

Clinical Efficacy and Safety of Transurethral Plasma Enucleation in the Treatment of Benign Prostatic Hyperplasia

Qingqing Lu*

Ward 16, Haimen District Hospital of Traditional Chinese Medicine, Nantong 226001, Jiangsu Province, China

*Corresponding author: Qingqing Lu, podiori@126.com

Copyright: © 2023 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: *Objective:* This paper aims to analyze the effectiveness and safety of transurethral plasma enucleation in clinical treatment of benign prostatic hyperplasia. *Methods:* A total of 100 patients with benign prostatic hyperplasia who received surgical treatment in our hospital from January 2022 to January 2023 were randomly divided into groups by envelope method. 50 patients who received transurethral plasma resection of the prostate were selected as the control group and 50 patients who received transurethral plasma enucleation of the prostate were the study group. The effective rate of treatment, incidence of complications, postvoid residual (PVR) volume, maximum urinary flow rate (Qmax), and international prostate symptom score (I-PSS) were compared between the two groups. *Results:* By comparison, the effective rate of treatment in the study group was higher ($P < 0.05$). By comparison, the incidence of complications in the study group was lower ($P < 0.05$). Before treatment, there was no significant difference in PVR, Qmax, and I-PSS scores between the two groups ($P > 0.05$). After treatment, the PVR and I-PSS scores of the study group were lower, and Qmax was higher ($P < 0.05$). *Conclusion:* In the treatment of benign prostatic hyperplasia, the application of transurethral plasma enucleation can improve the clinical efficacy and clinical symptoms, with high safety and application value.

Keywords: Benign prostatic hyperplasia; Transurethral plasma enucleation; Safety; Effectiveness

Online publication: October 25, 2023

1. Introduction

In urology, benign prostatic hyperplasia (BPH) is very common. It is said that the incidence of this disease can reach 50–80%. The main symptoms of patients include frequent urination, increased residual urine volume, and dysuria. As the condition worsens, there will be varying degrees of overflow incontinence or chronic urinary retention^[1,2]. Middle-aged and elderly men are a high-incidence group for this disease, and the prevalence rate will increase with age. Transurethral resection of the prostate is currently the gold standard for the treatment of this disease, but there are major limitations in this operation. This operation is not suitable for patients with large prostate volume, and it is prone to complications such as bleeding or resection syndrome symptoms, which can adversely affect the prognosis^[3,4]. Transurethral plasma enucleation is based on the plasma bipolar

resection system. During the operation, the electrocoagulation system can be used to coagulate the bleeding site in real time to stop the bleeding, which can ensure the clarity of the intraoperative field of view and improve the clinical efficacy^[5,6]. In this study, 100 patients with benign prostatic hyperplasia admitted to our hospital from January 2022 to January 2023 were selected as the research objects, and they were compared and observed in groups to determine the efficacy and safety of transurethral plasma enucleation.

2. Materials and methods

2.1. General information

The study selected 100 patients with benign prostatic hyperplasia who were treated in our hospital from January 2022 to January 2023, and divided them into groups by random envelope method. There were 50 patients in the control group, aged between 54 and 72 years old, with an average of 63.26 ± 4.31 years old, the course of disease was between 1–3 years, with an average of 2.11 ± 0.36 years, the body mass index (BMI) was between 23–26 kg/m², the average BMI was 24.54 ± 0.72 kg/m². The 50 patients in the study group were aged between 55–74 years old, with an average of 64.17 ± 4.49 years old, the course of disease was between 1–4 years, with an average of 2.39 ± 0.44 years, the BMI was between 23–27 kg/m², the average BMI was 24.86 ± 0.85 kg/m². There was no significant difference in the general information between the two groups ($P > 0.05$). The ethics committee had approved the study.

Inclusion criteria included patients who meet the diagnostic criteria for benign prostatic hyperplasia confirmed by relevant tests^[7], patients with complete clinical data, and patients who voluntarily participate in the research project and sign the consent form.

