Photoselective Vaporization of the Prostate vs Plasmakinetic Resection of the Prostate: A Randomized Prospective Trial With 12-Month Follow-up in Mainland China

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OBJECTIVE To compare the short-term efficacy and safety results of photoselective vaporization of the prostate (PVP) and plasmakinetic resection of prostate (PKRP), 2 methods of treating benign prostatic hyperplasia (BPH)—related lower urinary tract symptoms (LUTS) in mainland China.

METHODS One hundred twenty patients with LUTS secondary to BPH were randomly divided into 2 groups: PVP group (n = 61) and PKRP group (n = 59). Perioperative data and postoperative complications were recorded for both groups. Patients were followed up for 12 months after treatment.

RESULTS Compared with PKRP, PVP required a longer operation time (56 vs 41 minutes; $P < .01$). PVP also needed shorter catheterization time (2.4 vs 3.5 days; $P < .01$) and shorter length of hospitalization (3.5 vs 5.1 days; $P < .01$). International Prostate Symptom Score, Qmax, and quality of life score were significantly improved for both groups after surgery, and no significant differences were apparent between the 2 groups, for up to 12 months. Short-term complications were assessed in regard to necessity of blood transfusion (1 vs 1), clot retention (1 vs 0), reoperation (1 vs 0), incontinence (0 vs 0), urethral stricture (1 vs 0), and retrograde ejaculation (4 vs 6) in the PVP vs PKRP groups, respectively.

CONCLUSION In patients with BPH-related LUTS, PVP may be a superior treatment to PKRP as it relates to the endpoints of this study, with short-term results after a 12-month follow-up as length of hospital stay and catheterization time needed were both less than what was required for PKRP. Long-term comparative data are required to clearly define the role of PVP and PKRP in patients. UROLOGY 87: 161–165, 2016. © 2016 Published by Elsevier Inc.

Lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH) are a common problem for men, with patient discomfort arising from troublesome symptoms and related complications.[1] There are numerous treatment options available for patients with BPH-related LUTS, including pharmacologic therapy, surgical intervention, and cautious waiting. When pharmacologic therapy has no obvious effect, surgical intervention is often required.

The gold standard of surgical procedures for patients with BPH-related LUTS is transurethral resection (TUR) of the prostate (TURP), which uses a monopolar device and glycine as irrigation fluid.[2] In recent years, many minimally invasive technologies have been developed to replace TURP; these technologies have dramatically reduced the incidence of perioperative and postoperative complications, such as urethral stricture, bleeding, and especially TUR syndrome (TURS).

Plasmakinetic resection of prostate (PKRP) using the Gyrus PlasmaKinetic system (Gyrus Medical Ltd., United Kingdom) is a recently developed bipolar minimally invasive urology technique. The active and return electrodes are located in the same axis, separated by a ceramic insulator, and thus, the electric current does not pass through the patient body. The risk of TURS is eliminated by use of a saline solution for irrigation during resection. Several randomized controlled trials[3-5] and

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meta-analyses[6,7] have indicated that PKRP has the same effect on the improvement of maximal urinary flow rate (Qmax) and the International Prostate Symptom Score (IPSS) as TURP treatment does. Moreover, there are distinct advantages to PKRP treatment, including a lower incidence of TURS and postoperative clot retention, fewer requirements for blood transfusions, and a shorter duration of both catheterizations and hospital stays.

Another minimally invasive surgical treatment for LUTS is laser therapy, which is becoming an alternative therapeutic approach to TURP. Photoselective vaporization of the prostate (PVP) is a side-firing laser prostatectomy at 532 nm, a wavelength which can be absorbed by hemoglobin and water in tissue, leading to a smaller penetration depth of the laser and better coagulation and vaporization.[8] Several randomized controlled trials[9,10] and meta-analyses[8,11,12] have already shown that PVP is as effective as TURP in improving LUTS. Moreover, PVP has other benefits, including prevention of TURS by saline irrigation, reduced bleeding, shorter hospital stays, and shorter catheterizations. A study from India compared bipolar TURP with PVP. It indicated that these minimally invasive techniques were equally efficacious after a 12-month follow-up and that PVP had some advantages: less blood loss, less of a need for blood transfusion, and shorter catheterization time.[13] However, efficacy and safety comparisons had not been done for these 2 approaches in mainland China. The present study compares the short-term efficacy results and safety of PVP and PKRP as 2 treatment options for BPH-related LUTS in mainland China.

