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Study on the Treatment of Benign Prostate Hyperplasia Combined with Underactive Bladder Detrusor Contraction by Transurethral Plasma Enucleation of the Prostate

Yong Li, Zhongjun Chen

Department of Urology, People's Hospital of Songzi, Jingzhou, China
Email: m13135765759@163.com

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Abstract

Objective: Exploring the clinical efficacy of transurethral plasma enucleation of the prostate in the treatment of benign prostatic hyperplasia with underactive bladder detrusor contractility. **Methods**: Retrospective analysis of the clinical data of 68 patients with benign prostatic hyperplasia and underactive detrusor muscle contractility treated by our department from July 2021 to July 2022. The above patients all met the diagnosis of benign prostatic hyperplasia, excluding prostate cancer and urethral stricture. Urodynamics showed a decrease in the contractile force of the bladder detrusor muscle, and the surgical equipment used Olympus bipolar plasma resection equipment method. Divide the above patients into two groups: the experimental group of 34 patients who underwent transurethral plasma enucleation of the prostate and the control group of 34 patients who underwent transurethral plasma resection of the prostate. Evaluate the preoperative clinical baseline level and postoperative observation indicators of the two groups of patients, and compare the statistical differences between the two groups. **Results**: Both groups of patients successfully completed the surgery, and there were no serious complications such as rectal or bladder perforation during the surgery, with less bleeding. The postoperative QOL, IPSS, Qmax, and residual urine volume of patients undergoing transurethral plasma enucleation and resection of the prostate were significantly improved compared to those before surgery ($P < 0.05$). Meanwhile, through inter group comparison, the improvement of QOL, IPSS, Qmax, and residual urine volume after plasma enucleation was better than that of the plasma resection group, and the differences were statistically significant ($P < 0.05$), but there was no significant difference in surgical time between the two groups ($P > 0.05$). **Conclusion**: Transurethral enuclea-

tion of the prostate has good efficacy and safety in the treatment of benign prostatic hyperplasia combined with weakened detrusor muscle contractility. Compared with traditional electric resection surgery, the efficacy is more significant. In terms of the main complications of the surgery, although there are slightly more patients with temporary urinary incontinence after prostate enucleation, there is no statistically significant difference compared to after electric resection, and they can recover to normal in the short term.

Keywords

Transurethral Enucleation of the Prostate, Prostate Hyperplasia, Underactive Bladder Detrusor Contractility

1. Introduction

Benign prostatic hyperplasia (BPH) is a common condition in older men, leading to lower urinary tract symptoms (LUTS) and low quality of life (QoL), Epidemiologic studies of BPH from 25 countries have shown that the overall prevalence of BPH is 26.2%, and its incidence rate gradually increases with age [1]. Over the past ten years, with the continuous development of treatment equipment and accumulation of technology, transurethral enucleation of the prostate has become the main surgical procedure for the treatment of prostate hyperplasia, and a large number of studies have confirmed its safety and effectiveness, compared with the traditional way, prostate tissue removal is more thorough, the operation time is shorter, the bleeding is smaller, and the safety is fundamentally improved compared with the past [2] [3]. The safety of the procedure is radically improved compared to previous methods. Prostatic hyperplasia is urodynamically manifested as obstruction of the bladder outlet. Prolonged obstruction will lead to a loss of bladder detrusor function, resulting in bladder capacity sensitivity disorder, varying degrees of detrusor contraction, or even premature end of the micturition reflex, which affects the process of urination [4] [5]. In the past, for patients with decreased urethral muscle function, the choice of traditional electrosurgical methods needed to be more careful due to the occurrence of postoperative urinary retention again or the lack of significant symptom improvement. For the purpose of this study, we retrospectively analyzed the clinical data of 68 patients with prostatic hyperplasia combined with weakened bladder detrusor contraction treated in our department from July 2021 to July 2022, to further explore the clinical efficacy and safety of transurethral plasma enucleation of the prostate for the treatment of prostatic hyperplasia combined with weakened bladder detrusor contraction.

