the scores for IIEF, IPSS, EHS, slow twitch, and fast twitch were improved in the treatment group (p-value <0.05), whereas in the control group there were only improvements in IIEF and IPSS scores (p-value <0.05).* ***Conclusion:*** *There was an improvement in erectile function (increased IIEF score, EHS score, decreased IPSS score, and increased pelvic floor muscle strength) after pelvic floor muscle biofeedback in ED patients with LUTS for 10 sessions.*

Keywords: *Biofeedback, erectile dysfunction, pelvic floor muscle exercises, lower urinary tract symptoms (LUTS).*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk mengetahui pengaruh pemberian biofeedback otot dasar panggul terhadap perbaikan fungsi ereksi pada pasien dengan LUTS. Perbaikan fungsi ereksi dinilai dengan IIEF (International Index of Erectile Function), EHS (Erectile Hardness Score), dan kekuatan otot dasar panggul.Perbaikan gejala LUTS dinilai dengan IPSS (International Index of Prostat Symptoms).****Bahan& Cara:*** *Penelitian ini merupakan studi randomized controlled trial pada pasien rawat jalan di RSUPN CiptoMangunkusumo. Subjek penelitian dibagi menjadi 2 kelompok, pada kelompok perlakuan mendapatkan biofeedback otot dasar panggul sebanyak 10 sesi dan latihan dirumah. Kelompok kontrol hanya mendapatkan latihan dirumah.* ***Hasil:*** *Terdapat 21 pasien LUTS yang mengalami DE. Sebanyak10 subjek (50%) merupakan DE ringan, 4 subjek (20%) merupakan DE sedang, dan 6 subjek (30%) merupakan DE berat. Terdapat perbaikan skor IIEF, IPSS, EHS, slow twitch dan fast twitch pada kelompok perlakuan (p-value <0.05), sedangkan pada kelompok kontrol hanya didapatkan perbaikan pada skor IIEF dan IPSS (p-value <0.05).* ***Simpulan*** *: Terdapat perbaikan fungsi ereksi (peningkatan skor IIEF, skor EHS, penurunan skor IPSS dan peningkatan kekuatan otot dasar panggul) setelah pemberian biofeedback otot dasar panggul pada pasien DE dengan LUTS selama 10 sesi.*

Kata kunci : *Biofeedback, disfungsi ereksi, latihan otot dasar panggul, lower urinary tract symptoms (LUTS).*

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INTRODUCTION

According to the International Consultation on Incontinence, the global prevalence of Lower Urinary Tract Symptoms (LUTS) in adults reached 46% in 2012.[1] In 2018, there were 382 patients at dr. Cipto Mangunkusumo General Hospital Jakarta with LUTS. The Multinational Survey of the Aging Male (MSAM-7) conducted by the US and 6 other European countries, found that sexual dysfunction is strongly related to age and the severity of LUTS.[2] Erectile dysfunction (ED) is the most common sexual dysfunction in men. There is a 76% incidence of ED in men with LUTS.[3] Although the prevalence

of ED is high, patients often do not seek medical help because they believe ED is part of normal aging, lack of knowledge about ED, and are embarrassed to talk to doctors about sexuality, so ED complaints are often not reported.[4] Behavior to seek treatment because the incidence of ED is low, namely 7.7% in Brazil, 17-43% in Asia, and 21 -56% in the United States and Europe.[5]

The cause of ED is associated with weakness of the pelvic floor muscles. Pelvic floor muscle training can increase the activity of the ischiocavernosus and bulbocavernosus muscles during penile erection, both of which play a role in initiating and maintaining penile erection.[6] Other non-invasive and easy-to-do therapeutic interventions, such as pelvic floor muscle biofeedback, also provide significant improvements in sexual function. There was an increase in the IIEF score after giving pelvic floor muscle biofeedback for 3 months.[7] The International Index of Erectile Function (IIEF) is a validated questionnaire as a tool for assessing sexual functionand has been validated in Indonesian.

Erectile Hardness Score (EHS) is another term for the degree of hardness of the penis in erection. Pelvic floor muscle biofeedback provides visual and auditory information during contractions, so that it can provide awareness of muscle activity and can contract the right muscles. Biofeedback carried out for 10 sessions as a preoperative measure effectively reduced the incidence of urinary incontinence and erectile dysfunction in post-radical prostatectomy patients ($p < 0.001$).[8] Currently, pelvic floor muscle biofeedback has not been routinely applied as a therapy for erectile dysfunction.

