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Long-term Follow-up of Transurethral Enucleation Resection of the Prostate for Symptomatic Benign Prostatic Hyperplasia

Bin Pan[1], Zhihai Deng[2], Genlong Jiao[1], Caiyong Lai[1], Zexuan Su[1], Junfeng Liu[3, *]

[1]Department of Urology, the First Affiliated Hospital of Jinan University, Guangzhou, Guangdong, People's Republic of China

[2]Department of Urology, Gao Zhou People's Hospital, Gaozhou, Guangdong, People's Republic of China

[3]Department of Urology, Inner Mongolia People's Hospital, Hohhot, Inner Mongolia, People's Republic of China

Email address:

junfeng__liu@sina.com (Junfeng Liu)

[*]Corresponding author

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Abstract: Transurethral enucleation resection of the prostate is safe and feasible for the treatment of symptomatic benign prostatic hyperplasia (BPH). However, long-term results of this treatment in patients with BPH have not been reported. To assess the efficacy and safety of this procedure, this study retrospectively evaluated long-term outcomes in 1400 consecutive patients who underwent transurethral enucleation resection of the prostate for BPH between 2008 and 2014. Patients were followed up at 1, 3, 6, and 12 months, and every year thereafter. At a median follow-up of 70.1 months, mean Qmax increased from 6.43 to 22.1 ml/s and mean IPSS decreased from 22.3 to 2.9. PVR decreased from 123.0 to 12.0 cc, and mean TRUS volume decreased from 65.4 to 21.4 ml ($P<0.0000$). QOL score improved from 4.96 to 1.0, and PSA concentrations decreased from 6.87 to 0.75 ng/ml ($P<0.0000$). Complications included bladder neck contracture in 1.0% of patients and urethral stricture in 1.3%. These long-term results showed that transurethral enucleation resection of the prostate is durable, safe, and effective for patients with BPH, with patients not requiring reoperation.

Keywords: Benign Prostatic Hyperplasia, Transurethral Resection of the Prostate, Follow-up

1. Introduction

Transurethral resection of the prostate (TURP) has been regarded as the gold standard treatment for patients with benign prostatic hyperplasia (BPH) [1]. Although TURP shows long-term safety and high efficacy, about 20% of patients experience complications, including intraoperative hemorrhage, clot retention, and transurethral resection (TUR) syndrome [1-4].

Transurethral enucleation resection of the prostate (TUERP) is a new, less invasive surgical approach that is safe and effective in the treatment of BPH [5]. A prospective randomized study comparing TUERP and TURP demonstrated the efficacy of TUERP, as shown by improvements in subjective and objective parameters [5-9]. Less is known, however, about the long-term (>5 years) efficacy, safety, and durability of TUERP. This study therefore evaluated the durability of TUERP outcomes by retrospectively analyzing 7 year follow-up results of TUERP for symptomatic BPH.

2. Materials and Methods

2.1. Study Design

Between January 2008 and February 2014, 1400 consecutive patients with lower urinary tract symptoms (LUTS) due to BPH were assessed for eligibility to enter the study. Preoperative evaluation included medical history, physical examination with digital rectal examination, transrectal ultrasonography, free uroflowmetry, measurement of postvoid residual urine (PVR) by abdominal ultrasound of the bladder, estimation of prostate volume (PV) by transrectal

ultrasound, routine urine analysis, and detection of serum prostate-specific antigen (PSA). All patients were administered the International Prostate Symptom Score (IPSS) index, Quality of Life score (QoL), and International Index of Erectile Function (IIEF-5) questionnaires.

Inclusion criteria were patient age >55 years, IPSS ≥10, maximal flow rate (Qmax) >15 ml/s, and postvoid residual urine ≤350 ml. There was no upper limit for prostate size. Exclusion criteria included previous prostate surgery, prostate carcinoma, urethral stricture, bladder calculus, neurogenic bladder dysfunction, or acute urinary tract infection. Baseline characteristics of the treated patients are shown in Table 1.

