Int J Clin Exp Med 2020;13(11):8942-8949
www.ijcem.com /ISSN:1940-5901/IJCEM0115311

Original Article

Analysis of the risk factors of postpartum stress urinary incontinence and the treatment efficacy of electromyography biofeedback combined with neuromuscular electrical stimulation

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Received May 30, 2020; Accepted July 11, 2020; Epub November 15, 2020; Published November 30, 2020

Abstract: Objective: To explore the possible risk factors of postpartum stress urinary incontinence (PSUI) and the efficacies of electromyography biofeedback (EB) combined with neuromuscular electrical stimulation (NES). Methods: Clinical information of 180 patients with PSUI (PSUI group) and 80 patients without PSUI (non-PSUI group) were retrospectively analyzed. Risk factors of PSUI were analyzed. The PSUI group was divided into the observation group and control group according to different treatment methods, with 90 cases in each group. The control group was treated with Kegel kinesiotherapy, while the observation group was treated with EB combined with NES. Clinical efficacy, urodynamic indexes, pelvic floor muscle strength and quality of life were compared between the two groups. Results: The risk factors for PSUI were vaginal delivery, urinary incontinence before being pregnant, new urinary incontinence in pregnancy, and delivery of a large infant ($P<0.05$, $OR>1$). Compared with the control group, the effective rate was higher in the observation group ($P<0.05$). Compared with before treatment, maximal urethral closure pressure (MUCP), maximal urethral pressure (MUP), maximum urinary flow rate (Qmax) and electromyogram (EMG) values in the observation and control groups were significantly increased after treatment, and the values in the observation group were greater than those in the control group (all $P<0.05$); while there was a opposite trend in the scores of the International Consultation Committee on Incontinence Questionnaire Short Form (ICI-Q-SF, $P<0.001$). Conclusion: Vaginal delivery, urinary incontinence before pregnancy, new urinary incontinence in pregnancy, and delivery of a large infant were the risk factors for PSUI. The application of EB combined with NES in PSUI patients can obviously improve urodynamic indexes, enhance pelvic floor muscle strength and ameliorate symptoms of urinary incontinence, thereby improving maternal postpartum quality of life.

Keywords: Postpartum stress urinary incontinence, risk factors, electromyography biofeedback, neuromuscular electrical stimulation, efficacy

Introduction

Stress urinary incontinence is involuntary leakage of urine associated with an increase in abdominal pressure. Due to the continuous growth of the fetus during pregnancy and the injury of the pelvic floor muscle during delivery, postpartum pelvic floor dysfunction can easily occur. With weakened ability to control urine, postpartum stress urinary incontinence (PSUI) becomes prone to occur [1, 2], which affects maternal postpartum quality of life. The pathogenesis of PSUI is complicated; therefore, it is of great importance to recognize its risk factors for preventing the occurrence of PSUI and improving postpartum quality of life [3, 4].

Surgical treatment is mainly adopted in patients with severe cases and invalid non-surgical treatment failure [5, 6], while for patients with mild cases, non-surgical treatment is mainly conducted [7], such as electrical stimulation, pelvic floor muscle training and drug therapy. The improvement effect of pelvic floor muscle training on patients' pelvic floor muscle strength can be limited. Selective α1 adrenergic receptor agonist are usually applied in drug treatment, but obvious adverse reactions such as hypertension, palpitation and headache are apparent after drug taking, which limits its clinical application. Therefore, it is of great clinical significance to find a safe, effective and treatment method with fewer side-effects to improve the abnormal urodynamics and quality of life in patients.

Electrical stimulation therapy is used to wake up the damaged perineal nerve through bioelectrical stimulation, which helps to enhance the strength and elasticity of the perineal muscles and forces the rhabdoid muscles around the urethra to passively contract. In addition, electrical stimulation can inhibit excitation of the detrusor nucleus and contraction of detrusor through neurons [8, 9]. Perennial clinical practice has found that electromyography biofeedback (EB) combined with neuromuscular electrical stimulation (NES) in PSUI patients can obviously improve pelvic floor muscles. Therefore, this study aimed to explore the effects of EB combined with NES on urodynamic indexes, pelvic floor muscle strength and quality of life in PSUI patients.

