The Safety and Efficacy of Bipolar Plasma-Kinetic Transurethral Resection of The Prostate in Patients Taking Low-Dose Aspirin

Jie Wu[1]#, Hongyan Li[2]#, Rongzhen Tao[1]#, Qinglai Tang[1] *

Purpose: To explore the safety and efficacy of bipolar plasma-kinetic transurethral resection of the prostate in patients taking low-dose aspirin.

Materials and Methods: Benign prostatic hyperplasia (BPH) patients who underwent surgical treatment from November 2018 to May 2020 were retrospectively analyzed, and divided into two groups according to whether taking 100mg aspirin daily aspirin or not. The perioperative indexes, complications and sequelae also were used to evaluate safety. The efficacy was evaluated by the functional outcomes in 3,6,12 months.

Results: There were no statistical differences in the baseline characteristics or perioperative indicators and complications and sequelae, except for a longer operative time(90.49 ± 14.34 vs 84.95 ± 15.49; 95%CI: 0.26-10.83; $P = .040$) and a shorter hospital stay time(HST) (8.52 ± 1.55 vs 9.09 ± 1 .50; 95% CI: 0.21-1.11; $P = .042$) in the non-aspirin group. During the 12-months follow-up period, the functional outcomes of the two groups were significantly improved except International Index of Erectile Function (IIEF-5).

Conclusion: Based on our research results, PKRP a safe and effective method for patients with BPH who taking 100mg aspirin daily.

Keywords: aspirin; benign prostatic hyperplasia; bipolar plasma-kinetic transurethral resection of the prostate; efficacy; safety

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common cause of lower urinary tract symptoms (LUTS) in elderly men [(1)]. Although medical management have been shown to be effective in the treatment of BPH[(2)]. For patients with severe LUTS due to BPH, minimally invasive treatment or surgical treatment is still the preferred option. For many years, transurethral resection of the prostate (TURP) has been regarded as the "gold standard" for the treatment of BPH[(3)].The field of minimally invasive surgery in which BPH causes lower urinary tract symptoms (LUTS) has undergone extraordinary progress over recent years. Bipolar plasma-kinetic transurethral resection of the prostate(PKRP) has the same efficacy as TURP, and its perioperative complications are much lower than that of TURP, it is widely used in clinics[(4,5)].

Nowadays, urologists are facing more and more patients with a variety of diseases. Among them, patients with cardiovascular and cerebrovascular diseases take long-term low-dose aspirin to prevent thrombosis[(6)], which significantly increases the risk of urological surgery. This study is based on our clinical observation that some patients with BPH take long-term low-dose aspirin. In this study,we explore the safety and efficacy of PKRP in patients taking aspirin.

MATERIALS AND METHODS

Study Population

This retrospective study was initiated by the Affiliated Jiangning Hospital of Nanjing Medical University in January 2022. The clinical data and follow-up data of BPH patients who underwent surgical treatment at the Department of Urology, the Affiliated Jiangning Hospital of Nanjing Medical University from November 2018 to May 2020 is analyzed retrospectively. According to whether to take 100mg aspirin daily, the included patients are divided into aspirin group and non-aspirin group. The flow diagram shown in **Figure 1** was used to describe the study.

Inclusion and exclusion criteria

All included patients were diagnosed with BPH by urinary system B-ultrasound who had been treated conservatively for more than one year. Urodynamic examination revealed bladder neck obstruction, the maximum urine flow rate(Qmax) was less than 15ml/s, and postvoid residual(PVR) was greater than 60ml. Exclusion criteria included a history of prostate surgery, urethral stricture, neurogenic bladder, detrusor weakness, bladder tumor, bladder diverticulum and postoperative pathological diagnosis of prostate cancer, and patients who might be taking other anti-coagulants drugs.