Exclusion criteria were patients with contraindications related to surgery, patients without indications for surgery, patients with severe urinary system infection, and patients unable to communicate normally due to cognitive impairment, mental illness, etc.

2.2. Methods

The preoperative preparation methods of the two groups of patients were the same, the preoperative examination was improved, and the specific situation of the lesion hyperplasia was clarified. The operation plan of the control group was transurethral plasma resection of the prostate. The anesthesia plan was combined spinal and epidural anesthesia, and after the onset of anesthesia, the patient was assisted to take the bladder lithotomy position, and the operation was started after disinfection and draping. The distal landmark is the seminal colliculus, and the proximal landmark is the bladder neck. The right lobe, left lobe, and bladder neck were cut with an electric knife in sequence. After the operation was completed, the seminal colliculus was trimmed, and the excised tissue fragments were sucked out. After hemostasis with the electric knife, an F22# three-lumen catheter is inserted for urine drainage.

The operation plan of the study group was transurethral plasma enucleation. The anesthesia plan and the position of the operation were the same as that of the control group. The urethral dilation was determined according to the urethral caliber of the patient. The 26F resectoscope sheath was implanted and the plasma resectoscope was sent visually along the urethra to the bladder with saline as the medium. The target location was seminal colliculus of the prostate. At 6 o'clock, the prostate capsule was cut through all the entrances, and the incision was made in the direction of the bladder through the urethral mucosa. After enucleation of the prostate tissue, electrocoagulation was performed, and 200ml normal saline was injected into the bladder after it was clear that there was no bleeding. After the lens was removed, the bladder base was gently pressed by the hand, and a three-cavity catheter was indwelled after the urethral orifice was cleared. After the operation, it is

necessary to continue to flush the bladder with normal saline until the flushing fluid is clear.

2.3. Observation indicators

The indicators below were compared between the two groups.

- (1) Comparison of treatment effectiveness. Clinical symptoms have been significantly improved after treatment, postvoid residual (PVR) volume and maximum urinary flow rate (Qmax) have been improved by more than 90%, and no postoperative complications are considered to be markedly effective. Clinical symptoms have improved after treatment, with the improvement rate of PVR and Qmax less than 90%, but more than 70%, and mild complication, these are considered to be effective. The clinical symptoms are not improved after treatment, or aggravated, and the improvement rate of PVR and Qmax is less than 70%, and severe complication symptoms, these are ineffective. Treatment effective rate = $100.00\% - \frac{\text{number of ineffective cases}}{50} \times 100.00\%$.
- (2) Comparison of incidence of complications, including secondary bleeding, temporary urinary incontinence, and urethral injury.
- (3) Comparison of relevant indicators, including PVR, Qmax, and International Prostate Symptom Score (I-PSS). The I-PSS score ranges from 0 to 35 points, and the higher the score, the more severe the prostate symptoms of the patient.

2.4. Statistical methods

The study data were processed using SPSS24.0 statistical software package. The treatment response rate and complication rate were described by n (%), and the scores of PVR, Qmax, and I-PSS were described by mean \pm standard deviation (SD). By *t* and χ^2 tests, $P < 0.05$ meant that the difference between groups was statistically significant.

3. Results

3.1. Comparison of treatment effectiveness

The effective rate of treatment in the study group was 98.00% (49/50), 34 cases were markedly effective (68.00%), 15 cases were effective (30.00%), and 1 case was ineffective (2.00%). The effective rate of treatment in the control group was 80.00% (40/50), markedly effective in 23 cases (46.00%), effective in 17 cases (34.00%), and ineffective in 10 cases (20.00%). It can be seen that the study group has a higher effective rate ($P = 0.010$, $\chi^2 = 6.537$).

