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Original Article

Multivariate analysis on improvement of nocturia in patients with benign prostatic hyperplasia after transurethral plasmakinetic prostatectomy

Yan Chen, Fukang Zhen, Shiqiang Su, Fengchao Yin, Chao Sun

Department of Urology, Shijiazhuang People's Hospital, Shijiazhuang 050000, Hebei Province, China

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Abstract: Objective: To investigate the effect of transurethral plasmakinetic prostatectomy (TUPKP) on nocturia in patients with benign prostatic hyperplasia (BPH) and the factors affecting the postoperative efficacy. Methods: From May 2016 to June 2019, 158 patients with BPH treated in our hospital were selected and randomly separated into two groups. In the control group (CG), 71 patients received transurethral resection of prostate. In the observation group (OG), 87 patients received TUPKP. The postoperative indexes (PSA, maximum flow rate) of all patients were compared. The international prostate symptom score (IPSS), overactive bladder symptom score (OABSS) and quality of life score (QOL) were compared before and after operation. Logistic analysis was used to analyze the related factors affecting the improvement of nocturia. Results: After operation, the expression of PSA in OG was obviously lower than that in CG, while the expression of Qmax was significantly higher than that in CG. The postoperative IPSS (urinary frequency, urgency of urination, number of nocturia, endless urination, urination segmentation, thinning of urinary stream and waiting for urination) scores of patients in OG were obviously lower than those in CG. After operation, the OABSS scores in OG were obviously lower than those in CG, while the QOL scores of patients in OG were obviously higher than those in CG. Patients with age > 60, high PSA, low Qmax, high IPSS score, high OABSS score, low QOL score and transurethral resection of prostate had an increased risk of nocturia symptoms. Conclusion: The increase of nocturia is the result of multiple risk factors, and TUPKP intervention can reduce the number of nocturia, ameliorate micturition symptoms and improve the quality of life for patients with BPH.

Keywords: Benign prostatic hyperplasia, transurethral plasmakinetic prostatectomy, improvement of nocturia symptoms, multivariate analysis

Introduction

BPH is one of the most common diseases in adult males clinically [1], which is characterized by the proliferation of smooth muscle cells and epithelial cells in the transitional region of prostate [2]. BPH often develops in small areas (transitional regions) near urethra [3]. Clinically, the incidence of BPH increases with age, so the demand for intervention also increases [4]. The clinical treatment options for BPH include drug treatment, observation, waiting and surgical treatment [5]. However, the surgery is the most effective method to treat BPH, and there are many surgical methods available in clinic, so it is particularly important to choose effective and safe surgical methods.

In recent years, with the development of new scientific and technological methods, more advanced surgical techniques have been adopted in the treatment of prostatic hyperplasia [6]. For example, the rapid development of TUPKP is characterized by low risk of bleeding, clear vision, high safety, quick recovery and less postoperative complications [7]. TUPKP is clinically considered to be more suitable for the anatomical structure of prostate and patients with prostate volume larger than 80 ml, which avoids the limitation of the volume and time of hyperplasia glands [8]. Other studies have shown that [9] TUPKP has great advantages in reducing the incidence of traditional prostatic hyperplasia. For example, studies by Hu Y have shown that TUPKP operation has significant long-term clinical efficacy and safety for patients with BPH, and the postoperative urethral stricture and reoperation rate are low [10]. Most patients with BPH are accompanied by

increased nocturia, which seriously affects the quality of life of patients. For example, with the increase of nocturia frequency, the sleep is interrupted, resulting in decreased sleep quality, fatigue, muscle stiffness and attention decrease [11]. The nocturia has a variety of causes. The clinical results reveal that nocturia after prostatectomy may show a different clinical course from other lower urinary tract symptoms [12]. Therefore, the improvement of nocturia is often regarded as one of the indexes for the treatment of BPH in clinic.