Materials and methods

General information

Clinical data of 180 PSUI patients (PSUI group) who gave birth in Jiangdu People's Hospital of Yangzhou from February 2017 to September 2019 were retrospectively analyzed. Another 80 non-PSUI patients who gave birth in our hospital during the same period were selected as the non-PSUI group. The PSUI group was divided into the observation group and control group according to different treatment methods, with 90 cases in each group. This study was approved by the Ethics Committee of Jiangdu People's Hospital of Yangzhou and all patients signed the informed consent.

Inclusion criteria for PSUI group: Patients aged 20-38 years old; patients who met the diagnostic criteria for urinary incontinence in the report on *Diagnosis and Treatment of Urinary Incontinence* [10] formulated by the International Scientific Committee; patients who were registered in our hospital and hospitalized for delivery; patients with complete clinical information.

Exclusion criteria for PSUI group: Patients with mental disorder or disturbance of consciousness; patients with autoimmune diseases; patients with tumor; patients who were lost to follow-up.

Methods

The control group was treated with Kegel kinesiotherapy. Continual contraction of the perineum and anus was conducted for 3-5 s with an interval of rest for 3-5 s. The actions were performed interactively once in the morning and evening, respectively, at 15 cycles/time for 3 months.

The observation group was treated with EB combined with NES. The parturient was in a prostration position and the vaginal electrode of neuromuscular stimulation therapy instrument (PHENIX USB 4; Shanghai Hanfei Medical Equipment Co., Ltd., China; origin: France) was placed in the vagina. The frequency was set at 20-100 Hz, and wave width at 200-500 Izs. The electrical stimulation lasted for 15 s with an interval of 25 s. The intensity was gradually strengthened, and the appropriate stimulus level was when patients could consciously contract the pelvic floor muscle contraction without obvious discomfort. According to the graphic instructions on the display screen of the therapeutic instrument, patients were instructed to conduct pelvic floor muscle scaling training, and the stimulation and feedback were alternated every 15-20 minutes, twice a week for 3 months.

Outcome measures

Primary measures: (1) Univariate analysis and multivariate Logistic regression analysis were used to analyze the risk factors of PSUI. Univariate analysis was used to analyze clinical information, including age, body mass index (BMI), gestational weeks, the numbers of abortion, delivery time, delivery mode, the number of fetus, urinary incontinence before pregnancy, new urinary incontinence in pregnancy, urinary tract infection during pregnancy, exercise during pregnancy, neonatal weight and feeding mode of newborn. Multivariate Logistic regression analysis was carried out to screen

Table 1. Univariate analysis of risk factors for PSUI ($\overline{X}$ ± SD, n)

	PSUI group (n=180)	Non-PSUI group (n=80)	χ^2/t	P
Age (year old)	30.1±3.2	30.0±3.5	0.226	0.821
BMI (kg/m^2)	23.47±1.10	23.24±1.37	1.323	0.187
Gestational weeks (week)	39.5±2.5	40.0±2.1	1.560	0.120
The number of abortion			1.043	0.307
≤2 times	131	63		
>2 times	49	17		
Delivery			0.485	0.486
≤1 time	154	71		
>1 time	26	9		
Delivery mode			25.617	<0.001
Vaginal delivery	142	38		
Cesarean section	38	42		
The number of fetus			0.063	0.801
Singletons	177	79		
Multiples	3	1		
Urinary incontinence before pregnancy			15.127	<0.001
Yes	101	24		
No	79	56		
New urinary incontinence in pregnancy			32.585	<0.001
Yes	114	20		
No	66	60		
Urinary tract infection during pregnancy			2.415	0.120
Yes	102	37		
No	78	43		
Exercise during pregnancy			1.091	0.580
<5,000 steps/day	60	32		
5,000-10,000 steps/day	96	38		
>10,000 steps/day	24	10		
Neonatal weight			14.096	<0.001
<4,000 g	61	47		
≥4,000 g	119	33		
Feeding mode of newborn			2.865	0.239
Breast feeding	70	34		
Artificial feeding	33	20		
Mixed feeding	77	26		

Note: PSUI, postpartum stress urinary incontinence; BMI, body mass index.

the risk factors of PSUI by taking the differences in univariate analysis as independent variables and the occurrence of PSUI as dependent variables. (2) Three months after treatment, clinical efficacy was compared between the observation and control groups. Clinical efficacy was divided into three grades. Cured: Symptoms of urinary incontinence completely disappeared, and physical examination showed no stress urinary incontinence. Effective: the times of urine leakage was reduced by more than half. Ineffective: it didn't meet the above standards. Total effective rate = Number of cases of (cured + effective)/total number of cases * 100%. (3) The patients were required to come to the hospital for reexamination 3 months after treatment. Urodynamic indexes, including maximal urethral closure pressure (MUCP), maximal urethral pressure (MUP) and maximum urinary flow rate (Qmax) in the observation and control groups before treatment and 3 months after treatment were detected

