

# Research Progress of Transurethral Prostatectomy for Benign Prostatic Hyperplasia with Bladder Stones

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**Abstract:** Benign prostatic hyperplasia, which can be abbreviated as prostatic hyperplasia, is a urinary system disease that has a high incidence in middle-aged and elderly male populations in China. The incidence of benign prostatic hyperplasia is increasing year by year. Patients with benign prostatic hyperplasia are prone to have bladder outlet obstruction, which in turn leads to an increase in residual urine volume in the bladder and impurities in the urine, such as upper urinary calculi that enter the bladder, urine crystals, various exfoliated cells, etc. If these substances stay in the bladder for a long time, stones in the bladder will be generated. Benign prostatic hyperplasia with bladder stones can severely obstruct the urinary tract, causing clinical symptoms such as urinary tract infections, urinary urgency, frequent urination, and dysuria. These symptoms seriously affects the physical and mental health of patients, leading to low levels of normal work and quality of life. With the development of medical technology, surgical treatment is commonly used in clinical practice. Among them, transurethral prostatectomy is widely used in clinical treatment, and has achieved good results.

**Keywords:** Benign prostatic hyperplasia; Bladder stones; Transurethral prostatectomy; Application status; Application advantages; Limitations

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Bladder stones are the most common complication of benign prostatic hyperplasia that belong to secondary stones<sup>[1]</sup>. Prostatic hyperplasia surgery has a history of hundreds of years and is the most commonly used

and highly effective treatment. The purpose of the surgical treatment is to remove the part of the prostate hyperplasia through surgery to keep the urethra open and remove the obstruction. Open surgery was one of the first form of surgery used for treatment, but the patients who were treated by open surgery suffered severe bleeding and trauma during the surgical operation, which was not conducive to the improvement of the patient's prognosis. At present, the invention of resection and laser has made a landmark of progress for minimally invasive surgery represented by transurethral prostatectomy. This technique can effectively reduce trauma and help patients recover faster<sup>[2]</sup>. Based on this, this study reviews the research progress of transurethral resection of benign prostatic hyperplasia with bladder stones.

## 1 Application of transurethral prostatectomy

With prostate hyperplasia, the prostate of patient is larger than usual, and compression of the urethra causes narrowing of the urethra of the prostate, and lower urinary tract symptoms such as dysuria appear, which cannot be improved after treatment using drug. If the patient's physical condition is not suitable for long-term medication or the patient refuses treatment using medications, prostatectomy should be considered as treatment.

### 1.1 Surgical options for benign prostatic hyperplasia with bladder stones

Patients with benign prostatic hyperplasia with bladder stones can choose the appropriate surgical method such as open prostatectomy and transurethral prostatectomy according to their own body tolerance and disease development<sup>[3]</sup>. For patients whom we can touch the

entire margin of the prostate during anal examination, if the prostate adenoma is too large, there will be more bleeding during the surgical operation. As a result, it will be difficult to stop bleeding, the resection will not be clean, and injuries will easily occur. Therefore, it is more appropriate to choose open surgery, which can quickly and completely remove the proliferative glands. Transurethral resection of the prostate is more suitable for patients with poor tolerance to open surgery, patients who cannot urinate without resection of the glands, patients with comorbidities, and patients with small adenomas whose prostate is deep within the pelvis. Transurethral resection of the prostate should be carried out as soon as possible for those who have good body condition, insignificant drug treatment effect, or poor general condition, even if the residual urine volume is less than 50ml and the urine flow rate indicates obstruction of the bladder outlet, transurethral prostatectomy should be performed as soon as possible. For those with surgical indications, transurethral resection of the prostate should be performed as soon as possible to avoid indwelling of the urinary tract that happens with age, cardio-cerebrovascular disease, or sudden urinary retention. These would prolong the surgical operation time and increase the difficulty of surgery. Regardless of method, it should remove as much glandular tissue as possible.

## 1.2 Contraindications for transurethral prostatectomy

Transurethral prostatectomy contraindications include: severe cardiopulmonary dysfunction and respiratory diseases, such as severe bronchial asthma, emphysema combined with pulmonary infection, significantly reduced lung function, etc., severe disorders of blood system and hemorrhagic diseases that cannot be treated, acute infections of the urinary and reproductive system, serious liver and kidney dysfunction, cardio-cerebral vascular diseases such as severe hypertension, diabetes, acute myocardial infarction, uncontrolled heart failure, recent cerebrovascular accidents in patients with hemiplegia and pacemaker, and large adenoma which is more than 60 g.

## 2 Advantages of transurethral prostatectomy

Transurethral resection of the prostate is currently regarded as the gold standard for the treatment of benign prostatic hyperplasia. This kind of surgery is increasingly accepted by physicians and patients due to its advantages such as less trauma and rapid