[1]Department of Urology, The Affiliated Jiangning Hospital of Nanjing Medical University, Nanjing, China.
[2]Department of Rheumatology and Immunology department, The Affiliated Jiangning Hospital of Nanjing Medical University, Nanjing,China.
*Correspondence: Department of Urology, Affiliated Jiangning Hospital of Nanjing Medical University, Nanjing, China.
Tel: +86 025 52087000. Fax: +86 025 52087000. E-mail:122055623@qq.com.
# These authors contributed equally to this work
Received November 2022 & Accepted June 2023

Table 1. The baseline characteristics and perioperative indicators

Variable [a]	Non–aspirin group(n=67)	Aspirin group (n=58)	*P*
Age (year)	69.42 ± 5.91	70.26 ± 5.58	.417
BMI (kg/m^2)	22.81 ± 2.69	23.59 ± 3.10	.134
PV(mL)	84.54 ± 16.23	84.98 ± 16.37	.880
tPSA(ng/mL)	1.90 (1.00,2.70)	2.32 (1.00,3.21)	.413
Qmax (ml/s)	6 (4,15)	7 (5,9)	.415
PVR (mL)	82.00 ± 17.31	83.76 ± 17.15	.570
IPSS	22.45 ± 3.21	23.05 ±3.56	.320
QoL	5 (4,5)	5 (4,5)	.318
IIEF-5	18 (15,18)	18 (15,21)	.571

Abbreviations: BMI body mass index, PV prostate volume, tPSA total prostate-specific antigen, Qmax maximum urinary flow rate,PVR postvoid residual,IPSS international prostate symptom score, QoL quality of life, IIEF International Index of Erectile Function

[a] Data are presented as mean±SD or median and IQR

Table 2. Perioperative indicators

Variable[a]	Non–aspirin group	Aspirin group	*P*
BLL (ml)	180.67 ± 30.24	182.76 ± 41.24	.745
OT(min)	90.49 ± 14.34	84.95 ± 15.49	.040
BIT(h)	39.91 ± 8.24	42.32 ± 6.52	.072
ICT(d)	5.69 ± 1.38	6.12 ± 1.23	.068
HST(d)	8.52 ± 1.55	9.09 ± 1.50	.042

Abbreviations: BLL intraoperative blood loss, OT operation time, BIT bladder irrigation time, ICT indwelling catheter time, HST hospital stay time

[a] Data are presented as mean±SD

Surgical Technique

All patients were operated by one urologist with more than 10 years of experience in prostatectomy. After connecting the resection ring to the plasma ultra-pulse generator (BOWA, ,German), a 26 Ch resectoscope (Storz,German) was used to perform the operation under continuous irrigation with 0.9% NaCl.The surgeon Inserted an electric resection mirror to gradually remove the benign prostatic hyperplasia tissue in the order of middle lobe, right lobe, left lobe and parietal lobe, starting from the bladder neck and ending at the seminal caruncle. During surgery, the surgeon took care to recognize the distal signs of the bladder neck and to preserve it as intact as possible. The wound surface was electrocoagulated to stop bleeding thoroughly, and the fragmented tissues were sucked out with ELLIK balls and submitted for pathological examination. A 22 Ch three-cavity catheter connected to the irrigation system is inserted into the bladder.

Evaluations

The baseline characteristics including age, prostate volume(PV), body mass index(BMI), total prostate-specific antigen (tPSA), were recorded. The primary endpoints were the perioperative indexes, complications and sequelae including intraoperative blood loss(BLL), operation time(OT), bladder irrigation time(BIT), indwelling catheter time(ICT), hospital stay time(HST), transurethral resection syndrome(TURS), intraoperative blood transfusion(IBT), postoperative bleeding(PB), bladder spasm(BS), postoperative urethral stricture(PUS), retrograde ejaculation(RE), temporary incontinence(TI), bladder neck contracture (BNC). We estimated intraoperative blood loss by the following formula: estimated blood loss (ml) =(preoperative hemoglobin - postoperative hemoglobin)/ preoperative hemoglobin) Body weight (kg) × 7% × 1000. The secondary endpoints were functional outcomes including maximum urinary flow rate (Qmax), International Prostate Symptoms Score (IPSS), post-void residual urine volume (PVR), quality of life(QoL), and International Index of Erectile Function (IIEF).

Statistical analysis

IBM®SPSS®Statistics20.0 was applied for statistical analysis. The variables are expressed in the form of mean±standard deviation(SD), or median and Inter Quartile Range(IQR). Student's t test, Mann-Whitney U test and $\chi 2$ test or Fisher's test (expected value <5) were used analyze our data.

Ethical statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the ethics committees at The Affiliated Jiangning Hospital of Nanjing Medical University. Informed consent was obtained from all individual participants.

