

Original Research Article

Therapeutic efficacy of the combination of two surgical procedures with tamsulosin in treatment of benign prostatic hyperplasia complicated with bladder stones

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Abstract

Purpose: To compare the efficacies of two surgical methods combined with tamsulosin in treating benign prostatic hyperplasia (BPH) complicated with bladder stones.

Methods: A total of 86 patients with BPH complicated with bladder stones and admitted to The People's Hospital of Dingzhou, Hebei, from October 2021 to October 2022 were selected as subjects. The patients were equally divided into groups A and B ($n = 43$). Patients in group A were treated with transurethral vaporization and electro-resection of the prostate (TURP) + percutaneous nephroscopic lithotripsy (PCNL), while patients in group B were treated with TURP + holmium laser lithotripsy (HLL). Baseline clinical information, curative effect, surgery-related indicators, clinical symptoms, and recurrence were compared between the two groups of patients.

Results: At 4 weeks post-surgery, Q_{max} was significantly higher in group B than in group A, while IPSS score, RUV, and prostate volume were significantly lower in group B than in group A ($p < 0.05$). The levels of physiological state, psychological state, social functionality and level of subjective judgment were higher in group B than in group A ($p < 0.05$). The incidence of complications in group A was 11.63 %, with a recurrence rate of 6.98 %, while the corresponding values for group B were 13.95 and 4.65 %, respectively ($p > 0.05$).

Conclusion: The effect of TURP + HLL surgery on patients with BPH complicated with bladder stones is significantly better than that of TURP + PCNL surgery. The former also reduces clinical symptoms while improving the quality of life of patients.

Keywords: Two surgical methods, Tamsulosin, Benign prostatic hyperplasia, Bladder stones, Clinical efficacy

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common clinical disease of the reproductive system in

men. The main symptoms of the disease are frequent urination, urgency, and increased frequency of nocturia [1]. Some patients may also experience dysuria, urinary tract infection,

and bladder stones. The occurrence of BPH may easily lead to obstruction of bladder outlet in patients, resulting in increased residual urine volume in the bladder, while small stones are discharged into the upper urinary tract of the bladder, crystal particles in urine, and exfoliated cells are retained for long in the bladder. Thus, patients are susceptible to the formation of bladder stones [2]. Patients with BPH complicated with bladder stones may experience symptoms such as sudden interruption of urine flow, hematuria, and dysuria. Bladder stones are secondary stones, and the incidence may be up to about 10 %. The occurrence of this situation seriously affects the daily lives of patients [3].

At present, the clinical treatment for BPH complicated with bladder stones is mainly based on surgical methods. Nowadays, the methods used are transurethral vaporization and electro-resection of the prostate (TURP), in combination with percutaneous nephroscopic lithotripsy (PCNL) or holmium laser lithotripsy (HLL). These two surgical methods do not have the disadvantages of early open surgery, such as high degree of trauma, large volume of bleeding, high risk of complications, slow recovery of patients, and long hospital stays. However, there are still some disagreements in clinical practice regarding the differences in curative effect between the two surgical procedures. Although the two methods minimize trauma in patients, they do not completely eliminate it. In addition, the use of in-dwelling urinary catheter after the operation may cause contraction of the patient's urethral smooth muscle, induce severe pain and delay urination [6].

Tamsulosin is a selective α_1 adrenergic receptor blocker that relaxes smooth muscle of the prostate in patients, thereby reducing the difficulty of urination and other conditions, resulting in recovery in patients with BPH [7]. The effect of tamsulosin as adjuvant treatment in BPH patients with bladder stones has been confirmed in some clinical studies [8]. Based on these observations, the present study was carried out to compare the clinical efficacies of two surgical methods when used in combination with tamsulosin in the treatment of BPH patients with bladder stones.

METHODS

Subjects

A total of 86 BPH patients with bladder stones and admitted to The People's Hospital of Dingzhou, Hebei, from October 2021 to October 2022 were enrolled in the study. Their baseline

clinical data were collected. All subjects received surgery in combination with tamsulosin. Based on the surgical method used, the patients were divided into groups A and B, with 43 subjects in each group. This study received approval from the Ethics Committee of People's Hospital of Dingzhou (approval no. DZ2020029). All patients and their families were informed about the purpose of the study, and they signed relevant consent forms. The study was conducted in accordance with the guidelines of Declaration of Helsinki [9].

Inclusion and exclusion criteria

Inclusion criteria

Patients in the following categories were included: those diagnosed with BPH complicated with bladder stones, via relevant clinical tests; patients who received relevant surgical treatment in The People's Hospital of Dingzhou, Hebei; those with complete baseline clinical information; patients who took tamsulosin after surgery, and those who independently completed relevant questionnaires and followed medical procedures.