Patients were followed up 1, 3, 6, and 12 months after surgery and every 12 months thereafter. Evaluations included the IPSS, QoL, and IIEF-5 questionnaires, as well as measurements of Qmax, serum PSA concentration, PV by transrectal ultrasonography, and PVR volume. Postoperative complications were also recorded.

Table 1. *Baseline characteristics of study subjects.*

Parameters	Mean±SD (range)
Age (yr)	68.3±7.6 (55–86)
TRUS volume (cc)	65.4±24.8 (34–260)
Preoperative PSA (ng/ml)	6.87±3.0 (0.07–19.10)
Preoperative IPSS	22.3±5.6 (11–35)
Preoperative QoL	4.96±1.0 (1–6)
Preoperative Qmax (ml/sec)	6.43±2.2 (0–15)
Preoperative PVR (ml)	123.0±57.3 (10–350)
Preoperative IIEF-5	19.7±4.6 (7–25)

IPSS = International Prostate Symptom Score; QOL = quality of life; Qmax = maximum urinary flow rate; PVR = postvoid residual urine; PSA = prostate-specific antigen; Qmax = detrusor pressure at Qmax; TRUS = transrectal ultrasound; IIEF = International Index of Erectile Function.

2.2. Surgical Procedures

All procedures were performed by three experienced surgeons, each of whom had performed >200 TUERP procedures, using a Storz 26F resectoscope, with patients under spinal or general anesthesia. The TUERP procedure was performed using the Gyrus Plasmakinetic SuperPulse System (Gyrus Medical, Cardiff, UK) with PlasmaSect electrodes, operated with a cutting power of 160 W and a coagulating power of 80 W [10]. The TUERP technique has been described in detail elsewhere [6]. Briefly, this technique involved retrograde enucleation of the prostatic adenoma lobes following triradiate bladder neck incisions. In essence, the prostatic adenoma lobes were dissected away from the prostatic capsule with a loop in exactly the same plane in which the surgeon's index finger moved during open prostatectomy. Hemostasis was verified prior to dissection of the adenoma.

2.3. Statistical Analysis

Baseline and postoperative IPSS, QoL, Qmax, PSA, PV, and PVR volume were compared using paired Student's t tests. All statistical analyses were performed using the Statistical Package for the Social Sciences, version 13.0 for Windows. A two-sided P-value <0.05 was considered statistically significant.

3. Results

Mean patient age was 68 years (range 55 to 86 years). Patients were followed up for a mean 70.1±34.2 months (range: 1–84 months), with 778 patients followed up for 7 years and 801 for 6 years. No patient experienced recurrent BPH symptoms with indications for surgery.

Subjective and objective outcome parameters were significantly improved immediately after surgery and continued during follow-up (Table 2). At 7 years, 778 of the 1400 patients were satisfied or extremely satisfied with their surgery overall. Mean Qmax increased from 6.43±2.2 to 22.1±7.7 ml/s (P<0.0000), and mean PVR decreased from 123.0±57.3 to 12.0±8.5 ml (P<0.0000). In addition, mean IPSS improved from 22.3±5.6 to 2.9±1.7 (P<0.0000) and mean QOL score improved from 4.96±1.0 to 1.0±0.9 (P<0.0000).

Table 2. *Qmax, PVR, IPSS, and QOL scores before and after TUERP in patients with BPH.*