In this study, TUPKP was given to patients with BPH to observe its effect on the patients and the improvement of BPH. Besides, logistics multi-factor regression analysis was conducted for the patients after treatment to analyze the risky factors affecting the nocturia of patients.

Materials and methods

Baseline data

From May 2016 to June 2019, 158 patients with BPH treated in Shijiazhuang People's Hospital were selected and randomly separated into two groups. In CG, 71 patients received transurethral resection of prostate. In OG, 87 patients received TUPKP.

Inclusion criteria: In both groups, patients were diagnosed with BPH [13], with good compliance and complete clinical data, and all of them were in accordance with surgical indications. This study was approved by the ethics committee of our hospital. All patients and their dependents were informed in advance, and a complete informed consent form was signed.

Exclusion criteria were as below: Those with urinary system infection, abnormal liver and kidney function; those who quit the experiment halfway; those who had a history of mental illness; those who had abnormal coagulation function and immune function; and those who were not interviewed.

Surgical methods

All patients were strictly prepared before operation, and the combined spinal and epidural analgesia was given to the patients to obtain the bladder lithotomy position. In CG, patients were treated with transurethral resection of prostate. The medical staff assisted the patient to adjust the surgical position and laid the towel routinely. The normal saline was used for lavage. The output power was set at 180-240 W, the electric cutting power was set at 60 W, and the 5% mannitol solution was used for continuous low-pressure irrigation. In OG, patients were treated with TUPKP. The electrocoagulation power was 40-80 W, the electric cutting power was 120-160 W, and the normal saline was used for continuous low-pressure lavage. The methods of operation were the same for both groups. The urethra was dilated to F24 in CG and F28 in OG. After inserting the resectoscope, the prostate was observed. At 5 o'clock and 7 o'clock, the electroresection was performed from the neck of the bladder to the seminal colliculus, as deep as the capsule layer. The prostate tissue in the left and right lobes was removed. The electrosurgical operation was rapid, and the scope was from inside to outside, not exceeding the seminal colliculus. After excision, the wound surfaces such as prostatic bladder tip, neck, and bladder crypt were repaired, the prostatic detritus was sucked out of the bladder, and the hemostasis was performed.

Outcome measures

1. The expression of prostate specific antigen (PSA) was detected in the two groups before and after operation. The maximum urine flow rate (Qmax) was recorded. 2. International prostate symptom scale (IPSS) [14]: There were seven dimensions, including urinary frequency, urgency of urination, number of nocturia, endless urination, urination segmentation, thinning of urinary stream, and waiting for urination. Each item was scored 0-5 points according to the severity of the patient's symptoms, and the higher the score, the more serious the symptoms. 3. Quality of life (QOL) scoring criteria [15] included 12 items (appetite, spirit, sleeping, fatigue, pain, family understanding and cooperation, colleagues understanding and cooperation, knowledge and cognition of one's own diseases, attitude towards therapy, daily living, side effects of treatment and facial expressions). Each item was scored from 1 to 6 points according to the severity of the patient, with a total score of 60 points. The higher the score, the better the quality of life. 4. Overactive bladder symptom scale (OABSS) [16]: There

Table 1. General data of patients in OG and CG [n (%)] (mean ± SD)

Classification	OG (n=87)	CG (n=71)	t/χ^2 value	*P* value
Average age (years old)	73.18±6.89	74.21±6.94	0.932	0.353
BMI (kg/m^2)	26.47±2.43	26.84±2.65	0.914	0.362
Prostate size (g)	71.37±7.43	72.04±7.47	0.563	0.575
Course of disease (years)	3.27±0.32	3.31±0.35	0.749	0.455
Place of residence			0.890	0.345
City	47 (54.02)	33 (46.48)		
Rural	40 (45.98)	38 (53.52)		
Nation			1.018	0.313
Han nationality	45 (51.72)	31 (43.66)		
Minority nationality	42 (48.28)	40 (56.34)		
Educational background			0.375	0.540
≥ high school	35 (40.23)	32 (45.07)		
< high school	52 (59.77)	39 (54.93)		
Smoking history			0.671	0.413
Yes	51 (58.62)	37 (52.11)		
No	36 (41.38)	34 (47.89)		
Drinking history			0.105	0.746
Yes	48 (55.17)	41 (57.75)		
No	39 (44.83)	30 (42.25)		
Diet			0.230	0.631
Light	42 (48.28)	37 (52.11)		
Spicy	45 (51.72)	34 (47.89)		
Systolic blood pressure (mmHg)	118.12±9.21	116.34±9.14	1.213	0.227
Diastolic blood pressure (mmHg)	74.98±7.43	75.07±7.29	0.076	0.939

