Exploration of Day Surgery. Photoselective Vaporisation of Prostate (PVP) in the Chinese population

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Abstract

Background: The problems of "difficulty in hospitalization, overlong waiting time and hospital stays" beset patients with benign prostatic hyperplasia/lower urinary tract symptoms (BPH/LUTS) in China nowadays. As a reform attempt, the surgical ambulatory procedures of photoselective vaporization of prostate (PVP) have been implemented by the urology department of Renji Hospital since 2014.

Objective: To explore the surgical effect and cost-effectiveness of day surgery versus inpatient surgery for PVP in Chinese population and present the flow chart of urologic ambulatory surgery.

Patients and Methods: This is a retrospective study of consecutive 240 patients undergoing day-surgery PVP (April 2014 to April 2016) and 156 patients undergoing inpatient-surgery PVP (May 2012 to March 2014). Functional measurements used were International Prostate Symptom Score (IPSS), maximum flow rate (Qmax), residual urine volume (RUV), postoperative complication. Economical results in terms of hospital stay, relevant preoperative, intraoperative and postoperative cost.

Results: There was no significant difference in operative time, incidence of postoperative complications and other functional outcomes between two groups ($P>0.05$), but the waiting time for admission and the hospital cost including the drug charges, bed fee, nursing fee, laboratory test and imaging fee of day-surgery group were significantly lower than that of inpatient surgery group ($p<0.05$).

Conclusion: Ambulatory surgery of PVP has a firm and well-accepted position even in ambulatory surgery. It could significantly reduce the waiting time for admission and hospitalization costs.

Keywords: Benign prostate hyperplasia; Lower urinary tract symptoms; Ambulatory surgery; Photoselective vaporization of prostate.

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Introduction

Benign prostate hyperplasia (BPH) is the main aetiology of lower urinary tract symptoms in elderly men (1). Transurethral resection of the prostate (TURP) has been the "Golden Standard" treatment of BPH for many decades. As technology has evolved in the past few years, the rate of alternative minimal invasive surgical therapies (MISTs) has increased (2). Photoselective vaporization of the prostate (PVP) has been introduced as a substitute treatment for patients with LUTS. Additionally, it has been shown that 180W XPS Greenlight laser prostatectomy is non-inferior to the standard procedure transurethral resection of prostate (TURP) in terms of efficacy, but there was a tendency of better safety pattern like severe bleeding (3). PVP, as a known safe and effective surgical method to treat benign prostatic hyperplasia, has become one of the first choices in surgical treatment of BPH in men suffering from LUTS due to benign prostate enlargement (BPE) worldwide, and recently in China too. As in 2012 about 432,000 "BPH"-procedures have been done in the U.S. with about 25% performed as Greenlight laser prostectomy procedures. The capability of the laser to destroy tissue is touchless (4). With the wavelength of 532nm green monochromatic light ablates prostate tissue by vaporization. Due to the optical tissue penetration depth of about 0.8 mm, the superficial rim of the tissue is coagulated which leads to the excellent perioperative hemostasis. With the evolution of 180W power setting and the improvements of the MoXy-fiber technique, 180W XPS Greenlight laser vaporization is effective and safe with reproducible results, especially in high-risk patient under ongoing anti-coagulation (5,6).

As a new mode typified by 24-h discharge, day surgery developed rapidly in the recent 20 years due to patients' requests and health economic pattern. At present, in certain European countries and especially in the United Kingdom and United States, day surgery accounts for up to 80% of all selective operations due to local health economic situations, which support ambulatory surgery (7,8). Due to the growth of ageing population is accelerating, the high BPH/LUTS prevalence is a significant financial and medical burden to patients and society. Performing PVP as an ambulatory procedure may decrease the duration of hospital stay and minimize cost.

Thus, we conducted this retrospective study to identify patients who have undergone PVP as an ambulatory surgery, to determine the adverse events, 30-day readmission rates and clinical outcomes who underwent PVP as a traditional inpatient procedure.

Patients and Methods

The present study was approved by the institutional review board. Between April 2014 and April 2016, our department has completed consecutive 240 cases of day surgery PVP. Treatment indications were in accordance with the clinical practice guidelines (9). We excluded the patients with prostate cancer by digital rectal examination (DRE) combined with prostate-specific antigen (PSA) test or prostate biopsy. Institutional review board approval was obtained.

Preoperative variables included medical history, symptoms index score, transrectal ultrosonography(TRUS), post-voiding residual(PVR), uroflowmetry, serum prostate specific antigen and hospitalization costs. Patients were evaluated at 1, 6, 12 months postoperatively. Postoperative complications were also recorded during follow-up visit. All complications were graded according to the Clavien-Dindo classification (10).

Day surgery procedure

Preoperatively, a detailed surgery instruction including postoperative care, occurrence of complications and expectations is provided for

the patients according with the surgical indications. A "day surgery application" will be submitted by doctor after the patient agrees to be hospitalized for surgery. The permission of related preoperative inspections will be issued (including the routine electrocardiogram (ECG), conventional blood and coagulation tests). After receiving a consultation at the clinic of anaesthesia department, the patient will be admitted to hospital at a chosen date. Patients taking aspirin or clopidogrel can undergo surgery without cession of therapy.