Exclusion criteria

Patients in the following categories were excluded from the study: those with severe organ function diseases; patients who had other urinary system diseases; those with abnormal coagulation function and incomplete baseline clinical information; patients who were allergic, or had contraindications to the drugs, operations, and equipment used in the study; those with mental and behavioral disorders, and patients who could not fully cooperate with the researchers during the study due to various reasons.

Procedures and treatments

After the operation, patients in both groups were orally administered 0.2 g of tamsulosin hydrochloride sustained-release capsules (Astellas Pharmaceutical Co. Ltd., approval number: H20000681), once daily, for a total of 4 weeks. Patients in group A were treated with TURP + PCNL. Routine continuous epidural anesthesia was given before surgery, and the patient was tilted in the lithotomy position. When the expected anesthesia effect was achieved, a Hawk vaporized resectoscope was placed in the bladder of the patient. Diabetic patients were given water lavage solution, while non-diabetic patients received lavage with glucose solution. The lavage was performed under low pressure conditions. Sterile injection water (400 mL) was

injected into the patient's bladder by puncturing the bladder at two transverse fingers above the pubic bone with an 18-G renal puncture needle.

The overall situation of the patient's urinary system was monitored with a transurethral endoscope, and a 1-cm F18 catheter was positioned through left and right abdominal wall transverse incision. After the abdominal wall transverse incision was completed, a zebra guide wire was placed, and the puncture hole was further expanded using a fascial dilator to F16, and then expanded to F24 with a metal coaxial dilator, after which a F22 Peel-away sheath was placed. The patient's stones were examined, and a pneumatic ballistic lithotripsy probe was used to crush the stones. Larger stones were removed with the help of alligator forceps. At the end of stone removal, TURP treatment was implemented in three sections, namely, the bladder neck, the middle of the prostate and the tip of the prostate. Cutting was performed in line with the degree of patient's hyperplasia. The cutting positions were 4 - 5 points, 7 - 8 points, and then at 11 o'clock, 1 o'clock, and the middle lobe positions.

The patients in group B were treated with TURP + HLL: the patient's body position, anesthesia method, Hawk resectoscope placement method, and lavage operation were all consistent with those in group A. The power of fiber optic of the resectoscope was adjusted to 1.0 J, and the stone was crushed to a suitable size (approximately 20 mm × 10 mm), and then rinsed. Subsequently, the power levels of the electrocution equipment and the electrocoagulation equipment were further adjusted to 120 and 60 watts respectively, but the other conditions were consistent with those used for patients in group A, including the cutting of the partitions. During the cutting process, electrocoagulation was carried out in time to stop bleeding. After ensuring that bleeding and other conditions of the patients were not abnormal, the resectoscope was removed and disinfected.

Evaluation of parameters

Clinical efficacy

This was categorized into markedly effective, effective and ineffective. Treatment was markedly effective if the symptoms and signs of BPH disappeared, and bladder stones were completely removed. If the symptoms and signs of BPH were significantly mitigated, and bladder stones were basically cleared, the treatment was effective. However, if none of the above events occurred, the treatment outcome was ineffective.

Surgery-related indicators

The surgical indicators in this study were stone extraction time, operation time, bladder flushing time, catheter in-dwelling time, and hospitalization time. These indicators were recorded by relevant medical staff in The People's Hospital of Dingzhou, Hebei.

Clinical symptoms

The clinical symptom indicators used in this study were International Prostate Symptoms (IPSS) score, maximum urinary flow rate (Q_{max}), residual urine volume (RUV), and prostate volume. Before the operation and 4 weeks after the operation, the patient's prostate symptoms were assessed based on the IPSS score. The score scale included 7 items, and score ranged from 0 to 35 points. The Q_{max} was determined via uroflowmetry, while RUV and prostate volume were measured using B-ultrasound.

Quality of life

Before surgery and 4 weeks after surgery, the patient's quality of life was evaluated using the "Quality of Life Scale" prepared by The People's Hospital of Dingzhou, Hebei. The scale comprised physiological state, psychological state, social functionality, and subjective judgment. The scores on each aspect were in the range of 0 - 100 points. The higher the score of the patient, the better the quality of life with respect to the corresponding aspect.

Complications and recurrence

The complications monitored in this study were urinary tract infection, residual stones, urethral stricture, acute urinary retention, and secondary bleeding. After the patient was discharged from the hospital, he was followed up for 6 months during which recurrence was monitored. The criteria for judging recurrence involved the use of B-ultrasound examination to confirm the diagnosis after symptoms such as frequent urination, incomplete urination or urinary incontinence reappeared in the patient.