Follow-up (patients)	Mean Qmax (ml/sec)	Mean PVR (ml)	Mean IPSS	Mean QOL score
Preoperative (1400)	6.43±2.2 (0–15)	123.0±57.3 (10–350)	22.3±5.6 (11–35)	4.96±1.0 (1–6)
1 mo (1300)	23.4±8.7 (5.3–62.3)	45.7±31.6 (0–180)	6.9±4.1 (0–23)	1.8±1.0 (0–6)
3 mo (1269)	22.7±9.2 (6–60.9)	19.3±5.1 (6–34)	5.8±4.2 (0–22)	1.4±1.1 (0–6)
6 mo (1258)	22.4±9.4 (7–63)	19.8±14.1 (0–150)	4.7±3.7 (0–20)	1.3±1.2 (0–5)
1 yr (1179)	21.0±8.1 (8–60.5)	14.0±9.3 (0–40)	4.2±3.5 (0–18)	1.1±1.1 (0–5)
2 yr (1150)	21.6±8.3 (8.5–58.4)	15.3±10.5 (0–41.4)	4.7±3.8 (0–19)	1.2±1.3 (0–6)
3 yr (1075)	22.0±9.1 (7.5–60)	13.9±9.4 (0–39.1)	4.3±3.6 (0–15)	1.1±1.2 (0–5)
4 yr (1025)	19.8±7.7 (7.3–53)	13.5±9.1 (0–36)	4.1±3.2 (0–11)	1.2±1.2 (0–4)
5 yr (907)	21.5±8.6 (6.8–57)	13.6±9.0 (0–38)	3.9±2.6 (0–8)	1.1±1.0 (0–4)
6 yr (801)	22.3±9.0 (9.7–61)	12.5±8.7 (0–34.5)	3.6±2.3 (0–7)	1.0±1.1 (0–4)
7 yr (778)	22.1±7.7 (9.5–59)	12.0±8.5 (0–31)	2.9±1.7 (0–6)	1.0±0.9 (0–4)

Abbreviations: Qmax, peak urinary flow rate; PVR, postvoid residual (urine volume); IPSS, International Prostate Symptom Score; QOL, quality of life (score).

Table 3. *PSA and prostate volume before and after TUERP in patients with BPH.*

No. of patients	Mean PSA (ng/ml)	Mean TRUS volume (cc)
Preoperative (1400)	6.87±3.0 (0.07–19.10)	65.4±24.8 (34–260)
1 mo (1300)	2.1±0.9 (0.02–6)	19.1±6.4 (7–35)
3 mo (1269)	1.02±0.51 (0.01–2.60)	19.3±5.1 (6–34)
6 mo (1258)	0.75±0.41 (0.02–2.20)	20.8±6.3 (8–36)
1 yr (1179)	0.63±0.36 (0.01–1.87)	19.6±5.8 (7.6–34)
2 yr (1150)	0.58±0.31 (0.01–1.6)	20.7±6.1 (8–35)
3 yr (1075)	0.46±0.27 (0.00–1.18)	21.1±6.5 (7–37)
4 yr (1025)	0.43±0.26 (0.01–1.04)	20.6±5.4 (7.8–34.5)
5 yr (907)	0.51±0.29 (0.01–1.11)	20.8±6.7 (6.8–35.9)
6 yr (801)	0.59±0.33 (0.01–1.43)	21.0±6.9 (8–37)
7 yr (778)	0.68±0.34 (0.05–1.60)	21.4±7.1 (8–38)

PSA: prostate-specific antigen; TRUS: transrectal ultrasound.

Table 4. *Summary of postoperative complications in patients who underwent TUERP for BPH.*

Long-term postoperative complication	Patients (%)
Irritative symptoms	117 (8.4)
Urinary tract infection	109 (7.8)
Stress incontinence	59 (4.2)
Urethral stricture	18 (1.3)
Meatal stenosis	13 (0.9)
Bladder neck contracture	15 (1.0)

Table 3 shows changes from baseline in PV and PSA concentration. Mean PSA, which was 6.87 ng/ml (range 0.07 to 19.10 ng/ml) preoperatively, decreased to 0.75 ng/ml (range 0.02 to 2.2 ng/ml) at 6 months postoperatively (P<0.0000). Mean TRUS volume decreased from 65.4±24.8 ml preoperatively to 21.4±7.1 ml 6 months after surgery (P<0.0000). Pathologic examination of the enucleated tissue revealed BPH in 1357 patients (96.9%), prostatic adenocarcinoma in 36 (2.5%), high-grade prostatic intraepithelial neoplasia (PIN) in four (0.3%), and low-grade PIN in three (0.2%).