Table 2. Multivariate Logistic regression analysis of risk factors for PSUI

	B	Standard error	Wald	P	OR	95% CI
Vaginal delivery	0.747	0.133	5.485	0.010	2.858	1.897-5.590
Urinary incontinence before pregnancy	0.403	0.059	8.570	0.035	1.907	1.667-4.306
New urinary incontinence in pregnancy	0.580	0.104	8.995	0.041	2.105	1.984-5.586
Delivery of large infant	0.569	0.085	10.852	0.026	1.857	1.773-3.479

Note: β, estimator of parameter; CI, confidence interval.

Table 3. Comparison of general information ($\overline{X}$ ± SD, n)

	Observation group (n=90)	Control group (n=90)	X^2/t	P
Age (year)	29.9±3.9	30.3±2.7	0.800	0.425
BMI (kg/m^2)	23.32±1.53	23.62±1.30	1.418	0.158
Gestational weeks (week)	39.2±2.3	39.7±2.1	1.523	0.130
The number of abortion			2.271	0.132
≤2 times	70	61		
>2 times	20	29		
Parity			0.719	0.396
≤1 time	75	79		
>1 time	15	11		
Delivery mode			1.201	0.273
Vaginal delivery	74	68		
Cesarean section	16	22		
The number of fetus			0.339	0.560
Singletons	89	88		
Multiples	1	2		

Note: BMI, body mass index.

Table 4. Comparison of clinical efficacy after treatment (n, %)

	Observation group (n=90)	Control group (n=90)	X^2	P
Cured	56 (62.22)	33 (36.67)		
Effective	31 (34.44)	45 (50.00)		
Ineffective	3 (3.33)	12 (13.33)		
Total effective rate (%)	87 (96.67)	78 (86.67)	2.427	0.015

by multichannel urodynamic detector (Nidoc 970A; Shanghai Hanfei Medical Equipment Co., Ltd., China; origin: Netherlands). (4) Pelvic floor muscle strength of the observation and control groups was measured by neuromuscular stimulation therapy instrument before treatment and 3 months after treatment. Electromyogram (EMG) values were expressed in terms of amplitude.

Secondary measure: The patients were required to come to the hospital for reexamination 3 months after treatment. The observation and control groups were asked to fill out the International Consultation Committee on Incontinence Questionnaire Short Form (ICI-Q-SF), in order to assess the quality of life before treatment and 3 months after treatment [11]. The total score was 21 points, and a higher score represented worse quality of life.

Statistical analysis

Statistical analysis was performed by SPSS 22.0 software. Count data were represented as n (%) and analyzed by chi-square test; measurement data were expressed as mean ± standard deviation ($\overline{X}$ ± SD) and analyzed by t test. Univariate analysis and multivariate Logistic regression analysis were used for risk factors. P<0.05 was considered statistically significant.

Results

Univariate analysis of risk factors for PSUI

The results of univariate analysis showed that there were significant differences in delivery mode, urinary incontinence before pregnancy, new urinary incontinence in pregnancy and neonatal weight between the PSUI and non-PSUI groups (all P<0.001). See **Table 1**.

Multivariate logistic regression analysis of risk factors for PSUI

Multivariate Logistic regression analysis was carried out to screen the risk factors of PSUI by taking the four factors with differences in univariate analysis as independent variables and the occurrence of PSUI as dependent variables. The results showed that the risk factors for

Table 5. Comparison of urodynamic index before and after treatment ($\overline{X}$ ± SD)

	Observation group (n=90)	Control group (n=90)	t	P
MUCP (kPa)				
Before treatment	5.98±1.14	5.70±1.23	1.584	0.115
After treatment	6.63±1.65**	6.16±1.27*	2.141	0.034
MUP (kPa)				
Before treatment	6.14±1.36	6.03±1.10	0.597	0.552
After treatment	7.05±1.29**	6.47±1.37*	2.924	0.004
Qmax (mL/s)				
Before treatment	25.88±1.66	25.56±1.39	1.402	0.163
After treatment	27.12±1.30**	26.17±1.42**	4.681	<0.001

Note: MUCP, maximal urethral closure pressure; MUP, maximal urethral pressure; Qmax, maximum urinary flow rate. Compared with before treatment, *P<0.05, **P<0.01.