3.2. Comparison of incidence of complications

The incidence of complications in the study group was lower than that in the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of incidence of complications [n (%)]

Group	Secondary bleeding	Temporary urinary incontinence	Urethral injury	Complication rate
Control group (n = 50)	2 (4.00)	5 (10.00)	2 (4.00)	9 (18.00)
Study group (n = 50)	0 (0.00)	1 (2.00)	0 (0.00)	1 (2.00)
χ^2	-	-	-	5.444

3.3. Comparison of relevant indicators

Before treatment, there was no significant difference in PVR, Qmax, and I-PSS scores between the two groups ($P > 0.05$). After treatment, the PVR of the study group was lower than that of the control group, Qmax was higher than that of the control group, and I-PSS score was lower than that of the control group ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of related indicators (mean \pm SD)

Group	PVR (ml)		Qmax (ml/s)		I-PSS (points)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group (n = 50)	115.39 \pm 11.84	23.13 \pm 3.19 Δ	8.60 \pm 3.34	13.72 \pm 3.11 Δ	26.47 \pm 3.16	13.54 \pm 1.36 Δ
Study group (n = 50)	116.27 \pm 12.07	16.38 \pm 2.27 Δ	8.54 \pm 3.28	20.35 \pm 4.16 Δ	27.00 \pm 3.21	7.39 \pm 2.27 Δ
<i>t</i>	0.368	12.190	0.090	9.026	0.831	16.433
<i>P</i>	0.713	<0.001	0.928	<0.001	0.407	<0.001

Δ indicates $P < 0.05$ compared with before treatment

4. Discussion

Prostatic hyperplasia is a common disease of the urinary system, and with the prolongation of the course of the disease, the condition will become more and more serious, and related complications will be induced, which seriously affects the patients' quality of life. The probability of suffering from this disease is as high as 50% for the elderly over 60 years old, and as high as 80% for the elderly over 80 years old [8,9]. With the continuous advancement of minimally invasive technology, there are more and more surgical treatment options for this disease. Transurethral plasma resection is one of the commonly used surgical options for the treatment of this disease. However, during the operation, it needs to be resected along the direction of the urethral mucosa of the patient's prostate to the outer capsule, which will result in anatomical layers. Moreover, the distal vision is not clear, and during the resection process, the high temperature of the electric resection can cause scabbing of the surrounding tissue, which also has a certain impact on the effect of the operation. Transurethral plasma enucleation is based on transurethral plasma resection and has been improved. This technique uses high temperature to vaporize or cut the tissue, and can directly peel off the diseased tissue, with good hemostatic effect. Additionally, the visual field during the operation is also clearer, which can effectively make up for some shortcomings of transurethral plasma resection. The working principle of the transurethral plasma enucleation system is as follows. There are two electrodes in the electrocution ring, the working electrode and the return electrode, with physiological saline as the medium, and under the mediation of physiological saline, a control loop is formed with the electrocution ring [9,10]. The results of this study showed that after the patients in the study group received transurethral plasma enucleation, the effective rate of treatment was significantly higher than that of the control group, the PVR and I-PSS scores were lower than those of the control group, and the Qmax was higher than that of the control group ($P < 0.05$). The reason may be that during the transurethral plasma enucleation operation, the current passes through the circuit generated between the two electrodes to release radio frequency energy, and then through the transformation of the medium, a plasma region of highly ionized particles can be formed, which can break the organic molecular bonds of the prostate tissue. After it is fused into basic molecules or low molecules, and crushed or gasified, the proliferative prostate tissue can be separated and enucleated along the envelope more accurately and thoroughly, thus reducing the influence of

proliferative prostate tissue on urination to the greatest extent^[10,11]. Moreover, the visual field is clear during the operation, the bleeding can be treated in time, with good hemostasis effect, which is also conducive to postoperative repair. In addition, the control circuit formed with saline as the medium can prevent the current from passing through the human body from damaging the prostate capsule nerve during cutting. The results of this study also showed that the incidence of postoperative complications in the study group was lower than that in the control group ($P < 0.05$), which may be due to the fact that transurethral plasma enucleation adopts the method of hemostasis while cutting, thus it can reduce secondary hemorrhage risk. Additionally, it can also avoid heat penetration during electrocution, reduce damage to surrounding tissues, and further reduce the risk of complications such as postoperative urinary tract irritation. The results of this study are consistent with those of previous studies^[12,13], hence further confirming the effectiveness and safety of transurethral plasma enucleation in the clinical treatment of benign prostatic hyperplasia.