RESULTS

A total of 125 patients with BPH who underwent PKRP were included in this study. Of these patients,58 patients (Aspirin group) had been taking aspirin(100 mg per day) regularly. And they didn't stop taking aspirin throughout the perioperative period. The other 67 patients(Non–aspirin group) didn't taking aspirin or any other anticoagulants. As shown in **Table 1**, there were no differences between the two groups in terms of age, BMI, PV, tPSA, Qmax, PVR, IPSS, QoL and IIEF-5. Perioperative indicators, complications and postoperative sequelae have been illustrated in Table 2 and Table 3. The OT of the non-aspirin group was longer(90.49 ± 14.34 vs 84.95 ± 15.49; 95%CI: 0.26-10.83; *P* = .040).And the HST was shorter than that of the aspirin group(8.52 ± 1.55 vs 9.09 ± 1 .50; 95% CI: 0.21-1.11; *P* = .042). However, There were no significant differences in BLL, BIT and ICT , TURS, IBT, PB, BS, PUS,

Table 3. Perioperative complications and postoperative sequelae

Group	TURS	IBT	PB	BS	PUS	RE	TI	BNC
Non–aspirin Group,67(n)	0	0	4	5	5	15	10	3
Aspirin group,58(n)	0	1	2	8	3	8	10	4
P	-	.942	.812	.248	.602	.216	.725	.559

Abbreviations: TURS transurethral resection syndrome, IBT intraoperative blood transfusion, PB postoperative bleeding, BS bladder spasm, PUS postoperative urethral stricture, RE retrograde ejaculation, TI temporary incontinence, BNC bladder neck contracture

Table 4. The functional outcomes

Variable[a]	Non–aspirin group Mean ± SD	Mean change	Aspirin group Mean ± SD	Mean change	*P*
Qmax (ml/s)					
3 months	21.34 ± 3.47	14.47*	21.66 ± 2.97	14.54*	.593
6 months	21.67 ± 3.90	14.80*	21.00 ± 3.27	13.88*	.292
12 months	18.87 ± 2.83	12.00*	19.12 ± 3.45	12.00*	.651
PVR (mL)					
3 months	16.33 ± 6.60	-65.67*	17.07 ± 4.73	-66.69*	.479
6 months	18.57 ± 3.71	-63.43*	17.79 ± 5.68	-65.97*	.378
12 months	20.11±2.45	-61.89*	19.97 ± 2.69	-63.79*	.739
IPSS					
3 months	5.85 ± 1.18	-16.60*	6.00 ± 1.18	-17.05*	.484
6 months	5.78 ± 1.82	-16.67*	6.10 ± 1.86	-16.95*	.324
12 months	5.97 ± 1.53	-16.48*	5.74 ± 1.69	-17.31*	.428
QoL					
3 months	1.85 ± 0.80	-3.05*	1.95 ± 0.93	-2.82*	.529
6 months	1.94 ± 0.94	-2.96*	1.86 ± 0.71	-2.91*	.604
12 months	2.01±0.90	-2.89*	2.05 ± 0.85	-2.72*	.815
IIEF-5					
3 months	14.90 ± 3.30	-0.02	15.27 ± 2.73	0.06	.488
6 months	15.07 ± 1.90	0.15	15.34 ± 2.59	0.13	.504
12 months	15.18 ± 2.00	0.26	14.74 ± 1.87	-0.47	.212

Abbreviations: Qmax maximum urinary flow rate,PVR postvoid residual,IPSS international prostate symptom score, QoL quality of life, IIEF International Index of Erectile Function'*' means $P < 0.05$)
a Data are presented as mean ± SD

RE, TI, and BNC.

As shown in **Table 4** and **Figure 2**, during the 12-month follow-up period, the QoL, IPSS, Qmax, and PVR of the two groups were significantly improved, and there was no significant difference in IIEF-5. Nevertheless, there was no significant difference in the above indicators between the two groups at 3, 6, and 12 months.

DISCUSSION

With the advancement of living and medical levels, many countries in the world have entered an ageing society. About 50% of men develop BPH at the age of 50, and about 80% of 80-year-old men suffer from BPH[7]. Although traditional TURP has been proven to be an effective and relatively safe method for the treatment of BPH patients, a wide range of innovative endoscopic techniques have challenged traditional TURP's role in the treatment of BPH[4,5,8,9]. The 2019 European Urology Guidelines recommend PKRP technology for the treatment of BPH, and the recommendation level is A[10].