Statistical analysis

The graphics software used in this study was GraphPad Prism 8, while the SPSS 25.0 was used for data analysis. Measurement data are expressed as mean ± standard deviation (SD), and were compared between the two groups using *t*-test. Count data are expressed as numbers and percentages (n (%)), and were

compared using chi squared (χ^2) test. Statistical significance was assumed at $p < 0.05$.

RESULTS

Baseline data

The 43 patients in group A were aged 44 - 73 years (mean age = 56.59 ± 3.87 years), with disease course of 0.4 - 5 years (mean disease course = 3.13 ± 0.98 years). The stone types comprised 19 single cases and 24 multiple cases, and stone diameter was in the range of 1.8 - 3.9 cm (mean diameter = 2.97 ± 0.26 cm). In group B, the 43 patients were aged 45 - 76 years (mean age = 56.78 ± 3.91 years), with disease course of 0.6 - 5 years (mean disease course = 3.22 ± 0.9 years). There were 20 single stones and 23 multiple stones, with stone diameter in the range of 1.9 - 4.0 cm (mean diameter = 3.02 ± 0.25 cm). As shown in Table 1, the baseline clinical data of the two groups of patients were comparable ($p > 0.05$).

Clinical efficacy

Treatment effectiveness in group A was 95.35 %, while treatment effectiveness in group B was 97.67 %. There was no significant difference in

treatment effectiveness between the 2 groups ($p > 0.05$; Table 2).

Surgery-related indicators

Stone removal time, operation time, bladder flushing time, catheter in-dwelling time, and hospitalization time were comparable in the two groups ($p > 0.05$; Table 3).

Clinical symptoms

As shown in Figure 1, the IPSS scores, Q_{max} , RUV, and prostate volume of group A before operation were 28.43 ± 3.62 , 8.53 ± 2.26 mL/sec, 162.54 ± 25.83 mL, and 32.19 ± 3.17 mL, respectively, while the corresponding values at 4 weeks after operation were 15.74 ± 3.12 , 14.94 ± 2.83 mL/sec, 33.54 ± 5.29 mL and 17.13 ± 2.25 mL, respectively. In group B, the IPSS scores, Q_{max} , RUV, and prostate volume before operation were 28.29 ± 3.57 , 8.62 ± 2.89 mL/sec, 161.98 ± 27.62 mL, and 32.13 ± 3.11 mL, respectively, while the corresponding values at 4 weeks post-surgery were 28.29 ± 3.57 , 8.26 ± 2.89 mL/sec, 16.42 ± 4.83 mL, and 14.02 ± 2.10 mL respectively. The Q_{max} of group B was significantly higher than that of group A at 4 weeks after operation, while the IPSS score, RUV, and prostate volume were significantly lower in group A ($p < 0.05$).

Table 1: Comparison of basic data (n=43)

Parameter	Group A	Group B	t/ χ^2	P-value
Age range (years)	44-73	45-76		
Mean age (years)	56.59 ± 3.87	56.78 ± 3.91	-0.226	0.822
Disease duration (years)	0.4-5	0.6-5		
Mean duration of disease (years)	3.13 ± 0.98	3.22 ± 0.95	-0.432	0.667
Stone type			0.047	0.829
Single shot	19	20		
Multiple	24	23		
Stone diameter (cm)	1.8-3.9	1.9-4.0		
Mean diameter (cm)	2.97 ± 0.26	3.02 ± 0.25	-0.909	0.366

Table 2: Comparison of clinical efficacy (n=43)

Group	Markedly effective	Effective	Ineffective	Total effectiveness (%)
A	13	28	2	41 (95.35)
B	12	30	1	42 (97.67)
χ^2	-	-	-	0.345
P-value	-	-	-	0.557

Table 3: Comparison of surgery-related indices between the 2 groups (n=43)

Surgical indicator	Group A	Group B	t	P-value
Stone extraction time (min)	15.53 ± 8.64	15.65 ± 8.36	-0.065	0.948
Operation time (h)	1.14 ± 0.42	0.98 ± 0.37	1.874	0.064
Bladder flushing time (h)	63.45 ± 3.29	64.72 ± 3.11	-1.84	0.069
Catheter indwelling time (h)	73.86 ± 20.39	74.67 ± 22.41	-0.175	0.861
Length of hospital stay (days)	7.38 ± 1.29	7.24 ± 1.17	0.527	0.6

Table 4: Comparison of complications and recurrence rates between both groups (n=43)