2. Patients and Methods

We retrospectively analyzed the clinical data of 68 patients with prostatic hyperplasia combined with weakened bladder detrusor contractility treated in our de-

partment from July 2021 to July 2022. All patients underwent quality of life (QOL) scoring, International Prostate Symptom Score (IPSS) scoring, urological ultrasound evaluation of the prostate size to calculate the volume as well as residual urine volume of bladder, urodynamics, PSA, etc., and all of the above patients were diagnosed with benign prostatic hyperplasia and excluded from prostate cancer and urethral stenosis. All of them conformed to the diagnosis of benign prostatic hyperplasia, excluded prostate cancer and urethral stenosis, and urodynamics suggested that the contraction force of bladder forcing muscle was weakened, and the surgical equipment used Olympus bipolar plasma electrocautery equipment method, and the above patients were divided into two groups by randomized numerical table method: 34 cases of the experimental group who underwent transurethral plasma enucleation of prostate, and 34 cases of the control group who underwent transurethral plasma electrocautery, and statistically analyzed. There was no statistically significant difference in the baseline levels of preoperative clinical indicators between the two groups ($P > 0.05$) (Table 1). The content of this study was approved by the Ethics Research Committee of the hospital; the enrolled patients and their families were aware of the content of this study and voluntarily signed an informed consent form.

3. Methods

3.1. Transurethral Plasma Enucleation of the Prostate Approach

After the patient was successfully anesthetized by combined lumbar and rigid anesthesia, a stone was taken and placed on the operation table, the operation field was routinely disinfected with iodine-vodine, a towel was spread, and the electroscope was inserted smoothly under direct vision, with an electrodesiccator power of 160 W and an electrocoagulant power of 100 W, and the urethral mucosa was incised in the groove of one side of the caruncle, and the sheath of the scope was used to squeeze one side of the gland, revealing the surgical peritoneum of the prostate gland, and then the peritoneum was enucleated along the peritoneum level to the direction of the neck of the bladder in a counterclockwise or clockwise manner up to 12 o'clock. Backward mirror to the seminal groove

Table 1. Comparison of baseline levels of preoperative clinical indicators between the two groups ($\overline{x} \pm s$).

clinical indicator	Enucleation of prostate (n = 34)	Electro-prostatectomy (n = 34)	P-value
Age (years)	72.4 ± 7.1	70.8 ± 6.5	0.340
Prostate volume (ml)	63.9 ± 15.9	59.9 ± 24.8	0.439
BMI (kg/m^2)	23.5 ± 2.5	22.8 ± 2.5	0.219
Qol (points)	4.8 ± 0.8	4.8 ± 0.9	0.890
IPSS (points)	26.4 ± 3.5	25.2 ± 5.6	0.258
Qmax (ml/s)	4.1 ± 2.8	3.1 ± 2.8	0.161
Residual urine volume (ml)	84.1 ± 66.5	82.0 ± 92.0	0.915

incision, the same method as described above will be the middle lobe and the opposite lobe of the gland clockwise or counterclockwise enucleation, according to the size of the middle lobe to decide whether to split the lobes of the enucleation, and finally the use of the sheath of the mirror to properly push and push down the whole piece of stripped tissue to the direction of the neck of the bladder, pay attention to the position of the tip of the prostate gland at 12 o'clock method of using wedge-shaped enucleation, to retain the mucous membranes of the urethra here and part of the gland, to avoid damage to the urinary sphincter muscle, and finally the whole piece of enucleated tissue. Finally, the whole piece of enucleated tissue is pushed into the bladder and the gland is sucked out using a tissue crusher, a three-lumen catheter is left in place, and the water bladder is filled with 40 - 50 ml of water.

3.2. Transurethral Plasma Electrocision of the Prostate Approach

The patient in the lumbar hard joint anesthesia after the success of taking truncation is located on the operating table, the operation field routine iodine disinfection, laying towel, direct vision smoothly inserted into the electrodiagnostic microscope, identify a good external urethral sphincter, electrodiagnostic power of 160 W, electrocoagulation power of 100 W, the first electrodiagnostic from the point of 5 - 7 points to the peritoneum up to the point of approaching the spermathecal caruncle, along this plane of electrodiagnostic of both lobes, repairing trauma, stopping the hemorrhage, flushing suction out of the prostatic tissues, leave the triple-lumen catheter, the water bladder Inject 40 - 50 ml of water.

3.3. Observation Indicators

Comparison of perioperative related indexes between the two groups, including operation time, preoperative Qmax, IPSS, QOL, residual urine volume, operation time, removal of catheter after 3 - 5 days of indwelling catheter, evaluation of postoperative Qmax, IPSS, QOL, residual urine volume on the second day of catheter removal, as well as incidence of urinary incontinence in the two groups.