were four dimensions. A score of 0-5 indicated mild bladder overactivity, a score of 6-11 indicated moderate bladder overactivity, and a score above 12 indicated severe bladder overactivity. 5. The risk factors affecting nocturia were analyzed.

Statistical analysis

SPSS22.0 (Beijing Baiao Yijie Technology Co., Ltd., China) was used for statistical analysis. The counting data were represented by cases/percentage (n/%). The chi-square test was used for comparison of enumeration data between groups. When theoretical frequency in chi-square test was less than 5, the continuous correction chi-square test was applied. The quantitative data were represented by mean ± standard deviation (mean ± SD). The independent sample T test was used for comparison of measurement data between groups. The paired T test was used for comparison between groups before and after intervention. Logistic multi-factor regression was used to analyze the risk factors affecting the nocturia symptoms of patients. The difference was statistically significant with $P < 0.05$.

Results

Baseline data

There was no significant difference in mean age, body mass index, prostate size, course of disease, place of residence, nation, education background, smoking history, drinking history, diet, systolic blood pressure and diastolic blood pressure between OG and CG ($P > 0.05$) (**Table 1**).

Improvement of postoperative indicators in both groups

There was no obvious difference in the expressions of PSA and Qmax in both groups before operation ($P > 0.05$), but the expressions of PSA and Qmax in both groups were obviously improved after operation ($P < 0.05$). After operation, the expression of PSA in OG was obviously lower than that in CG, while the expression of Qmax was significantly higher than that in CG ($P < 0.05$) (**Table 2**).

Comparison of IPSS scores in both groups before and after operation

There was no obvious difference in IPSS scores in both groups before operation ($P > 0.05$), but the IPSS scores of the two groups were obviously improved after operation ($P < 0.05$). After operation, the urinary frequency, urgency of urination, number of nocturia, endless urination, urination segmentation, thinning of urinary stream and waiting for urination in OG were significantly lower than those in CG ($P < 0.05$) (**Table 3**).

Table 2. Improvement of postoperative indicators in both groups (mean ± SD)

Grouping	Cases	PSA (ng/ml)		Qmax (ml/s)	
		Before operation	After operation	Before operation	After operation
OG	87	7.43±1.04	4.32±0.46	5.65±0.24	12.43±1.65
CG	71	7.45±1.06	5.26±0.43	5.73±0.32	11.43±1.78
t	-	0.119	13.150	1.794	3.657
P	-	0.905	< 0.001	0.075	0.001

Comparison of OABSS scores in both groups after operation

There was no obvious difference in OABSS scores in both groups before operation (P > 0.05), but the OABSS scores were improved in the two groups after operation (P < 0.05), and the OABSS scores in OG were obviously lower than those in CG after operation (P < 0.05) (**Figure 1**).

Comparison of QOL scores in both groups after operation

There was no obvious difference in QOL scores in both groups before operation (P > 0.05), but the QOL scores were improved in the two groups after operation (P < 0.05), and the QOL scores in OG were obviously higher than those in CG after operation (P < 0.05) (**Figure 2**).