Complication	Group A	Group B	χ^2	P-value
Urinary tract infection	1	1	-	-
Stone residue	2	1	-	-
Urethral stricture	1	1	-	-
Acute urinary retention	0	1	-	-
Secondary bleeding	1	2	-	-
Total incidence (%)	5 (11.63 %)	6 (13.95 %)	0.104	0.747
Recurrence rate (%)	3 (6.98 %)	2 (4.65 %)	0.212	0.645

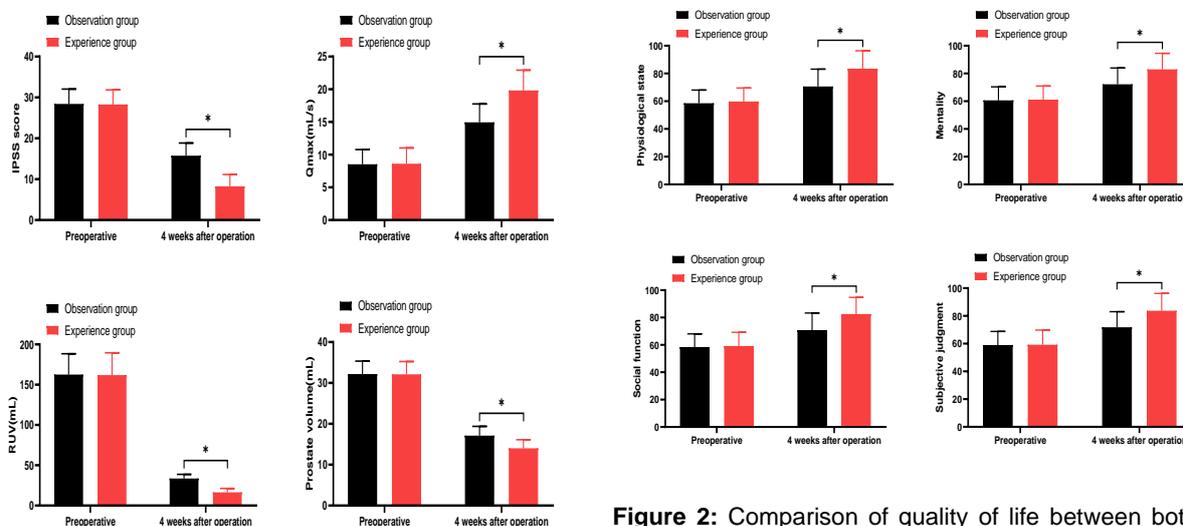


Figure 1: Comparison of clinical symptoms. * $P < 0.05$

Quality of life

As shown in Figure 2, the physiological scores of patients in group A before operation and 4 weeks after operation were 58.52 ± 9.54 and 70.65 ± 12.47 , respectively, while the corresponding psychological state scores were 60.65 ± 9.72 and 72.23 ± 11.76 , respectively, and the social functionality scores were 58.39 ± 9.64 and 70.59 ± 12.68 , respectively. The corresponding scores for subjective judgments were 58.96 ± 9.84 , 71.78 ± 11.26 , respectively. In group B, the physiological state scores before operation and 4 weeks after operation were 59.83 ± 9.72 and 83.39 ± 12.96 , respectively, and the psychological state scores were 61.09 ± 9.85 and 82.98 ± 11.54 , respectively. Moreover, social functionality scores before and 4 weeks after surgery were 58.97 ± 10.21 and 82.43 ± 12.25 , respectively, while the corresponding scores for subjective judgment were 59.21 ± 10.57 and 83.68 ± 12.55 , respectively. The physiological state, psychological state, social function and subjective judgment levels were significantly higher in group B than in group A at 4 weeks after operation ($p < 0.05$).

Figure 2: Comparison of quality of life between both groups. * $P < 0.05$

Complications and recurrence

There was a complication rate of 11.63 % in group A, while recurrence accounted for 6.98 %. In group B, complication rate was 13.95 %, while recurrence rate was 4.65 %. There were no significant differences in complication rate and recurrence rate between the two groups ($p > 0.05$; Table 4).

DISCUSSION

In recent years, with increases in the population of aged people in China, the incidence of BPH in middle-aged and elderly male groups has increased significantly [10]. The pathogenesis of BPH is relatively complicated. In the past, it was believed to be related to age, inflammatory response, and interstitial-epithelial interaction in the prostate gland. It is the main cause of lower urinary tract obstruction symptoms such as dysuria and incontinence [11]. If the condition is not treated, a large amount of minerals in the patient's urine will accumulate in the bladder, making it difficult to excrete the original small stones in the kidney and ureter. This eventually results in formation of bladder stones which further aggravate dysuria and other symptoms in the patient [12].