Intraoperatively, all the patients received general anaesthesia including intraoperative monitoring. After the surgery, the patient is returned to the inpatient unit for a rest. The voiding trial was taken on postoperative day 1 and patients were discharged when they met standardized criteria.

Standardized procedure of PVP surgery ("Six-step method of PVP side lightening")

All the patients received general anaesthesia. Then operation was performed using a Greenlight laser 120W-LBO (Realton Co., Beijing, China) or 180W-LBO (Realton Co., Beijing, China). Saline was used as washing fluid, and a Storz 26F(Karl Storz GmbH&Co., Tuttlingen, Germany) continuous flow resectoscope with a laser bridge was used for all these surgeries.

By first setting the laser power at 60W, vaporization of prostatic urethra mucosa started from 11 to 7 o'clock in a counterclockwise direction. Then without changing the laser power setting, mucosa lining the prostatic urethra was vaporized from 1 to 5 o'clock in a clockwise direction.

Between 7 and 11 o'clock, we increased laser power to 120W/180W and vaporized prostate tissues from bladder neck to apex, removed right lobe in a counterclockwise direction.

From 1 to 5 o'clock, from the bladder neck to prostatic apex, left lobe is vaporized in a clockwise direction. Keeping the laser in its highest power, from bladder neck to apex, we applied a technique of vapor-resection on median lobe between 5 and 7 o'clock. From 11 to 1 o'clock, from the bladder neck to prostatic apex, we vaporized the distal portion of the prostate with 120W/180W energy. At the end of the procedure, we usually use 80W laser power to manage bleeding, and to make the bladder neck and prostate apex smoother.

Postoperative follow-up

The first postoperative follow-up was scheduled at 4 weeks after the surgery, which examined IPSS, RUV and uroflowmetry. The incidences of postoperative complications were observed during the follow-up. Then the follow-up was taken place at 1,6 and 12 months, which examined IPSS, uroflowmetry and RUV. All the clinical data were retrospectively collected.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences, version 22.0(IBM Corp., Armonk, NY). Statistical results were presented as mean ± standard deviation (X±S) or as a percentage of total patients. Proportions of the variables were analyzed using Chi-square t test. All tests were two-sided with significant level at $p<0.05$.

Results

In this study we compared the 240 cases of BPH patient performed with day surgery with the ones performed with non-day PVP surgery before April 2014 (n=156). Table 1 lists the preoperative and intraoperative parameters of all patients. There was no significant difference in immediate curative effect and safety between the both groups, while daytime PVP surgery was able to reduce the waiting time for admission, the total cost was also reduced accordingly. Compared to intraoperative costs, there was no significant difference in the intraoperative anesthesia and surgery fee, ($p>0.05$). But in the postoperative costs, the drug charges, nursing care fee and bed fee of day surgery group were all lower than that of inpatient surgery group ($p<0.05$).

Overall, 228 patients of ambulatory surgery group were discharged in 24 hours and 12 patients were delayed, mainly due to the bleeding disorder requiring bladder irrigation (7 cases) and high fever (4 cases). One patient experienced acute myocardial infarction, transferring to intensive care unit immediately.

Clinical outcomes for the perioperative period and postoperative follow-up are summarized in Table 2. Follow-up was 12 months. IPSS, RUV and Qmax in both groups have been significantly improved. For postoperative complications, the overall complications rates at 0-12 months were 27.1%(65/240) and 28.8%(45/156) between two groups and majority of adverse events were Clavien-Dindo grade I (17.5% verse 20.5%, P=0.452) . Complications requiring intervention under regional or general anaesthesia (Clavien-Dindo grade III-IV) was recorded as 2.1% for patients undergoing ambulatory surgery, which showed no significant difference with inpatient surgery group ($p>0.05$). Irritative symptoms and bleeding were the most common Clavien-Dindo grade I/II complications. Urinary stricture was the most common Clavien-Dindo grade III complication. 1 patient developed acute myocardial infarction following PVP and was transferred to intensive care unit immediately.

Discussion

The mode of day-surgery has not been widely carried out in China, especially in the field of laser treatment in BPH. This is the first study to present the day surgery of Photoselective vaporization of prostate (PVP) in a Chinese population. In the domain of surgical treatment of BPH/LUTS, the development of laser technology enormously improved the patient's surgical experience and curative effects. The safety and effectiveness of PVP have been already widely acknowledged long ago as a main force in the field of laser technologies (11), while the combination of minimally invasive technology with daytime inpatient unit has further enormously improved the patient's experiences of hospitalization and therapy.

One published article study PVP as a day-case in 134 patients, 121 (90%) were actually discharged in ambulatory pathway (12). As demonstrated in our study, the majority of patients (228/240, 95%) patients can be managed safely in the ambulatory setting, with only 12 patients delayed the discharged and being converted to an inpatient procedure. We observed the main reason for delay were haemorrhagic events, which were mostly associated with bladder spasm.