Table 6. Comparison of EMG values and ICI-Q-SF scores before and after treatment ($\overline{X}$ ± SD)

	Observation group (n=90)	Control group (n=90)	t	P
EMG (μV)				
Before treatment	7.60±2.21	7.11±1.80	1.631	0.105
After treatment	10.12±2.45**	8.87±1.46**	4.158	<0.001
ICI-Q-SF (score)				
Before treatment	16.69±4.98	17.32±4.64	0.878	0.381
After treatment	10.07±2.45**	12.40±2.37**	6.485	<0.001

Note: EMG, electromyogram; ICI-Q-SF, International Consultation Committee on Incontinence Questionnaire Short Form. Compared with before treatment, **P<0.01.

PSUI were vaginal delivery, urinary incontinence before pregnancy, new urinary incontinence in pregnancy, and delivery of a large infant (P<0.05, OR>1). See **Table 2**.

Comparison of general information

There was no statistical difference in general information between the observation and control groups (all P>0.05). See **Table 3**.

Comparison of clinical efficacy

After treatment, compared with the control group, the observation group had a higher total effective rate (P<0.05). See **Table 4**.

Comparison of urodynamic indexes before and after treatment

Compared with before treatment, MUCP, MUP and Qmax in the observation and control groups were significantly increased after treatment, and the values in the observation group were greater than those in the control group (all P<0.05). See **Table 5**.

Comparisons of EMG values and ICI-Q-SF scores

Compared with before treatment, increased EMG values and decreased ICI-Q-SF scores were seen in the observation and control groups after treatment, and more obvious changes were seen in the observation group (both P<0.001). See **Table 6** and **Figure 1**.

Discussion

With the increase of fetal weight during pregnancy, organs and tissues around the pelvic floor are displaced, pelvic floor tissues are damaged to different degrees, and urinary incontinence is induced by obstruction of urethral closure after delivery [12]. The study of Wang et al. [13] showed that the incidence of PSUI after vaginal delivery was significantly higher than that after cesarean section, indicating that cesarean section is a protective factor for PSUI. Research [14] found that compared with normal pregnant women, the incidence of PSUI was 2.3 times higher in women with urinary incontinence before pregnancy, and 3-5 times higher in women with new urinary incontinence in pregnancy. The results of this study showed that the risk factors for PSUI were vaginal delivery, urinary incontinence before pregnant, new urinary incontinence in pregnancy, and delivery of a large infant, which was similar to our results. This is because the process of pregnancy may lead to pelvic floor functional decline, secondary vaginal delivery may damage pelvic floor type I muscle fibers, and gestation and delivery process of macrosomia (neonatal weight of ≥4,000 g) for maternal pelvic floor muscle injury is more serious. Some scholars believe that BMI, the number of abortions and multiple births are also related to the occurrence of PSUI [15]. However, this result