Surgery is currently the preferred method for the clinical treatment of patients with BPH complicated with bladder stones [13]. In the past, patients with BPH complicated with bladder stones were often treated with open suprapubic cystotomy + prostate extraction. Since most patients with this disease are elderly, some of them are unable to tolerate this surgical treatment due to complications in other organs, as well as co-morbidities [14]. Clinically, for high-risk patients who cannot accept open surgical treatment, simple bladder stone removal or transurethral cystoscopy is usually performed. However, this method does not completely remove the cause of urinary tract obstruction, thereby leading to recurrence of bladder stones in patients [15].

In recent years, with continuous advances in clinical TURP technique, this technology has become an effective way of treating BPH with bladder stones. Currently, patients with BPH with bladder stones are usually treated first, and then TURP is performed after the treatment. Different methods are used according to the specific symptoms of the patient. Common lithotripsy methods include use of pneumatic ballistics and laser [16]. However, there are still differences in clinical practice as to which of the various lithotripsy methods has the best therapeutic effect on patients with BPH complicated with bladder stones. Therefore, this study analyzed the clinical data of 86 patients with BPH complicated with bladder stones in The People's Hospital of Dingzhou, Hebei. Patients in group A (n = 43) were treated with TURP + PCNL + tamsulosin. The PCNL lithotripsy technology is generated by compressed gas. The energy of the compressed gas is converted into mechanical energy used in crushing the stones [17]. Research has shown that pneumatic lithotripsy does not generate electric current and heat, or generates very little heat, and its technology produces relatively low thermal damage to the patient [18]. However, another study showed that PCNL technique may lead to complications such as acute bleeding, mucosal shedding, and edema in patients [19]. The other 43 patients (group B) were treated with TURP + HLL + tamsulosin. The mechanism underlying lithotripsy HLL technology involves the activation of the rare element holmium embedded in the yttrium aluminum garnet crystal through the krypton flashing light source, thereby forming a pulsed 2100 nm laser which high energy is used to crush the stones instantly. Holmium laser is a contact light source. With a tissue penetration depth of only 0.4 mm, it causes minimal damage to patients, and it has higher lithotripsy accuracy [20].

The results of this study show that the total treatment effectiveness in group A was 95.35 %, which was comparable with that in group B (97.67 %). This result is consistent with that obtained in a previous study [21]. However, other research results are different. For example, the total effectiveness of treatment in patients with HLL was better than that of treatment of patients with PCNL. This difference may be due to factors such as different sample sizes and differences in efficacy of judgment standards. In terms of surgery-related indicators, the stone removal time, operation time, bladder flushing time, catheter indwelling time, and hospital stay were compared between the two groups. It was confirmed that there were no significant differences in results of implementation of the two operations. This result is similar to the results of previous studies [22]. In terms of clinical symptoms and quality of life, the Qmax of group B was significantly higher than that of group A, while the IPSS score, RUV, and prostate volume were significantly lower than those of group A.

The scores on physiological state, psychological state, social functionality and subjective judgment were significantly higher in group B than in group A. These results are basically consistent with the results of an earlier study [23]. Thus, PCNL + tamsulosin regimen, as well as TURP + HLL + tamsulosin regimen may further reduce the clinical symptoms in patients and improve their quality of life after surgery. In addition, previous studies have shown that the incidence of postoperative complications and disease recurrence rate of patients treated with TURP + HLL were lower than those of patients treated with TURP + PCNL. In terms of safety, there was 11.63 % complication in group A, while the recurrence rate was 6.98 %. The complication rate of group B was 13.95 %, and the recurrence rate was 4.65 %. Thus, complication rate and recurrence rate in the two groups were comparable. This result is not consistent with previous reports. The reason for this discrepancy may be related to factors such as the small number of patients included in this study [24].

Limitations of this study

There are some limitations to this study. First, the sample was from single center, therefore further research would be needed to determine if this type of intervention would be appropriate for other populations more generally. Another limitation of the current study is that the follow-up duration was short. Hence a systematic and comprehensive assessment of this strategy are needed in the future studies.

CONCLUSION

The effect of TURP + HLL in the treatment of BPH patients with bladder stones is significantly better than that of TURP + PCNL, and the former reduces clinical symptoms and improves the quality of life of patients. It is a potential management strategy for BPH patients with bladder stones, and should be further investigated with the view to promote its application in clinical settings.

DECLARATIONS

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Ethical approval

None provided.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Liwei Wu and Weihong Meng contributed equally to the study.

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