Of the patients who expressed dissatisfaction with the procedure, 59 (4.2%) developed stress incontinence, which was treated with levator ani muscle exercises for 3 to 6 months. In addition, 117 patients (8.4%) had postoperative irritative symptoms, which required occasional treatment with anticholinergic agents, and 109 (7.8%) developed urinary tract infections, which were treated with appropriate antibiotics. Urethral strictures developed in 18 patients (1.3%), and meatal stenosis developed in 13 (0.9%). All procedures were easily performed under local anesthesia. Fifteen patients (1.0%) developed bladder neck contracture (BNC), including seven at 6 months and eight at 2 years after surgery, with all patients treated successfully by laser incision of the bladder neck (Table 4). In addition, 673 sexually active patients (48%) had retrograde ejaculation. No patient experienced recurrent BPH symptoms.

4. Discussion

TUERP, which involves cutting off each adenoma within the surgical capsule [5], is a new endo-enucleation technique used in the treatment of obstructive BPH [5-8]. Excellent hemostatic properties resulted from the rapid removal of obstructive prostatic adenoma with the least bleeding, with several studies confirming the safety and efficacy of TUERP in the treatment of symptomatic BPH. Clinical outcomes after TUERP were similar to those after TURP, but long-term data analysis of TUERP was lacking [6, 9].

Evaluation of different endo-enucleation techniques for prostatic adenomas has indicated that TUERP yields durable subjective and objective improvements [9, 10-13]. In the current study, our 7 year long-term follow-up data showed that TUERP has a low morbidity rate and is an alternative to TURP in the treatment of patients with symptomatic BPH. To our knowledge, this study is the largest long-term follow-up study on TUERP for symptomatic BPH.

Our results provide evidence supporting the long-term efficacy of TUERP. Clinical outcomes after TUERP using the PK device were considered satisfactory. Improvements in subjective variables (IPSS and QOL) showed that the patients were satisfied with the results of this procedure. At 7 years, mean Qmax improved 243.7%, to 22.1 ml/s; PVR urine volume and IPSS decreased 90.2% and 82%, respectively; and QOL scores improved 80%, when compared with preoperative data. The highly significant improvements from baseline in postoperative PVR and QOL index showed that the obstruction had been successfully relieved.

A study of 1100 patients who underwent TUERP and were followed up for more than 4 years found that the procedure resulted in minimal morbidity, with immediate improvements in symptoms and voiding [6]. Follow-up after a mean 4.3 years showed an improvement in Qmax to 24.8 ml/s; 90.8% and 78.7% reductions in PVR and I-PSS, respectively; and a 67.4% improvement in QOL score, with no patient requiring a reoperation. A retrospective review of 978 patients who underwent HoLEP for symptomatic BPH showed that, at 1 year follow-up, Qmax increased to 23.4 ml/s, PVR was 32.5 ml, and IPSS was 4.5 [14]. Furthermore, 4% of patients required retreatment for BPH, with retreatment rate positively associated with the procedure learning curve. A comparison of plasmakinetic enucleation of the prostate (PKEP) and TURP for symptomatic BPH in 204 patients showed significantly greater improvements in outcomes after 3 years of follow-up in the PKEP than in the TURP group [9]. Specifically, IPSS (2.4±2.2 vs 4.3±2.9; P<0.001), QOL (0.6±0.5 vs 1.6±1.4; P<0.001), Qmax (28.8±10.1 ml/s vs 25.1±8.0 ml/s; P=0.017), and TRUS volume (21.0±7.3 ml vs 26.4±6.8 ml; P<0.001) showed significantly greater improvements in the PKEP than in the TURP group [9].