In summary, surgical treatment is currently the main clinical treatment for benign prostatic hyperplasia. In the selection of surgical methods, the application of transurethral plasma enucleation can improve the clinical treatment effect and clinical symptoms of patients, with high surgical safety and application value.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Zhao H, 2023, Analysis of the Effect of Transurethral Bipolar Plasma Enucleation of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Henan Journal of Surgery*, 29(3): 142–144.
- [2] Zhong H, Zhao F, Wu G, 2022, Efficacy and Safety Analysis of Transurethral Plasma Enucleation of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Chinese Science and Technology Journal Database (Citation Edition) Medicine and Health*, 2022(1): 8–10.
- [3] Han Y, Li Y, Bai Y, et al., 2021, Comparison of the Effect of Transurethral Plasma Enucleation of the Prostate and Transurethral Resection in the Treatment of Benign Prostatic Hyperplasia. *Contemporary Medical Forum*, 19(14): 71–73.
- [4] Urology Professional Committee of Chinese Research Hospital Association, Evidence-Based Medicine Branch of China Healthcare International Exchange Promotion Association, 2018, Guidelines for the Treatment of Benign Prostatic Hyperplasia in China (2018 Simplified Version). *Modern Journal of Urology*, 2018(9): 651–654.
- [5] Zhong X, Li X, 2020, Meta-Analysis of Transurethral Holmium Laser Enucleation and Transurethral Plasma Enucleation in the Treatment of Benign Prostatic Hyperplasia. *Modern Medicine*, 48(9): 1143–1149.
- [6] Zhu X, Li J, Yu Z, et al., 2022, A Comparative Study on the Clinical Efficacy of Transurethral Plasma Enucleation of the Prostate and Transurethral Resection of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Advances in Modern Biomedicine*, 22(12): 2280–2283 + 2288.
- [7] Ding H, Chen S, Jiang Q, 2022, Comparison of Short-Term Prognosis of Patients with Benign Prostatic Hyperplasia after Holmium Laser and Plasma Enucleation of the Prostate. *Chinese Medicine*, 17(2): 236–240.
- [8] Cai X, Mao M, Li X, et al., 2019, Comparative Analysis of the Efficacy and Safety of TUPKEP and TURP in the Treatment of Benign Prostatic Hyperplasia. *Chinese Sexology*, 28(3): 32–35.
- [9] Xiao H, Wu J, Feng J, 2020, Clinical Comparative Study of Transurethral Holmium Laser Enucleation of the Prostate and Transurethral Plasma Resection of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Chinese Sexology*, 29(1): 34–37.

- [10] Mou X, Xie H, Li Q, 2019, Exploring the Application Value of Transurethral Plasma Enucleation of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Chinese Sexology*, 28(3): 18–21.
- [11] Wei H, 2023, Comparative Analysis of Clinical Efficacy of Transurethral Bipolar Plasma Enucleation of the Prostate (TUPEP) and Transurethral Resection of the Prostate (TURP) in the Treatment of Benign Prostatic Hyperplasia. *Chinese Science and Technology Journal Database (Citation Edition)*. *Medicine and Health*, 2023(4): 66–69.
- [12] Niu X, 2022, Discussion on the Clinical Effectiveness and Safety of Transurethral Plasma Enucleation in the Treatment of Benign Prostatic Hyperplasia. *Systematic Medicine*, 7(17): 130–133.
- [13] Hong Y, Li W, Liu Z, et al., 2023, The Clinical Value of Transurethral Plasma Enucleation of the Prostate in the Treatment of Benign Prostatic Hyperplasia. *Chinese Medicine Innovation*, 20(1): 64–67.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.