OBJECTIVE

The aim of this study is to assess the effect of giving pelvic floor muscle biofeedback on improving erectile function in patients with LUTS as measured by the IIEF and EHS questionnaires, as well as pelvic floor muscle strength, including improvement in LUTS symptoms as measured by the International Index of Prostat Symptoms (IPSS) questionnaire.

MATERIAL &METHODS

The design of this study was a randomized controlled trial. We recruited outpatient LUTS who had ED in the neuromuscular rehabilitation and the

Table 1. Characteristics Subjectss

Characteristics	Interversion	Control	Total
	Total (%)	Total (%)	n = 20
Age	52.10 ± 16.12	62.20 ± 8.80	57.15 ± 13.66
<40 years old	2 (20)	-	2 (10)
40-60 years old	3 (30)	4 (40)	7 (35)
>60 years old	5 (50)	6 (60)	11 (55)
Education			
Junior high school	1 (10)	-	1 (5)
Senior high school	6 (60)	6 (60)	12 (60)
Bachelor	3 (30)	4 (40)	7 (35)
BMI	24.37 ± 3.52	23.58 ± 3.33	23.98 ± 3.36
Underweight	-	1 (10)	1 (5)
Normal	3 (30)	3 (30)	6 (30)
Overweight	2 (20)	3 (30)	5 (25)
Obesity grade I	5 (50)	3 (30)	8 (40)
Smoking			
Yes	6 (60)	5 (50)	11 (55)
No	4 (40)	5 (50)	9 (45)
Comorbid			
DM	2 (28.6)	2 (33.3)	4 (30)
Hypertension	3 (42.9)	3 (50)	6 (46)
Cerebrovascular disease	-	1 (16.7)	1 (8)
Benign vertebrae tumor	1 (14.3)	-	1 (8)
Polisitemia vera	1 (14.3)	-	1 (8)
Drugs			
DM	1 (12.5)	2 (28.6)	3 (20)
Hypertension	3 (37.5)	2 (28.6)	5 (33)
LUTS	4 (50)	3 (42.9	7 (47

BMI (Body Mass Index), DM (Diabetes Melitus). LUTS (Lower Urinary Tract)

urology at dr. Cipto Mangunkusumo General Hospital Jakarta. The sample selection was carried out by block randomization. The inclusion criteria for this study were 20 years old, suffering from LUTS, having ED, no cognitive impairment, nodepression, having a sexual partner, and being willing to follow health protocols. The exclusion criteria on in this study were congenital urogenital abnormalities, uncontrolled diabetes mellitus, uncontrolled hypertension, a history of heart disease, urinary tract stones, consumption of antidepressants and anticonvulsants, allergy to condoms, and abnormalities in the anus that could interfere with the examination, such as grade III-IV hemorrhoids and anal fissures. Subjects who were willing to participate in this study were asked to sign an informed consent form after being given an explanation by the researcher.

Calculation of sample size using the sample size formula for the difference between the two pre-post averages, an addition of 20% to the number of samples, so that the number of samples for each group becomes 19 subjects. This study passed an ethical review from the Faculty of Medicine University Indonesia Research Ethics Commission and a land permit letter for dr. Cipto Mangunkusumo General Hospital Jakarta. The data analysis was done using the SPSS for Windows version 20 computer program. Wilcoxon and Mann-whitney test was used to deduce p-value.

RESULTS

Research data collection was carried out at the neuromuscular rehabilitation outpatient and urology outpatient, from August 2021-April 2022. There were 290 LUTS patients, with 30 (10.34%) suffering from erectile disorders obtained from anamnesis. A total of 9 subjects were excluded, so a total of 21 subjects met the inclusion and exclusioncriteria. There was 1 subject who dropped out, so 20 subjects completed this research to the end.

There was no significant difference in age (p-value 0.09), body mass index (p-value 0.52) and smoking history (p-value 0.673) in the two groups.There were significant differences (p-value <0.05) in the measurement of IPSS, IIEF, EHS, slow twitch and fast twitch scores in the treatment group. Whereas in the control group there was a significant difference (p-value <0.05) in measuring the IPSS and IIEF scores.