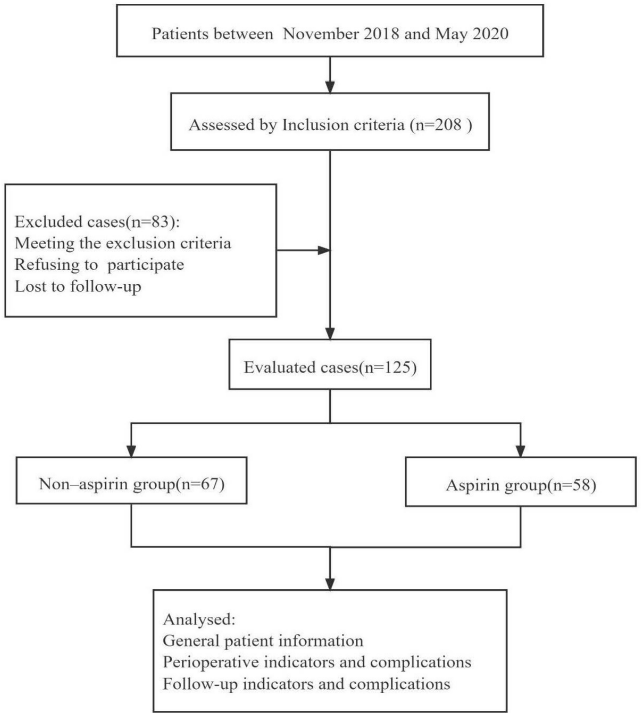

Figure 1. The flow diagram.

In 2004, PKRP was first applied to BPH treatment. In the process of PKRP treatment of BPH, plasma vaporizes the surface of the prostate tissue and the tissue below about 2mm to form a uniform coagulation layer, which quickly closes the capillaries, deep arterioles and venules, thus achieving a rapid and effective hemostasis[11].In addition, the temperature of the wound surface of PKRP surgery is maintained at 40°C to 70°C, which greatly reduces thermal damage[12]. Therefore, PKRP is regarded as a safe and effective endoscopic option for the treatment of BPH.

Aspirin, also known as acetylsalicylic acid, is a kind of white crystal or crystalline powder[13]. After nearly a hundred years of clinical application, it has proved to be effective in relieving mild or moderate pain, preventing platelet aggregation and thrombosis[13,14]. Some of patients with BPH are accompanied by cardiovascular and cerebrovascular diseases. In the past, these patients undergoing TURP need to stop aspirin one week before the operation in order to prevent excessive bleeding during the operation[15]. However, for these patients, stopping aspirin greatly increases the risk of thrombosis and even endanger their lives[16,17].

This study suggested that there was no significant difference in the patient preoperative information between the aspirin group and the non-aspirin group. However,the operation time of the aspirin group is shorter than that of the non-aspirin group. In our study, the patients in the aspirin group stayed in hospital longer than those in the non-aspirin group. Patients in the aspirin group