In terms of complications between 0-12 months, serious or even life-threatening complication are rare in both inpatient and outpatient surgery group, which were similar to the previously published literature including the GOLIATH study (3) and other reported XPS Greenlight series (10). Urinary symptoms (IPSS, QoL) and uroflow parameters (Qmax, PVR) were all significantly improved compared to baseline. These data showed that the PVP was successful to treat patients in outpatient mode.

An extra emphasis is laid on the evaluation of effect of clinical and medical therapy of day surgery in western countries, focusing on the safety of day surgery including the incidence of postoperative adverse reaction, second-time surgery and postoperative living quality and other indexes (6). However, comparison of definitive costs and

Table 1 Comparison of cost-savings between day-surgery PVP and non-day surgery PVP.

	Non-day surgery	Day surgery	P-value
Age (years)	68.2±10.5	71.1±8.42	0.725
Size of prostate (g)	58.4±26.70	51.9±24.7	0.296
Mean surgery time (min)	38.9±21.9	36.9±24.0	0.408
Waiting time for admission (days)	16.5±6.2	7.9±3.4	0.000
Hospital stay (days)	3.7±1.2	1.3±0.5	0.000
Total cost (CNY)	11435.2±816.7	9478.6±652.2	0.000
Laboratory test and imaging cost	899.6±41.7	597.7±27.1	0.000
Surgery fee	3508.6±182.4	3412.4±165.5	0.708
Anesthesia fee	1172.9±112.3	1148.4±96.8	0.620
Drug charges	2622.8±613.3	1757.4±589.7	0.000
Nursing care fee	72.4±10.2	35.7±7.0	0.000
Bed fee	386.7±70.9	142.6±32.6	0.000
Medical material fee (Fiber)	2000	2000	

Table 2 Clinical variables assessed during the follow-up.

	Non-day surgery	Day surgery	P value
Preoperative IPSS	25.8±6.9	26.4±7.5	0.637
Preoperative Qmax (ml/s)	7.2±4.3	6.8±4.5	0.583
Preoperative RUV (ml)	232.5±204.1	213.2±192.6	0.708
IPSS, 1 month follow-up	7.4±5.1	6.9±4.6	0.628
Qmax, 1 month follow-up (ml/s)	17.9±4.6	16.7±4.9	0.728
RUV, 1 month follow-up (ml)	17.9±26.4	17.3±24.2	0.600
IPSS, 6 month follow-up	4.8±4.5	5.4±4.6	0.342
Qmax, 6 month follow-up (ml/s)	20.9±6.7	19.8±5.8	0.460
IPSS, 12 month follow-up	5.0±4.5	4.5±3.7	0.684
Qmax, 12 month follow-up (ml/s)	20.3±6.2	21.8±6.0	0.636

reimbursements in Europe is difficult because of different health economic regulations. It was shown by data from U.K. and Italy that, PVP could shorten the hospital stays by averagely 1.15 days as compared to the traditional TURP surgery ($p<0.01$); the result of cost minimization analysis (CMA) showed that, 629 Euros were saved from medical insurance for every case of PVP patient as compared with TURP (15,16). With the accelerating growth of PVP, the ramifications for health care expenditure worth discussing.

In this study, data presented the ambulatory surgery of PVP was able to reduce the hospitalization costs including the drug charges, nursing care fee and bed fee. At the same time, the increase of bed conversion shortened the patient's time of waiting for bed. The satisfaction rate of patients has also been elevated substantially. The majority of patients with benign prostatic hyperplasia needing surgical treatment were elderly people, who were in need of the company and care of relatives. The simplicity of daytime inpatient unit system and substantial shortening of hospital stays undoubtedly have reduced nursing burden and provided convenience for the whole family of patient.

During the course of this clinical exploration, we realized the combination with PVP and day surgery unit is feasible. The key to the whole process included: 1) All the patients should accept a complete and strict preoperative evaluation by the urologist and anaesthetist to exclude those patients not suitable for day surgery. It depends on the experienced clinical assessment that takes in account the underlying health of patients, risk for general anesthesia and postoperative severe complications. 2) The postoperative observation is the most important, especially in some elderly patients who were more prone to suffer bleeding, infection and even cardiovascular complications. The medical staff should fully inform the patients of the potential postoperative complication and corresponding emergency measures. Therefore, the development of day-surgery PVP in the remote areas with the comparative fall-behind medical condition has some limitations. 3) Postoperative health guidance and regular follow-up are equally important.

The limitation of this study include the relative small number of patients and heterogeneity of the series. These results may only reflect a single center experience.

PVP day surgery has developed up to now in our department; it tends to become a mature management mode that can be referenced. Nowadays, no unified day-surgery management system has been developed in China yet. The standards and supervisions of hospitals of

various levels were also of different qualities, resulting in a portion of hidden medical risks, that how to regulate the according supervisory system and matching policies and regulations still requires the coordination and management by government through intervention.

Conclusion

Ambulatory surgery of PVP has a firm and well-accepted position even in ambulatory surgery. It could significantly reduce the waiting time for admission and hospitalization costs. It improves utilization of medical resource and reduces the healthcare burden of the country.

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