Table 2. Comparison of IPSS, IIEF, EHS, Slow Twitch, Fast TwitchPre and Post Treatment (Wilcoxon Test)

Indicator	Intervention		Control	
	Median (Min-Max)	*p-value* (<0.05)	Median (Min-Max)	*p-value* (<0.05)
IPSS				
Pre	16.00 (12-25)	0.005	13.00 (6-19)	0.015
Post	10.00 (7-18)		10.00 (1-19)	
IIEF				
Pre	17.00 (2-21)	0.007	15.00 (5-20)	0.035
Post	19.00 (8-24)		15.00 (5-24)	
EHS				
Pre	3.00 (2-4)	0.014	3.00 (2-4)	0.157
Post	4.00 (3-4)		3.50 (2-4)	
Slow twitch				
Pre	135.50 (65-161)	0.005	90.00 (54-173)	0.169
Post	192.50 (101-238)		125.00 (69-217)	
Fast twitch				
Pre	111.00 (34-157)	0.005	102.50 (21-178)	0.202
Post	159.00 (62-199)		128.00 (51-214)	

IPSS *(International Index of Prostate Symptoms).* IIEF *(International Index of Erectile Function),*
EHS *(Erectile Hardness Score)*

DISCUSSION

There were 20 subjects included in this study.In this study, there were 10.34% of LUTS who had ED. This number is smaller in comparison to studies in other countries, such as Brazil, where 24.6% of patients had ED, Turkey, where 59.6% did, and China, where 82.25% of LUTS patients had ED.[5,9,10] This is influenced by people's knowledge and culture. Patients often do not seek medical help because they believe that ED is part of normal aging, lack knowledge about ED, and are embarrassed to talk to doctors about sexuality, so ED complaints are often not reported.[4]

A total of 10 subjects (50%) were included in the mild ED category, 4 subjects (20%) were included in the moderate ED category, and 6 subjects (30%) were included in the severe ED category. Age characteristics are dominated by the age range >60 years. In old age, there was a delayed full erection, reduced erectile rigidity, and diminished or absent erections during sleep. Other things related to ED and aging are vascular changes, changes in pressure in the cavernous space, and changes in penile morphology.[11] Based on the level of education, most of the research subjects had a high school level education. Education level influences better self-awareness about personal health.[12]

An understanding of the benefits of and adherence to exercise will influence the outcome of therapy. In this study, subjects' adherence to participating in pelvic floor muscle exercises was good. Compliance with subjects in participating in the study was achieved by educating them about the importance of regular exercise at home, providing daily logbooks, monitoring filling every week via mobile phone applications by researchers, practicing biofeedback twice a week for the treatment group, and controlling every week for the control group to ensure the subject did the correct technique.

The research subjects were dominated by smokers, 55% of the total subjects. Smoking is a strong predictor of ED. The effect of smoking on ED is mediated by systemic changes such as hypercoagulability, increased platelet aggregation, an imbalance between thromboxane and prostacyclin concentrations, and toxic effects on the vascular endothelium.[13] Smoking also increases the incidence of LUTS exacerbations. Nicotine increases sympathetic nervous activity and contributes to the clinical picture of storage symptoms by increasing the tone of the detrusor smooth muscle. In addition, smoking causes disturbances in the balance of hormones and nutrients, which can affect collagen synthesis, so that it can affect bladder muscle strength and detrusor instability.[4]

Co-morbidities were dominated by hypertension, which was 46%, followed by diabetes mellitus, which was 30%, and other diseases, namely benign tumors of the vertebrae and polycythemiavera. Endothelial dysfunction is caused by hypertension, and diabetes mellitus is a strong predictor of DE, which is associated with microvascular changes and peripheral neuropathy, with an odds ratio of DE in the hypertensive population of 1.3-2.79.[14-15]

Based on the LUTS symptoms suffered by the research subjects, 10% had mild LUTS symptoms, 80% moderate symptoms, and 10% severe symptoms. In measuring the severity of ED using the International Index of Erectile Function (IIEF) from 20 subjects, the proportion of mild ED was 55%, moderate 20%, and 30% severe. This is consistent with previous research, which found that 25% of LUTS patients had mild ED, 18.3% had moderate ED, and 16.7% had severe ED. There is a correlation between the incidence of LUTS and ED, where among 57.6% of LUTS patients who suffer from ED is 29.7%.[16] There are 4 mechanisms underlying the occurrence of ED in LUTS, namely changes in nitric oxide levels, hyperactivity of the autonomic pathway, Rho-kinase and pelvic atherosclerosis.[17] There is a positive correlation between age and IPSS scores and the severity of LUTS. ED is the most common symptom associated with LUTS, accounting for 54.3% of all cases.[16,18]