Analysis of factors affecting the improvement of nocturia symptoms in patients

By comparing the differences of clinical parameters and related indexes that affected the curative effect of patients after operation, it was found that there were 43 patients in the two groups who failed to improve their nocturia symptoms after treatment, and 115 patients who were effective in improving nocturia symptoms after treatment. The univariate analysis of patients with BPH showed that there were statistically obvious differences in both groups in age, PSA, Qmax, urination symptoms, obstruction symptoms, IPSS score, OABSS score, QOL score and treatment methods (P < 0.05). Multivariate logistic regression analysis was conducted for the factors with differences. The results revealed that age (P=0.001), PSA (P=0.005), Qmax (P=0.002), IPSS score (P=0.003), OABSS score (P=0.004), QOL score (P=0.001) and treatment methods (P=0.001) were risk factors for nocturia. Patients with age > 60, high PSA, low Qmax, high IPSS score, high OABSS score, low QOL score and transurethral resection of prostate had an increased risk of nocturia symptoms (**Tables 4**-**6**).

Discussion

With the development of society and the aggravation of population aging, BPH has gradually become one of the most concerned diseases in urology [17, 18]. BPH is one of the most common causes of dysuria in middle-aged and elderly men, which is a benign disease with slow progress [19]. It is mainly characterized by frequent and urgent urination, endless urination, waiting for urination and other lower urinary tract symptoms, which seriously impacts the quality of life of patients [20]. In this research, TUPKP was applied to analyze the postoperative efficacy of patients and explore the relevant factors affecting the efficacy.

TUPKP is a newly developed method in the field of transurethral surgery, which applies plasma cutting technology to urological endoscopic system, so as to achieve the purpose of prostatectomy [21]. In this study, we used TUPKP to treat patients with BPH, and found that the micturition symptoms and quality of life of patients were obviously improved after treatment intervention. Studies have revealed that [22] the PAS level in patients with BPH is significantly increased, while Qmax is significantly decreased. The results of this study showed that the expression of PSA in OG was significantly lower than that in CG after operation, while the expression of Qmax was significantly higher than that in CG. This was consistent with the conclusion of a previous study [23], indicating that TUPKP surgery could cause smaller wounds in patients compared with tranurethral resection of prostate, and the operation was relatively simple. Therefore, the symptoms such as the expressions of PSA and Qmax could be better improved in patients after operation. Studies have shown that [24] the single-stage electrodes are used to remove enlarged prostate tissue one by one in tranthrothral prostatectomy, which has a long-term effect and sig-

Table 3. Comparison of IPSS scores between the two groups before and after operation (mean ± SD)

Grouping	Cases	Urinary frequency		Urgency of urination		Number of nocturia		Endless urination		Urination segmentation		Thinning of urinary stream		Waiting for urination	
		Before operation	After operation	Before operation	After operation	Before operation	After operation	Before operation	After operation	Before operation	After operation	Before operation	After operation	Before operation	After operation
OG	87	3.82±0.54	1.65±0.23	3.04±0.43	0.98±0.31	4.62±0.37	2.32±0.12	3.86±0.46	1.12±0.15	3.62±0.65	0.94±0.18	4.13±0.54	0.91±0.14	2.83±0.23	0.63±0.09
CG	71	3.87±0.56	2.09±0.28	3.07±0.41	1.34±0.36	4.61±0.34	2.89±0.18	3.83±0.44	1.43±0.18	3.69±0.61	1.13±0.22	4.11±0.57	1.32±0.32	2.88±0.37	0.89±0.14
t	-	0.569	10.850	0.445	6.752	0.175	23.770	0.416	11.810	0.692	5.971	0.226	10.760	1.039	14.120
P	-	0.569	< 0.001	0.656	< 0.001	0.861	< 0.001	0.678	< 0.001	0.489	< 0.001	0.822	< 0.001	0.301	< 0.001