postoperative recovery<sup>[4]</sup>. Liu *et al*<sup>[5]</sup> performed transurethral prostate bipolar resection in 45 patients with benign prostatic hyperplasia. The surgery was successful in 45 patients. No patients were converted to open surgery and no blood transfusion cases were performed. There were no significant changes in sodium, hemoglobin, and hematocrit after comparison. The maximum urinary flow rate, international prostate symptom score (IPSS), and speaking quality score were significantly higher at 3, 6, and 12 months after surgery than before surgery. This shows that transurethral prostatectomy can obtain safe and effective treatment results. Andrej Jedinak *et al*<sup>[6]</sup> also pointed out that transurethral prostate bipolar resection can achieve better postoperative results and effectively improve the clinical symptoms of patients. In the study of benign prostatic hyperplasia in the elderly conducted by Deng Aihua, the control group used traditional open surgery, and the observation group used minimally invasive transurethral prostatectomy with bipolar plasma<sup>[7]</sup>. The results showed that in the minimally invasive transurethral prostatectomy group, the amount of hemoglobin loss, the length of postoperative urinary catheter indwelling, the time of postoperative bladder irrigation, and the length of hospital stay were all lower than those of the open surgery group. Meanwhile, the quality of life score was higher than that of the control group, but the incidence of complications was lower than that of the control group. This shows that transurethral resection of the prostate is less invasive, and this technique can accelerate the rehabilitation process of patients, improve the quality of life, and has a low incidence of complications and high safety performance. The main reason for this analysis is that transurethral prostatectomy can quickly remove excess prostate tissue, increase the inner diameter of the urethra, and improve the rate of urinary flow. The effect can be seen within one week so patients do not need to take medication for a long time after surgery and the urethral surgery has small wounds and is less traumatic. With these advantages, the rehabilitation process can be accelerated and the quality of life of patients can be improved.

In Jiang Shurong<sup>[8]</sup>'s clinical study of benign prostatic hyperplasia with bladder stones, the patients in control group underwent open surgery, and those in the observation group underwent transurethral prostatectomy and holmium laser lithotripsy. The results showed that the observation group had lower

surgical bleeding volume, time for extubation, cases of hospitalization, and surgical operation time than the control group. In addition, the incidence of complications in the observation group was significantly lower than that in the control group. This indicates that transurethral laser lithotripsy and transurethral prostatectomy can effectively treat benign prostatic hyperplasia combined with bladder stones. Besides, the advantages of short postoperative rehabilitation process, high surgical efficiency, increased safety, and low trauma are obvious. Zhi Fan *et al*<sup>[9]</sup> also pointed out in the study, holmium laser lithotripsy combined with resection of the prostate has the advantages of simple procedures to perform the surgical operation which is associated less trauma, less intraoperative bleeding and lower risk, as well as higher clinical application value, as compared with open surgery. The findings of this study were consistent with the conclusion of Montorsi F *et al*<sup>[10]</sup>. In the study by Liu *et al*<sup>[11]</sup>, the control group underwent transurethral prostate vaporization resection combined with pneumatic ballistic lithotripsy, and the observation group underwent transurethral prostate vaporization resection combined with holmium laser lithotripsy. The results showed that the IPSS score, residual urine volume, complication rate, and recurrence rate of the observation group were significantly lower than those of the control group, and the maximum urine flow, physiological state, psychological state, social function state, and subjective judgment score were higher than the control group. This shows that transurethral resection of prostate vaporization combined with holmium laser lithotripsy can improve the clinical symptoms and quality of life of patients with benign prostatic hyperplasia combined with bladder stones, and are associated with enhanced safety. In the study by Shigemura K *et al*<sup>[12]</sup>, there are many options for surgical treatment of benign prostatic hyperplasia such as transurethral resection of prostate. Holmium laser prostatectomy has a broader development prospect and may become the main development direction of this type of surgery in future. In the study of Shao Bo *et al*<sup>[13]</sup>, one group underwent transurethral plasma prostatectomy (enucleation group), while another group underwent transurethral plasma prostatectomy (resection group). The mass of the removed glands in the enucleation group was higher than that of the resection group, whereas the amount of intraoperative blood loss, the duration of continuous bladder irrigation, the length of indwelling catheter, and

the length of postoperative hospital stay were less than those of the resection group. Furthermore, postoperative urinary incontinence, urethral stricture, transfusion rate and complication rate in the enucleation group were lower than those of the resection group. This indicates that compared with ordinary transurethral resection of prostate, plasma transurethral enucleation of prostate can achieve better surgical efficacy and higher safety performance. Therefore, plasma transurethral enucleation of prostate is possible to become the main trend of minimally invasive treatment in the future as this treatment method has much implementation prospects and research values.

### 3 Limitations of transurethral prostatectomy

Complications that may occur immediately after transurethral prostatectomy include excessive bleeding, hypothermia, hyponatremia, and deep vein embolism. Complications such as urinary incontinence, clot obstruction, urinary retention and erectile dysfunction would occur shortly after the surgery (within one to two weeks), but most of them will gradually improve. The amount of semen of the patients decreases after surgery. About 80%-90% of patients have retrograde ejaculation after surgery, that is, semen first enters the bladder during ejaculation, and then being drained during urination. Of note, a small part of the prostate would remain even after the surgical operation. This residual tissue will still continue to proliferate. This explains why some patients may need to undergo another operation after five to ten years.

### 4 Summary

Compared with traditional open surgery, transurethral prostatectomy in the treatment of benign prostatic hyperplasia with bladder stones can achieve better surgical results, but this surgery still has some disadvantages. Therefore, the medical research community is constantly exploring other treatment methods that are more effective, less disruptive, safer and more comfortable to the patients. At present, the combined treatment of transurethral prostatectomy with pneumatic lithotripsy and laser lithotripsy is widely used in clinical treatment, but to use this technique for treatment, better medical equipment with more advanced operating technology is required. The transurethral plasma enucleation may be the development trend of benign prostatic hyperplasia in future. Therefore, in the actual clinical treatment

process, personalized surgical treatment plans should be formulated to better improve the patient's prognosis, according to the patient's body tolerance and the status of disease, and considering the opinions of family members and the level of equipment in the hospital.

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