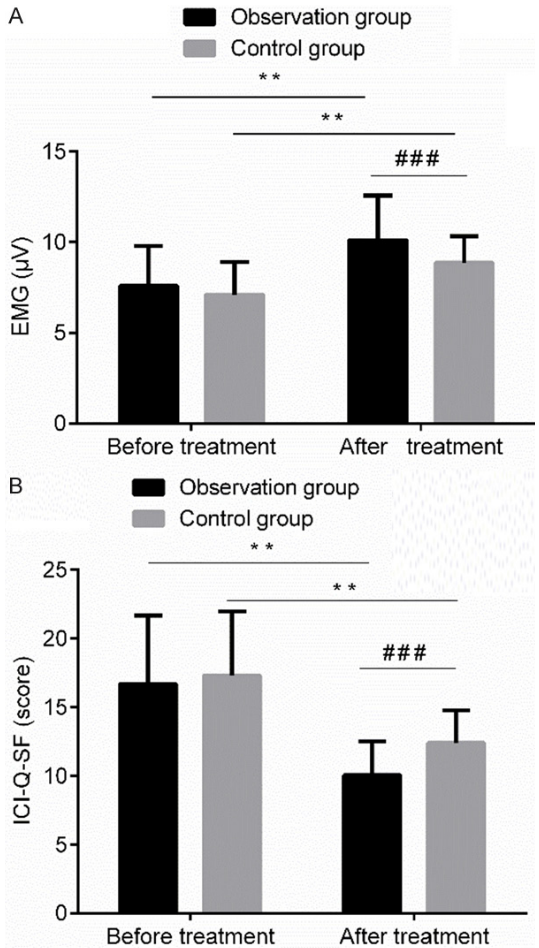

Figure 1. Comparison of EMG values and ICI-Q-SF scores before and after treatment. A: EMG values; B: ICI-Q-SF scores. Compared with before treatment, **P<0.01; compared with control group, ###P<0.001. EMG, electromyogram; ICI-Q-SF, International Consultation Committee on Incontinence Questionnaire Short Form.

was not found in this study, which may be related to the sample size and the individual differences of enrolled mothers.

Most of PSUI is recoverable, but Celada P et al. [16] pointed out that the symptoms of urinary incontinence in puerperae with new urinary incontinence in pregnancy can last for 10 years or even longer. Therefore, timely detection and reasonable treatment are crucial to improve maternal postpartum quality of life. The key to treatment is to increase the stability of detrusor muscle and restore its normal function.

EB combined with NES is a treatment model designed for pelvic floor muscle training in patients with urinary incontinence. Studies [17, 18] have found that electrical stimulation of pelvic floor muscles can enhance pelvic floor muscle tension and reduce the occurrence of PSUI. However, electrical stimulation only causes passive muscle contraction, and some patients are able to exercise or contract pelvic floor muscles in a wrong way, which affects the therapeutic effect. Biofeedback can feed back the signal that improves the recovery of muscle motor function to patients, so it enables patients to autonomously and accurately control the contraction of pelvic floor muscles and improve the therapeutic effect of electrical stimulation [19, 20]. In this study, the urodynamic indexes (PMUC, PMU, Qmax and EMG) in the observation group after treatment were significantly higher than those in the control group. The total effective rate of the observation group was up to 96.67% after treatment, which was significantly higher than that of the control group. This suggests that the application of EB on the basis of NES can significantly improve urodynamics, enhance pelvic floor muscle tension, and ameliorate urinary incontinence symptoms, which is consistent with the research results of Terlikowski et al. [21]. In addition, ICI-Q-SF was used to assess the postpartum quality of life of PSUI patients. The results showed that 3 months after treatment, ICI-Q-SF scores in the observation group were significantly lower than those in the control group, indicating that EB on the basis of NES can significantly improve the quality of life after delivery in PSUI patients.

However, limitations also exist in this study. Due to the limited sample size and the lack of long-term follow-up, the effects of EB combined with NES on long-term urodynamics and pelvic floor muscle strength of PSUI patients cannot be determined. It should be further explored in the future study.

In conclusion, the risk factors for PSUI are vaginal delivery, urinary incontinence before being pregnant, new urinary incontinence in pregnancy, and delivery of a large infant. The application of EB combined with NES is worthy of clinical promotion with the advantages of significantly improved postpartum urodynamics, enhanced pelvic floor muscle tension, ameliorated urinary incontinence symptoms and improved quality of life.

Disclosure of conflict of interest

None.

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References

[1] Braga A, Caccia G, Sorice P, Cantaluppi S, Coluccia AC, Di Dedda MC, Regusci L, Ghezzi F, Uccella S and Serati M. Tension-free vaginal tape for treatment of pure urodynamic stress urinary incontinence: efficacy and adverse effects at 17-year follow-up. BJU Int 2018; 122: 113-117.

[2] Li YT and Lee WL. Is it really risky for postpartum stress urinary incontinence in the first year postpartum? J Chin Med Assoc 2018; 81: 582.

[3] Leroy Lda S, Lucio A and Lopes MH. Risk factors for postpartum urinary incontinence. Rev Esc Enferm USP 2016; 50: 200-207.

[4] Zhu L, Li L, Lang JH and Xu T. Prevalence and risk factors for peri- and postpartum urinary incontinence in primiparous women in China: a prospective longitudinal study. Int Urogynecol J 2012; 23: 563-572.

[5] Song P, Wen Y, Huang C, Wang W, Yuan N, Lu Y, Wang Q, Zhang T and Wen J. The efficacy and safety comparison of surgical treatments for stress urinary incontinence: a network meta-analysis. Neurourol Urodyn 2018; 37: 1199-1211.

[6] Carter E and Cartwright R. Surgical interventions for stress urinary incontinence. BMJ 2019; 365: l2350.