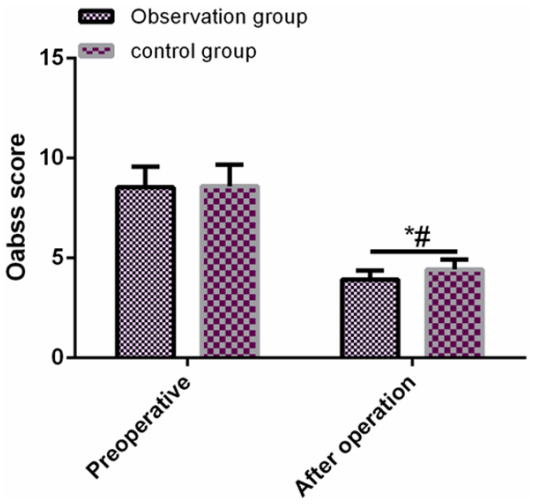

Figure 1. Comparison of OABSS scores between the two groups after operation. There was no significant difference in OABSS scores between the two groups before operation, but the OABSS scores in OG were significantly lower than those in CG after operation. Note: Compared with those before surgery, * < 0.05. Comparison between the two groups, # < 0.05.

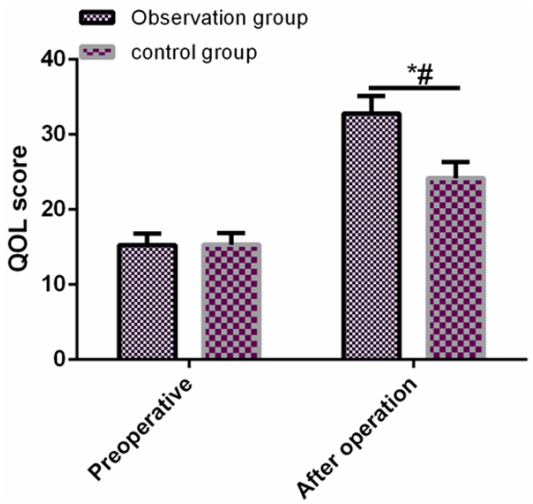

Figure 2. Comparison of QOL scores between the two groups after operation. There was no significant difference in QOL scores between the two groups before operation, but the QOL scores in OG were significantly higher than those in CG after operation. Note: Compared with those before surgery, * < 0.05. Comparison between the two groups, # < 0.05.

nificantly improves Qmax, urinary symptoms (IPSS score) and health-related quality of life. This was similar to the results of this research. In this research, the improvement of symptoms (urinary frequency, urgency of urination, number of nocturia, endless urination, micturition segmentation, thinning of urinary stream and waiting for micturition) in the IPSS score of OG was significantly better than that of CG. This might be because the TUPKP surgical wound was relatively small, the local inflammatory stimulus response might be easier to recover, the symptoms of increased urinary frequency and nocturia were less severe, and the straighter urethra and smaller urethral resistance reduced the residual urine volume of the bladder, thus reducing postoperative nocturia symptoms and improving IPSS score.

Studies have shown that [25] the long-term progress of BPH can lead to obstruction of bladder outlet. If the obstruction persists, it will lead to decreased bladder function, resulting in overactive bladder, so it will lead to an increase in OABSS score. The overactive bladder can lead to urinary frequency, urgency of urination or increased nocturia [26]. The results of this research revealed that the OABSS score of patients in OG was obviously lower than that in CG after operation, and this was similar to the results of a previous research [27], which indicated that TUPKP could relax the bladder outlet and the detrusor function of patients recovered quickly after operation. Although TUPKP can improve postoperative nocturia symptoms, most patients have urinary frequency, urgency of urination and increased nocturia after relieving the obstruction of bladder outlet, especially within 3 months after operation, which seriously impacts the postoperative quality of life of patients [28]. However, the results of this research revealed that the QOL scores of patients in OG were significantly higher than those in CG after operation, indicating that TUPKP could significantly ameliorate the micturition symptoms of patients, thus improving the postoperative quality of life of patients. BPH is a progressive disease, and its incidence increases with age [29]. Studies have shown that [30] the age is an independent factor affecting the improvement of postoperative nocturia symptoms in patients with BPH. The older the patients, the worse the improvement of postoperative nocturia symptoms. It also shows that increased nocturia is positively correlated with scores of overactive bladder, indicating that overactive bladder may be related to the development and progression of increased nocturia. In this study, logistic multivariate regression was used to analyze the factors influencing the improvement of postoperative nocturia symptoms in patients with BPH.