3.4. Statistical Methods

SPSS26 statistical software was used for data analysis. Count data were expressed as the number of cases and percentage by χ^2 test, measurement data were expressed as ($\overline{x} \pm s$), t test was used for intra-group and inter-group sample comparison, and count data were expressed as percentage (%) by χ^2 test for inter-group comparison, and the difference was regarded as statistically significant at $P < 0.05$.

4. Results

4.1. Comparison of Postoperative Differences in QOL, IPSS, Qmax, and Residual Urine Volume between the Two Groups of Patients

The patients in both groups successfully completed the operation without se-

rious complications such as rectal and bladder perforation during the operation, with less bleeding and no blood transfusion in the perioperative period. Patients with transurethral plasma enucleation of the prostate and electrodesiccation showed significant improvement in QOL, IPSS, Qmax, and residual urine volume after surgery compared with those before surgery ($P < 0.05$), and at the same time, by comparing between the groups, the degree of improvement in QOL, IPSS, Qmax, and residual urine volume after plasma enucleation was better than that of the plasma electrodesiccation group, and the differences were statistically significant ($P < 0.05$), but there was no significant difference in the operation time between the two groups ($P > 0.05$). Time was not significantly different ($P > 0.05$) (Table 2).

4.2. Postoperative Urinary Incontinence

The number of postoperative incontinence cases in the two groups (4 cases in the gouging group and 1 case in the electrodesiccation group) was not significant by the chi-square test ($P > 0.05$), see Table 2. All the above patients had temporary postoperative incontinence, and with the assistance of postoperative pelvic floor muscle training and close follow-up observation, the incontinence symptoms returned to normal completely within 1 - 3 months.

Table 2. Comparison of preoperative and postoperative indexes between the enucleation and electrodesiccation groups ($\overline{x} \pm s$).

groups	number of examples	Qol (points)				IPSS (points)			
		preoperative	postoperative	t	p	preoperative	postoperative	t	p
gouging out group	34	4.8 ± 0.8	1.0 ± 0.8	22.623	<0.001	26.4 ± 3.5	9.5 ± 2.1	25.691	<0.001
Electrical Cutting Group	34	4.8 ± 0.9	1.6 ± 0.9	14.908	<0.001	25.2 ± 5.6	11.1 ± 2.6	14.07	<0.001
t		0.138	2.926			1.141	2.743		
P		0.890	0.005			0.258	0.008		
groups	number of examples	Qmax (ml/s)				Residual urine volume (ml)			
		preoperative	postoperative	t	p	preoperative	postoperative	t	p
gouging out group	34	4.1 ± 2.8	24.3 ± 3.2	−30.051	<0.001	84.1 ± 66.5	8.9 ± 11.3	7.720	<0.001
Electrical Cutting Group	34	3.1 ± 2.8	18.6 ± 3.3	−21.692	<0.001	82.0 ± 92.0	18.6 ± 17.3	4.674	<0.001
t		1.417	−7.211			0.107	2.753		
P		0.161	<0.001			0.915	0.008		

groups	number of examples	Surgical time (min)	Number and incidence of urinary incontinence (%)
gouging out group	34	60.03 ± 14.50	4 (11.8%)
Electrical Cutting Group	34	64.56 ± 15.68	1 (2.9%)
t/χ^2		1.236	1.943
P		0.221	0.163

5. Discussion

There are various minimally invasive surgical treatments for BPH. Compared with traditional transurethral prostatectomy, transurethral enucleation of the prostate is becoming more and more widely used clinically because of its ability to maximize the cutting and removal of the gland. Transurethral plasma enucleation of the prostate combines the advantages of traditional open surgery and minimally invasive, with an electrosurgical sheath to simulate the action of fingers along the surgical envelope to enucleate the hyperplastic glands of the prostate, along the surgical envelope of the prostate gland to peel off the complete hyperplastic gland tissues, and in the envelope of the prostate gland will be removed [6]. Compared with traditional transurethral plasma prostatectomy, transurethral enucleation of the prostate has a shorter operative time, shorter bladder irrigation time, shorter hospital stay, earlier catheter removal, lower incidence of perforation of the surgical envelope, and a larger amount of glandular volume removed during the operation [7]. The enucleation of the prostate is therefore more advantageous than the traditional electrosurgical approach.