[7] Vinarov A, Atala A, Yoo J, Slusarenco R, Zhumataev M, Zhito A and Butnaru D. Cell therapy for stress urinary incontinence: present-day frontiers. J Tissue Eng Regen Med 2018; 12: e1108-e1121.

[8] Jha S, Walters SJ, Bortolami O, Dixon S and Alshreef A. Impact of pelvic floor muscle training on sexual function of women with urinary incontinence and a comparison of electrical stimulation versus standard treatment (IPSU trial): a randomised controlled trial. Physiotherapy 2018; 104: 91-97.

[9] Yeung K, Lui KL, Ho WF, Li CM, Fan CW and Tang CN. Evaluation of treatment outcomes in pelvic floor muscle training with biofeedback versus intra-vaginal electrical stimulation in women with urinary incontinence in Hong Kong Pamela Youde Nethersole Eastern Hospital. Urol Sci 2016; 27: S27.

[10] Abrams P, Andersson KE, Apostolidis A, Birder L, Bliss D, Brubaker L, Cardozo L, Castro-Diaz D, OConnell PR, Cottenden A, Cotterill N, De Ridder D, Dmochowski R, Dumoulin C, Fader M, Fry C, Goldman H, Hanno P, Homma Y and Wein A. Evaluation and treatment of urinary incontinence, pelvic organ prolapse, and faecal incontinence. Report ofthe international scientific committee. Neurourol Urodyn 2018; 37: 2271-2272.

[11] Busquets CM and Serra TR. Validation of a Spanish version of the international consultation on incontinence questionnaire Short-Form. Rev Med Chil 2012; 140: 340-346.

[12] Seth JH and Walker R. Case of acute severe postpartum urinary incontinence: an extravesical subsphincteric prolapsed ureterocoele. BMJ Case Rep 2018; 2018: bcr2017220290.

[13] Wang WL, Jardine JE and Einerson BD. Can planned caesarean section prevent long-term urinary stress incontinence in twin pregnancy? BJOG 2018; 125: 1694.

[14] Chen L, Luo D, Yu X, Jin M and Cai W. Predicting stress urinary incontinence during pregnancy: combination of pelvic floor ultrasound parameters and clinical factors. Acta Obstet Gynecol Scand 2018; 97: 966-975.

[15] Barbosa L, Boaviagem A, Moretti E and Lemos A. Multiparity, age and overweight/obesity as risk factors for urinary incontinence in pregnancy: a systematic review and meta-analysis. Int Urogynecol J 2018; 29: 1413-1427.

[16] Celada P, Canete P, Ortiz Murillo E, Tarin JJ and Cano A. Effectiveness and quality of life 10 years after transobturator suburethral tape surgery for stress urinary incontinence. J Obstet Gynaecol Res 2018; 44: 518-523.

[17] Richmond CF, Martin DK, Yip SO, Dick MA and Erekson EA. Effect of supervised pelvic floor biofeedback and electrical stimulation in women with mixed and stress urinary incontinence. Female Pelvic Med Reconstr Surg 2016; 22: 324-327.

[18] Sun Z, Zhu L, Lang J, Wang W, Shi H, Pang H and Shi X. Continuous improvement of portable domestic pelvic floor neuromuscular electrical stimulation on the pelvic floor function of patients with urinary incontinence. Zhonghua Fu Chan Ke Za Zhi 2015; 50: 937-941.

[19] Demidko YL, Glybochko PV, Vinarov AZ, Rapoport LM, Chaly ME, Akhvlediani ND, Esilevsky YM, Demidko LS, Bayduvaliev AM and Myannik SA. Treatment of urinary incontinence after radical prostatectomy using training of pelvic

muscles under the control of biofeedback. Urologiia 2015; 41-43.

[20] Liu J, Zeng J, Wang H, Zhou Y and Zeng C. Effect of pelvic floor muscle training with biofeedback on stress urinary incontinence in postpartum and post-menopausal women. Zhonghua Fu Chan Ke Za Zhi 2014; 49: 754-757.

[21] Terlikowski R, Dobrzycka B, Kinalski M, Kuryliszyn-Moskal A and Terlikowski SJ. Transvaginal electrical stimulation with surface-EMG biofeedback in managing stress urinary incontinence in women of premenopausal age: a double-blind, placebo-controlled, randomized clinical trial. Int Urogynecol J 2013; 24: 1631-1638.