Table 4. Analysis of factors affecting the improvement of nocturia symptoms in patients [n (%)] (mean ± SD)

Classification	n	Effective group (n=115)	Ineffective group (n=43)	t/χ^2 value	*P* value
Age/years old				4.425	0.035
≥60	85	56 (65.88)	29 (34.12)		
< 60	73	59 (80.82)	14 (19.18)		
PSA (ng/ml)	158	4.47±0.38	5.14±0.44	9.440	< 0.001
Qmax (ml/s)	158	12.87±1.94	10.79±1.84	6.081	< 0.001
IPSS score	158	10.23±1.21	16.07±1.62	24.510	< 0.001
OABSS score	158	3.84±0.37	4.36±0.43	7.516	< 0.001
QOL score	158	32.43±2.29	23.75±2.12	21.630	< 0.001
Treatment methods				22.921	< 0.001
Transurethral resection of prostate	87	50 (42.53)	37 (42.53)		
Transurethral plasmakinetic prostatectomy	71	65 (91.55)	6 (8.45)		

In CG, 71 patients received transurethral resection of prostate. In OG, 87 patients received transurethral plasmakinetic prostatectomy.

Table 5. Logistic multivariate regression analysis assignment

Factors	Variables	Assignment
Age ≥60	X1	Yes=0, No=1
PSA (ng/ml)	X2	High=0, Low=1
Qmax (ml/s)	X3	High=0, Low=1
IPSS score	X4	High=0, Low=1
OABSS score	X5	High=0, Low=1
QOL score	X6	High=0, Low=1
Treatment methods	X7	Transurethral resection of prostate=0, Transurethral plasmakinetic prostatectomy=1

Table 6. Multivariate logistic regression analysis of influencing improvement of nocturia symptoms in patients

Variables	B	S.E	Wals	P	OR	95% CI
Age ≥60	0.634	0.179	9.157	0.001	0.257	0.129-0.514
PSA (ng/ml)	0.443	0.032	2.571	0.005	0.894	0.447-1.788
Qmax (ml/s)	0.628	0.168	5.283	0.002	0.468	0.234-0.936
IPSS score	0.643	0.157	5.231	0.003	0.452	0.226-0.904
OABSS score	0.387	0.089	5.793	0.004	0.523	0.262-1.046
QOL score	0.583	0.095	5.829	0.001	0.268	0.134-0.536
Treatment methods	0.646	0.216	10.683	0.001	0.157	0.079-0.314

The results showed that patients with age > 60, high PSA, low Qmax, high IPSS score, high OABSS score, low QOL score and transurethral resection of prostate had an increased risk of nocturia symptoms.

Although this study revealed that TUPKP intervention is more beneficial to patients with BPH, there is still room for improvement. For example, we can supplement the basic experiments of the treatment mechanism of the two methods and explore the risk factors affecting the increase of nocturia in patients from the molecular level. In the future, we will gradually improve the research from the above perspectives.

To sum up, the increase of nocturia is the result of multiple risk factors, and TUPKP intervention can reduce the number of nocturia, ameliorate micturition symptoms and improve the quality of life for patients with BPH.

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Disclosure of conflict of interest

None.

Address correspondence to: Chao Sun, Department of Urology, Shijiazhuang People's Hospital, No. 365 Jianhua South Street, Shijiazhuang 050000, Hebei Province, China. Tel: +86-0311-69089930; E-mail: sunchao198210@163.com

References

[1] Yue L, Wang T, Ge Y, Ge M, Zhang C, Hou Q, Wang W, Tian H, Ren B, Du B and Zhang W. Prevalence and heritability of benign prostatic hyperplasia and LUTS in men aged 40 years or older in Zhengzhou rural areas. Prostate 2019; 79: 312-319.