Mean patient follow-up in our series was 70.1±34.2 months (range, 1–84 months), with more than 700 patients being followed up for longer than 7 years. No patient required a reoperation. This compares well with TURP, for which the reoperation rate is 3–8% (1–2%/yr) [15]. TUERP has several advantages, including the ability to remove entire prostatic adenomas and to avoid leaving adenomatous tissue in the prostatic fossa. Complete enucleation of the prostatic (obstructing) tissue, resulting in a wide prostatic cavity,

provided superior and more durable voiding function.

Similar to previous studies of TUERP, our patients showed a mean 90.1% reduction in PSA concentration and a mean 67.3% reduction in PV, from 65.4 to 21.4 cc [5,16], strongly suggesting that TUERP results in complete adenoma removal. We also found that 36 patients (2.6%) were diagnosed with prostate carcinoma after TUERP, a rate similar to the 3% of patients who underwent HoLEP [17].

There were no major safety concerns with TUERP. Most of the adverse events were uncomplicated and of short duration, including urethral stricture in 1.3% of patients and meatal stenosis in 0.9%. The long-term rate of BNC was 1.0%, similar to the rate (1.5%, range 0–3.8%) observed in a pooled analysis of patients who underwent HoLEP [18]. Incontinence was the most frequent adverse event during follow-up. We found that 4.2% of patients experienced stress incontinence, similar to previous findings in patients who underwent TUERP, with stress incontinence disappearing in most patients within 6 months [19]. Enucleation of the adenoma with the surgical capsule can contribute to radical deobstruction and reduce urethral resistance drastically. Sphincter muscle exercises resulted in improvements in incontinence, indicating that the bladder and sphincter change in response to urinary deobstruction induced by TUERP.

We found that 673 sexually active patients (48%) had retrograde ejaculation, a finding in agreement with previous results [20]. Because TUERP can damage the bladder neck, causing retrograde ejaculation, all patients undergoing this procedure must be informed in advance of this risk. Sexual functioning is an important part of life, with dysfunction being acceptable to patients if they had been informed preoperatively. Treatment options that affect sexual function should be considered.

Our study had several limitations, including those associated with a learning curve. TUERP requires skillful endoscopic technique and fundamental knowledge of the anatomy and morphology of the bladder neck, as well as the prostatic urethra and sphincter. Although TUERP has been reported valid and safe for any sized prostate [6], the learning curve should begin with small prostates. Other limitations included the retrospective, single center design of this study. Prospective, randomized multicenter studies are therefore required to assess the efficacy and safety of TUERP for symptomatic BPH.

5. Conclusions

This was the first long-term follow-up study showing that TUERP is effective and safe, as determined by both subjective and objective parameters, in patients with symptomatic BPH. IPSS, QOL, Qmax, and PVR showed statistically significant improvements from baseline. TUERP had good short- and long-term safety profiles, with a low complication rate. TUERP may be an alternative treatment of choice for symptomatic BPH.

References

[1] Oelke M, Bachmann A, Descazeaud A, Emberton M, Gravas S, Michel MC, et al. EAU Guidelines on the Treatment and Follow-up of Non-neurogenic Male Lower Urinary Tract Symptoms Including Benign Prostatic Obstruction. Eur Urol 2013; 64: 118-40.

[2] Hawary A, Mukhtar K, Sinclair A, Pearce I. Transurethral resection of the prostate syndrome: almost gone but not forgotten. J Endourol 2009; 23: 2013-20.

[3] Gilling PJ, Wilson LC, King CJ, Westenberg AM, Frampton CM, Fraundorfer MR. Long-term results of a randomized trial comparing holmium laser enucleation of the prostate and transurethral resection of the prostate: results at 7 years. BJU Int 2012; 109: 408-11.

[4] Geavlete P. Is Classical Transurethral Resection of the Prostate, the Gold Standard Endoscopic Treatment for Benign Prostate Hyperplasia, in Real Danger of Being Replaced? Eur Urol 2010; 58: 349-55.