Prostatic hyperplasia manifests itself urodynamically as bladder outlet obstruction, and prolonged obstruction can lead to pronounced.

Compensatory or decompensatory changes in bladder function. Several studies have shown a significant correlation between prostatic obstruction and changes in detrusor function. Bladder outlet obstruction can lead to compensatory elevation of detrusor pressure, and as the degree of obstruction progressively worsens and time passes, the detrusor muscle undergoes degenerative changes, with a large number of inelastic fibers proliferating, and a loss of compensation occurs with diminished detrusor contractility [8] [9] Inadequate bladder activity leads to difficulty in voiding, resulting in incomplete emptying of urine. The myogenic etiology of detrusor function includes structural and/or functional changes in or around the myocyte, and also in the transmission of contraction of the detrusor muscle; myogenic factors may lead to a decrease in the proportion of muscle collagen, and these changes may impair cellular mechanisms critical to myocyte contraction, such as ion storage and/or exchange, excitation-contraction coupling, calcium storage, and even signal generation. Thus, even if the neural pathways are not impaired, the nature of the urethral myocytes can lead to impaired contractile function of the urethral muscles, which can lead to the development of reduced urethral muscle function [10]. A study was conducted to investigate the ability of human mesenchymal stem cells (hMSCs) to restore bladder contractility in hypoactive rats and to enhance it by overexpressing hepatocyte growth factor (HGF) in hMSCs [11]. However, the above studies are limited to animal models. However, the above studies are limited to animal models, and the current methods to improve urethral contractility are very limited and ineffective. For impaired urethral contractility, such as UAB/deficient urethral activity (DU), if combined with bladder outlet obstruction, surgical lowering of the bladder outlet obstruction is mandatory for the

treatment of impaired UAB/inactivated urethra, and urethral function can be restored to varying degrees in the later stages of treatment [12].

In the last decade, based on the rapid development of energy platforms, prostate enucleation has given rise to a variety of surgical procedures represented by plasma enucleation and different types of laser enucleation. Different types of endoluminal enucleation have their own advantages and disadvantages, relatively speaking, enucleation can significantly reduce postoperative hematuria compared with traditional electrosurgery, because in the enucleation process, the prostate tissue is directly stripped under the peritoneum, clearly visible blood vessels are coagulated only once, the whole process of enucleation has a very clear field of vision, and it is almost possible to achieve a very small amount of bleeding, on the contrary, in TURP, the blood vessels are each time to excise prostate tissue cut, the blood vessels may retract and require repeated electrocoagulation to stop the bleeding [13]. Laser enucleation in particular is superior in its control of bleeding [14] [15] The intraoperative field of view is very clear, especially with shorter wavelength lasers, which are better absorbed by hemoglobin. However, due to the laser equipment and fiber optic are expensive, the treatment cost is relatively high, for the surgical treatment of benign prostatic hyperplasia, most of the hospitals in China are still based on the transurethral prostate plasma equipment, the plasma device electrode has different designs, such as button electrodes, rod electrodes, spade electrodes [16] [17] [18], Even so, due to the long learning curve and high technical threshold of enucleation, endoluminal enucleation has not even been carried out in many places. A large number of studies at home and abroad have confirmed the effectiveness and safety of plasma enucleation.

In this study, we confirmed that transurethral enucleation of the prostate has good efficacy and safety in prostatic hyperplasia combined with weakening of bladder detrusor muscle contraction, and the efficacy is more significant than that of the traditional electro cutaneous surgical method, and the difference is not statistically significant, although there are slightly more patients with transient urinary incontinence. In addition, the shortcoming of this study is that the evaluation of patient observation was only conducted in the short term after the catheter was removed after the operation, without longer follow-up, because patients with prostatic hyperplasia may still experience bladder neck contracture or other factors that cause difficulty in voiding or decrease in urine flow rate and increase in the amount of residual urine in the far term after the operation, especially those patients who are combined with the decrease in the contraction of bladder forced urethral muscle are more prone to recurrent urinary retention, so that patients who are combined with the decrease in the contraction of bladder forced urethral muscle are more prone to recurrent urinary retention. Therefore, the mid- and long-term evaluation is more worthy of attention and research.

In conclusion, the choice of transurethral enucleation of the prostate can effectively enhance the efficacy of patients with prostatic hyperplasia combined

with weakened contraction of bladder forcing muscle, improve their bladder function, and improve the quality of life of patients, which is worthy of promotion.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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