[2] Wu F, Ding S, Li X, Wang H, Liu S, Wu H, Bi D, Ding K and Lu J. Elevated expression of HIF-1alpha in actively growing prostate tissues is associated with clinical features of benign prostatic hyperplasia. Oncotarget 2016; 7: 12053-12062.

[3] Mohamed HM, Aly MS and Hussein TD. Genetic alterations in benign prostatic hyperplasia patients. Ger Med Sci 2017; 15: Doc16.

[4] Garcia C, Chin P, Rashid P and Woo HH. Prostatic urethral lift: a minimally invasive treatment for benign prostatic hyperplasia. Prostate Int 2015; 3: 1-5.

[5] Ng LG. Botulinum toxin and benign prostatic hyperplasia. Asian J Urol 2018; 5: 33-36.

[6] Hong DC, Jia W, Yu H, Ren LL, Hao JL, Liang G, Zhuang T, Chun YH, Xiang L, Hong JY, Qiang D and Qiang W. Comparison between thulium laser resection of prostate and transurethral plasmakinetic resection of prostate or transurethral resection of prostate. Sci Rep 2015; 5: 14542.

[7] Chang Y, Chang J and Wang H. Transurethral balloon dilatation of the prostate and transurethral plasmakinetic resection of the prostate in the treatment of prostatic hyperplasia. Pak J Med Sci 2018; 34: 736-739.

[8] Jiang Y, Bai X, Zhang X, Wang M, Tian J, Mu L, Zhang N, Li M and Du Y. Comparative study of the effectiveness and safety of transurethral bipolar plasmakinetic enucleation of the prostate and transurethral bipolar plasmakinetic resection of the prostate for massive benign prostate hyperplasia (> 80 ml). Med Sci Monit 2020; 26: e921272.

[9] Li BH, Yu ZJ, Wang CY, Zi H, Li XD, Wang XH, Ren XY, Liu TZ and Zheng H. A preliminary, multicenter, prospective and real world study on the hemostasis, coagulation, and safety of hemocoagulase bothrops atrox in patients undergoing transurethral bipolar plasmakinetic prostatectomy. Front Pharmacol 2019; 10: 1426.

[10] Hu Y, Dong X, Wang G, Huang J, Liu M and Peng B. Five-year follow-up study of transurethral plasmakinetic resection of the prostate for benign prostatic hyperplasia. J Endourol 2016; 30: 97-101.

[11] Margel D, Lifshitz D, Brown N, Lask D, Livne PM and Tal R. Predictors of nocturia quality of life before and shortly after prostatectomy. Urology 2007; 70: 493-497.

[12] Hur KJ, Lee KW, Kim SJ, Kim KS, Bae WJ, Cho HJ, Hong SH, Lee JY, Hwang TK and Kim SW. Changes in nocturia and lower urinary tract symptoms after radical prostatectomy. World J Mens Health 2015; 33: 194-201.

[13] Krivoborodov GG, Efremov NS and Bolotov AD. Ultrasound indicators of the prostate, urinary bladder and uroflowmetry parameters in the diagnosis of infravesical obstruction in men with benign prostatic hyperplasia. Urologiia 2017; 9-14.

[14] Aghdam N, Pepin A, Buchberger D, Hirshberg J, Lei S, Ayoob M, Danner M, Yung T, Kumar D, Collins BT, Lynch J, Kataria S, Suy S and Collins SP. Stereotactic body radiation therapy (SBRT) for prostate cancer in men with a high baseline international prostate symptom score (IPSS >/= 15). Front Oncol 2020; 10: 1060.

[15] Choi WS and Son H. The change of IPSS 7 (nocturia) score has the maximum influence on the change of QoI score in patients with lower urinary tract symptoms. World J Urol 2019; 37: 719-725.