There was a significant improvement in the IPSS score in both groups. Active pelvic floor muscle contractions can reduce urgency, prevent incontinence and reduce post void dribbling complaints by strengthening the pelvic floor muscles, resulting in an improvement in the IPSS score. In addition, based on the guidelines of the American Urological Association, pelvic floor muscle exercises are recommended as the first line for all patients with storage disorders LUTS.[19] LUTS has been shown to be associated with reduced quality of life. The potential effects of LUTS are very broad, ranging from sleep disturbances, socialization of personal relationships to decreased emotional well-being and productivity at work.[20]

In measuring the IIEF score, there was a significant improvement in the IIEF score in both

groups. Pelvic floor muscle exercises are one of the first-line therapies in patients with ED. Bulbocavernosus contractions maintain pressure within the corpus spongiosum and gland. Ischiocavernosus supports, stabilizes, and suppresses the corpora cavernosa, inhibiting the return of blood to maintain pressure and stiffness in the corpora cavernosa.[19] During the contractions, attention is paid to the subject's ability to retract the penis and elevate the scrotum, ensuring that the bulbocavernosus and ischiocavernosus muscles are exerted forcefully. When the contractions of these two pelvic floor muscles become stronger, there is an improvement in erectile function as assessed by the IIEF score. Likewise, in the EHS score, there was a significant improvement in EHS in the treatment group, but not significantly in the control group.

Specific exercises are important to determine the purpose of the exercise. In general, to recruit fast-twitch muscle fibers requires specific training for speed and strength, while slow twitch muscle fibers require endurance training.[21] There was a significant increase in slow twitch muscle strength in the treatment group but not in the control group when measuring pelvic floor muscle strength. Biofeedback educates the subject on how to perform proper pelvic floor muscle contractions. Anatomically, the proportion of slow twitch muscle fibers is greater than that of fast twitch, namely 70% and 30%. There was an increase in the strength of the slow twitch in the control group, although it was not statistically significant.[22] Likewise, there was a significant increase in fast twitch in the treatment group, whereas in the control group it did not increase significantly.The proportion of fast twitch muscles decreases frequently with aging, inactivity, and innervation damage. nerves.[19]

As many as 50% of patients fail to carry out effective pelvic floor muscle contractions after being given basic verbal or written training instructions.[22] In biofeedback, there is visual and auditory input that can help patients to make stronger muscle contractions. In addition, with the probe inserted into the rectum area, it will provide sensory discrimination so that the subject can perform muscle contractions properly. In this study, the treatment group had an increase in the IPSS score, IIEF score, EHS score, and slow twitch and fast twitch muscle strength after 5 weeks of intervention, which was better than the control group.

In general, the principles of pelvic floor muscle training should consist of overload, specificity and reversibility. The principle of overload is that the muscle contractions performed must exceed the usual contractions. In principle overload, there will be an increase in the number and size of mitochondria, an increase in the activity of aerobic and anaerobic enzymes, intramuscular glycogen, the number of capillaries and also their surface area resulting in hypertrophy and hyperplasia of the muscles. Specificity is using the muscles that are trained properly. Reversibility implies that the benefits of these exercises may return if the patient does not incorporate these exercises into his daily routine.[23]

Pelvic floor muscle training causes hypertrophy of the pelvic floor muscles, increases muscle strength, increases muscle awareness in the brain and allows greater recruitment of active motor neurons.[24] Pelvic floor muscle biofeedback for 5 weeks, has an effect which was greater than the control group. Biofeedback is a non-invasive exercise with no side effects that can be performed on LUTS patients with ED. Limitation of this study is small number of subjects involved in the research due to pandemic COVID-19.

CONCLUSION

There was an improvement in erectile function (increased IIEF score, EHS score, decreased IPSS score and increased pelvic floor muscle strength) after administration of pelvic floor muscle biofeedback in LUTS patients. Pelvic floor muscle biofeedback has the potential to be an option for erectile dysfunction therapy in LUTS patients.

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