[5] Xu A, Zou Y, Li B, Liu C, Zheng S, Li H, et al. A Randomized Trial Comparing Diode Laser Enucleation of the Prostate with Plasmakinetic Enucleation and Resection of the Prostate for the Treatment of Benign Prostatic Hyperplasia. J Endourol 2013; 27: 1254-1260.

[6] Liu C, Zheng S, Li H, Xu k. Transurethral enucleation and resection of prostate in patients with benign prostatic hyperplasia by plasma kinetics. J Urol 2010; 184: 2440-5.

[7] Rao JM, Yang JR, Ren YX, He J, Ding P, Yang JH. Plasmakinetic enucleation of the prostate versus transvesical open prostatectomy for benign prostatic hyperplasia >80 mL: 12-month follow-up results of a randomized clinical trial. Urology 2013; 82: 176-81.

[8] Ou R, Deng X, Yang W, Wei X, Chen H, Xie K. Transurethral enucleation and resection of the prostate vs transvesical prostatectomy for prostate volumes > 80 mL: a prospective randomized study. BJU Int 2013; 112: 239-245.

[9] Zhao Z, Zeng G, Zhong W, Mai Z, Zeng S, Tao X. A prospective, randomised trial comparing plasmakinetic enucleation to standard transurethral resection of the prostate for symptomatic benign prostatic hyperplasia: three-year follow-up results. Eur Urol 2010; 58: 752-8.

[10] Fayad AS, Sheikh MG, Zakaria T, Elfottoh HA, Alsergany R. Holmium laser enucleation versus bipolar resection of the prostate: a prospective randomized study. Which to choose? J Endourol 2011; 25: 1347-52.

[11] Elmansy HM, Kotb A, Elhilali MM. Holmium laser enucleation of the prostate: long-term durability of clinical outcomes and complication rates during 10 years of followup. J Urol 2011; 186(5): 1972-6.

[12] Krambeck AE, Handa SE, Lingeman JE. Experience with more than 1,000 holmium laser prostate enucleations for benign prostatic hyperplasia. J Urol 2010; 183: 1105-9.

[13] Elmansy H, Baazeem A, Kotb A, Badawy H, Riad E, Emran A, et al. Holmium laser enucleation versus photoselective vaporization for prostatic adenoma greater than 60 ml: preliminary results of a prospective, randomized clinical trial. J Urol 2012; 188: 216-21.

[14] Elshal AM, Elmansy HM, Elhilali MM. Feasibility of holmium laser enucleation of the prostate (HoLEP) for recurrent/residual benign prostatic hyperplasia (BPH). BJU Int 2012; 110: E845-50.

[15] Reich O, Gratzke C, Stief CG. Techniques and long-termresults of surgical procedures for BPH. Eur Urol 2006; 49: 970–8.

[16] Neill MG, Gilling PJ, Kennett KM, Frampton CM, Westenberg AM, Fraundorfer MR, et al. Randomized trial comparing Holmium laser enucleation of prostate with plasmakinetic enucleation of prostate for treatment of benign prostatic hyperplasia. Urology 2006; 68: 1020-4.

[17] Kuntz RM, Lehrich K, Ahyai S. Transurethral holmium laser enucleation of the prostate compared with transvesical open prostatectomy: 18-month follow-up of a randomized trial. J Endourol 2004; 18: 189-91.

[18] Kuntz RM: Current role of lasers in the treatment of benign prostatic hyperplasia (BPH). Eur Urol 2006; 49: 961-9.

[19] Seki N, Mochida O, Kinukawa N, Sagiyama K, Naito S. Holmium laser enucleation for prostatic adenoma: analysis of learning curve over the course of 70 consecutive cases. J Urol 2003; 170: 1847-50.

[20] Elshal AM, Elmansy HM, Elkoushy MA, Elhilali MM. Male sexual function outcome after three laser prostate surgical techniques: a single center perspective. Urology 2012; 80: 1098-104.