[16] Culha MG, Degirmentepe RB, Ozbir S, Cakir SS and Homma Y. Turkish validation of the overactive bladder symptom score (OABSS) and evaluation of mirabegron treatment response. Int Urogynecol J 2019; 30: 2121-2126.

[17] Welliver C, Feinstein L, Ward JB, Fwu CW, Kirkali Z, Bavendam T, Matlaga BR and McVary KT; Urologic Diseases in America Project. Trends in lower urinary tract symptoms associated with benign prostatic hyperplasia, 2004 to 2013: the urologic diseases in America project. J Urol 2020; 203: 171-178.

[18] Rastrelli G, Vignozzi L, Corona G and Maggi M. Testosterone and benign prostatic hyperplasia. Sex Med Rev 2019; 7: 259-271.

[19] Liao Z, Wang Z, Jin Z and Tang Z. Dysuria due to benign prostatic hyperplasia of the median lobe with ketamine-associated uropathy in a young male. BMC Urol 2019; 19: 105.

[20] Gupta NK, Gange SN and McVary KT. New and emerging technologies in treatment of lower urinary tract symptoms from benign prostatic hyperplasia. Sex Med Rev 2019; 7: 491-498.

[21] Wang K, Li Y, Teng JF, Zhou HY, Xu DF and Fan Y. Transurethral plasmakinetic resection of the prostate is a reliable minimal invasive technique for benign prostate hyperplasia: a meta-

analysis of randomized controlled trials. Asian J Androl 2015; 17: 135-142.
[22] Tanaka EY, Barbosa FT, Murta CB, Claro JF and Manzano JP. Diode laser vaporization for benign prostate hyperplasia: outcome after 126 procedures. J Endourol 2019; 33: 1025-1031.
[23] Pahwa M, Pahwa M, Pahwa AR, Girotra M, Chawla A and Sharma A. Changes in S-PSA after transurethral resection of prostate and its correlation to postoperative outcome. Int Urol Nephrol 2013; 45: 943-949.
[24] Huang SW, Tsai CY, Tseng CS, Shih MC, Yeh YC, Chien KL, Pu YS and Tu YK. Comparative efficacy and safety of new surgical treatments for benign prostatic hyperplasia: systematic review and network meta-analysis. BMJ 2019; 367: l5919.
[25] Suzuki T, Otsuka A and Ozono S. Combination of intravesical prostatic protrusion and resistive index is useful to predict bladder outlet obstruction in patients with lower urinary tract symptoms suggestive of benign prostatic hyperplasia. Int J Urol 2016; 23: 929-933.
[26] Savoie MB, Lee KA, Subak LL, Hernandez C, Schembri M, Fung CH, Grady D and Huang AJ. Beyond the bladder: poor sleep in women with overactive bladder syndrome. Am J Obstet Gynecol 2020; 222: 600, e1-e13.
[27] Hu H, Zhang W, Liu X, Wang H, Fang Z, Liang C, Wang T and Xu K. Nerve growth factor levels are associated with overactive bladder symptoms and long-term treatment outcome after transurethral resection of the prostate in patients with benign prostatic hyperplasia. J Urol 2018; 200: 620-625.
[28] de la Taille A, Robert G and Descazeaud A. Consequences of prostatic obstruction on bladder function, impact of removal, and management of recurrence after surgery. Prog Urol 2018; 28: 813-820.
[29] Li WM, Pasaribu N, Lee SS, Tsai WC, Li CY, Lin GT, Chuang HY, Tung YC and Tu HP. Risk of incident benign prostatic hyperplasia in patients with gout: a retrospective cohort study. Prostate Cancer Prostatic Dis 2018; 21: 277-286.
[30] Wen L, Wen YB, Wang ZM, Wen JG, Li ZZ, Shang XP, Liu ZS, Jia LH, Qin GJ, Heesakkers J, Corcos J and Djurhuus JC. Risk factors of nocturia (two or more voids per night) in Chinese people older than 40 years. Neurourol Urodyn 2015; 34: 566-570.