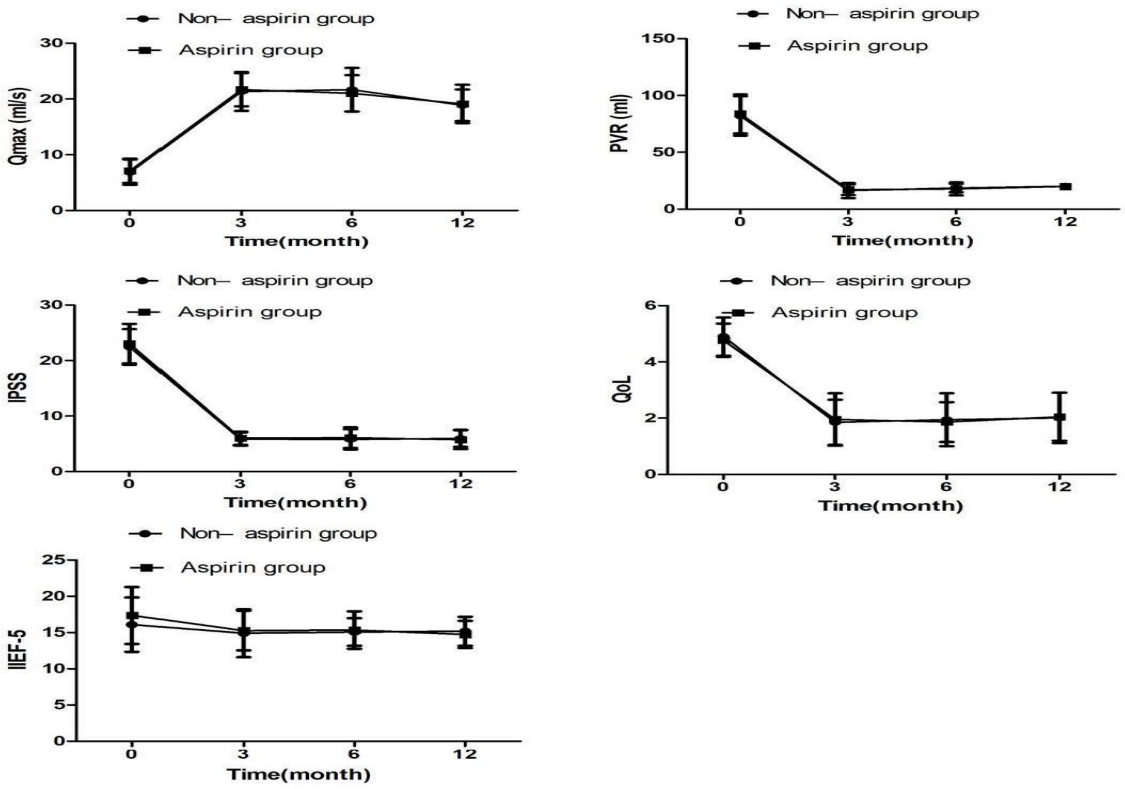

Figure 2. The functional outcomes in 3,6,12 months('0' represents preoperative).

were accompanied by cardiovascular and cerebrovascular diseases. Patients in the aspirin group were tended to be accompanied by cardiovascular and cerebrovascular diseases. The patients require additional examinations, such as cerebral CT scanning, before surgery. In addition, Cardiovascular and neurology departments should be involved in the preoperative evaluation of these patients. It greatly increases the length of hospital stay before surgery. There was no difference between the two groups in the other indicators(BLL, BIT and ICT) and the complications(TURS, IBT, PB and BS) during the perioperative period. Previous meta-analysis has shown that PKRP had better hemostatic effect than traditional TURP[5]. According to an international multidisciplinary expert consensus established by American Urological Association(AUA) and International Consultation on Urological Disease (ICUD), patients who continue to take low-dose aspirin are less likely to have serious bleeding complications in numerous urological procedures[17]. Therefore, we believe that PKRP is safe in the treatment of patients taking aspirin with PBH.

As shown by our results, the treatment effect(Qmax, PVR, IPSS) and QoL have been significantly improved in 3 months, 6 months and 12 months after the operation, whether the patient is taking aspirin or not. Neither of the two groups showed significant improvement in erectile function. Most previous studies have shown that PKRP has no significant effect on improving erectile function[18-20]. However, the IIEF-5 reported by Xu Cheng was improved after PKRP surgery[21] We believe that a large amount of reliable follow-up data is still needed to further verify the influence of PKRP on erectile function. In our study, We did not find significant differences in the follow-up indicators and complications between the aspirin group and non-aspirin group. A previous study has shown that minimally invasive PKERP may be considered a safe and effective treatment option for BPH patients receiving oral anticoagulant therapy and/or platelet aggregation inhibitors[22]. Currently, there are many studies on PKRP. Nonetheless, there are few reports on PKRP in patients taking aspirin. This study explores the safety and efficacy of PKRP in patients taking aspirin for the first time. Our research still has the following limitations: The sample size included in the study is limited and the follow-up time is relatively short. This study is a single-center retrospective cohort study. In addition, This study lacked an exploration of patients with BPH taking two or more anticoagulants.

CONCLUSIONS

Based on our research results, PKRP is a safe and effective method for patients with BPH who are maintained on low-dose aspirin.

ACKNOWLEDGEMENT

The authors are grateful to the entire staff of the Department of Urology,and The Affiliated Jiangning Hospital of Nanjing Medical University.The study was supported by Nanjing medical science and technology development fund (No.YKK22224).

CONFLICT OF INTEREST

The authors report no conflict of interest.

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