METHODS

Study Design

This study was conducted at the Second Xiangya Hospital of Central South University. The catchment area of the hospital includes Hunan province and some surrounding cities. The study was approved by the institutional ethics and research committee.

Patients

Men aged >50 years with BPH-related LUTS were included in the present study. Inclusion criteria involved an exclusive age range from 50 to 80 years, IPSS >7, Qmax <15 mL/s, and transrectal ultrasound volume >30 and <150 cc. A diagnosis of or suspected prostate cancer, neurogenic bladder, urethral stricture, bladder stone, and postvoid residual (PVR) urine volume of >300 mL were all criteria for exclusion. Patients with LUTS secondary to BPH were randomly assigned 1 of the 2 minimally invasive surgical techniques, PVP (n = 61) or PKRP (n = 59). Randomization was performed using a computer-generated list. All participating patients signed an informed consent document.

Preoperative evaluation included a detailed history and physical examination (especially digital rectal examination), IPSS and quality of life (QoL) scoring, measurement of total prostate-specific antigen (PSA) and free PSA levels, Qmax, TURS, and PVR volume.

Equipment and Techniques

The PKRP operations were all performed by 1 experienced urologist in accordance with the procedure described by Yang et al.[14] PKRP was performed using the Gyrus PlasmaKinetic Resection System with power settings of 160 W for cutting and 80 W for coagulating. PKRP irrigation was done by inserting a 22-Fr 3-way catheter and flushing it with 0.9% sodium chloride until the outflow liquid ran clear.

Photoselective Vaporization of the Prostate

The PVP operations were all performed by 1 experienced urologist according to the procedure described by Mohanty et al,[15] using a continuous flow ACMI 23F 30-degree laserscope (Laserscope Ltd.). The laser used was a 600-μm, 70-degree side-firing laser fiber emitting green light at 532 nm. The 22-Fr 3-way catheter was inserted postoperatively for irrigation with 0.9% sodium chloride and removed once the outflow liquid was clear.

Follow-up and Assessment

Perioperative parameters, including age, prostate volume, total PSA level, IPSS, Qmax, QoL score, PVR volume, operation time, and lengths of catheterization and hospital stays were all recorded. Postoperative IPSS, Qmax, and QoL score were evaluated at 1, 3, 6, and 12 months. Both groups were followed up at 12 months to assess the occurrence of clot retention, incontinence, retrograde ejaculation, urethral stricture, and any need for blood transfusion or reoperation.

The primary end points of this study were lengths of catheterization, efficacy (Qmax and IPSS), and safety (complications).

Statistical Analysis

The study suggested that the 2-day rate of catheter removal was almost 20% in bipolar TURP groups.[7] It was estimated that PVP treatment would increase this rate to 40%. We also considered that the rate of loss to clinical 1-year follow-up is about 20%. Thus, the enrollment of 60 patients per group would provide the study with a statistical power of 80% at a 2 sided significance level of .05.

Statistical analysis was performed by a professional statistician according to the procedure described by Yang et al.[14] Results were presented as mean ± standard deviation. The Student t test, the chi-square test, and the Fisher exact test were performed when appropriate, with $P < .05$ considered statistically significant.

RESULTS

Between January 2011 and June 2012, 120 patients were randomized to receive 1 of 2 minimally invasive surgical techniques, PVP (n = 61), or PKRP (n = 59). After operation, all patients were successfully followed up for the duration of the study (Fig. 1).

The baseline characteristics of PVP and PKRP groups are listed in Table 1. The mean ages of PVP and PKRP patients were 69.3 ± 6.4 and 68.7 ± 5.8 years, respectively ($P = .625$); their prostate volumes were 63.7 ± 26.5 and 64.7 ± 25.5 mL ($P = .832$); their mean total PSA levels were 3.03 ± 1.96 and 3.51 ± 2.24 ng/mL ($P = .213$); their mean IPSS were 21.5 ± 6.6 and 20.4 ± 6.6 ($P = .325$); the mean Qmax were 7.7 ± 3.0 and 7.2 ± 2.8 mL/s ($P = .365$); their mean QoL scores were 4.5 ± 1.0 and 4.6 ± 0.8 ($P = .465$); and their mean PVR volumes were 86 ± 54 and 84 ± 59 mL, respectively

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