Clinical Outcomes of Transurethral Enucleation with Bipolar for Benign Prostatic Hypertrophy

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(Received February 9, 2015; Accepted August 17, 2015)

Objective: This study compared outcomes of transurethral enucleation with bipolar (TUEB) with transurethral resection in saline (TURis).
Methods: Thirty patients who underwent TURis were compared with 30 who underwent TUEB. Perioperative treatment outcomes, preoperative and 1-month postoperative International Prostrate Symptom Scores (IPSS), quality of life (QOL) index, maximum flow rate, average urinary flow, post- void residual urinary volume, and complications were compared.
Results: There were no significant differences in IPSS, measurements of urinary flow, or duration of catheterization. However, the improvement of QOL index after surgery was significantly greater in the TUEB group than the TURis group. The TUEB group had significantly longer surgical time, but tended to have greater enucleated tissue weight than the TURis group. There was no significant difference in enucleated tissue weight per unit time between the groups. The TUEB group also tended to have less hemoglobin decrease at postoperative day 1; this tendency was more prominent in patients with an estimated prostate volume of ≥ 50 ml. No significant differences in postoperative complications were observed.
Conclusions: This study confirmed that the previously reported safety and efficacy of TUEB are comparable to those of TURis. TUEB appears especially safe for those with a large benign hypertrophic prostate.

Key words: benign prostatic hyperplasia, transurethral enucleation with bipolar, transurethral resection in saline

INTRODUCTION

Transurethral resection of the prostate (TUR-P) is the first-line surgical treatment for benign prostatic hyperplasia (BPH). However, when BPH is particularly extensive, TUR-P is often complicated by significant hemorrhage and hyponatremia. Holmium laser enucleation of the prostate (HoLEP) was developed to deal with these shortcomings and is now widely used. A similar technique, transurethral enucleation with bipolar (TUEB) using the transurethral resection in saline (TURis) system, has been developed by Olympus Corporation (Tokyo, Japan) with the aim of improving the cost-effectiveness of enucleation. We have been performing TUEB for 5 years in our hospital. This study compared the operative procedure, perioperative outcomes, complications, and treatment effects between TUEB and previously used TURis.

MATERIALS AND METHODS

We reviewed the records of 30 patients with lower urinary tract symptoms that persisted despite comprehensive medical treatment who underwent TUEB between December 2008 and December 2013. We also reviewed the records of 30 patients who underwent TURis between February 2007 and August 2009. The investigation conformed to the principles outlined in the Declaration of Helsinki.

Operative techniques

TUEB was carried out using the TURis system (Olympus), consisting of a standard loop electrode, TUEB electrode, and spatula built into a 26-Fr continuous-flow resectoscope. An incision was made in the adenomatous mucosa, commencing from the proximal edge of the verumontanum and proceeding around the circumference of the adenoma. The portion of the adenoma between the 11 o'clock and 1 o'clock positions was removed with a standard resecting loop. Then, incisions extending from the bladder neck to the apex were made at the 5 o'clock and 7 o'clock positions, thus dividing the adenoma into 3 lobes (right, left, and median). Enucleation was started from the median lobe. The spatula was inserted near the verumontanum through the circumferential incision and was advanced until the adenoma was evenly and entirely separated from the surrounding surgical capsule, such that it was attached only to the bladder neck. When separation was complete, the median lobe of the adenoma was resected with a resecting loop, after which the right and left lobes were consecutively disposed of in a similar fashion. The isolated adenoma was allowed to fall into

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Table 1 Patient characteristics

Patient characteristics	TUEB	TURis	P
Number of patients	30	30	
Age (years)	72.2 (61–88)	71.2 (55–85)	0.6
Estimated volume of prostate (ml)	66.9 (16.1–191)	46.6 (26–89.7)	0.013
Number of patients with estimated prostate volume of 50 ml or more	20 (67)	11 (37)	0.42
IPSS (score)	15.7 (1–37)	17.1 (3–34)	0.47
QOL index (score)	4.2 (1–6)	4.4 (0–6)	0.57
Q_{max} (ml/s)	5.6 (2–11.4)	6.6 (2–17.4)	0.26
Q_{ave} (ml/s)	4.1 (2–11.4)	4.9 (2–10.9)	0.1
PVR (ml)	133.4 (0–700)	205.2 (0–800)	0.012

Mean values

Table 2 Surgical outcomes

Surgical outcomes	TUEB	TURis	P
Surgical time (min)	123.1 (30–302)	75.1 (28–115)	*< 0.01
Enucleated tissue weight (g)	39.1 (7.5–115)	25.9 (4–55)	0.012
Enucleated tissue weight per time unit (g/min)	0.32 (0.18–0.55)	0.33 (0.12–0.51)	0.71
Decreased Hb after surgery (g/dl)	0.98 (−0.1 to 3.4)	1.18 (−1 to 6.5)	0.5
Decreased Hb after surgery (g/dl) ≥ 50 ml	0.99 (−0.1 to 3.4)	1.23 (0.3–2.1)	0.44
Duration of urethral catheterization (days)	2.6 (1–7)	3.1 (2–10)	0.12

Mean values

the bladder and, when possible, was minced with a morcellator (Versa Cut, Lumenis Surgical, Yokneam, Israel). All operations were carried out under spinal or general anesthesia. Postoperative care involved continuous irrigation with saline for 24 h, with the irrigation catheter removed after this period passed.

Outcomes

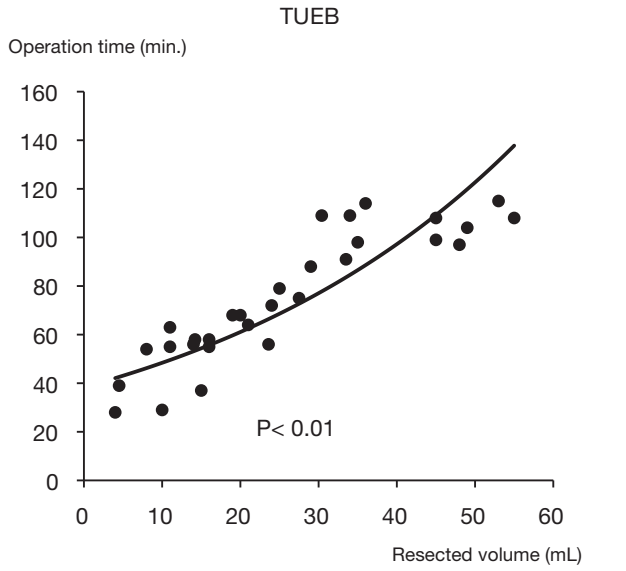
Surgical time, enucleated adenoma weight, preoperative and postoperative hemoglobin (Hb) levels, duration of urethral catheter placement, and complications were recorded. Outcome measures included International Prostate Symptom Score (IPSS), a quality of life (QOL) index with scores ranging from 1 to 6, maximal flow rate (Q_{max}), average urinary flow (Q_{ave}), and post-void residual urine volume (PVR), which were recorded preoperatively and 1 month postoperatively. Prostate-specific antigen (PSA) levels were measured preoperatively in all patients, and prostate biopsy was performed when indicated. However, change in PSA after the operation was not evaluated because PSA was not measured postoperatively in all cases. The t-test was used for statistical analysis, with P values < 0.01 considered statistically significant.

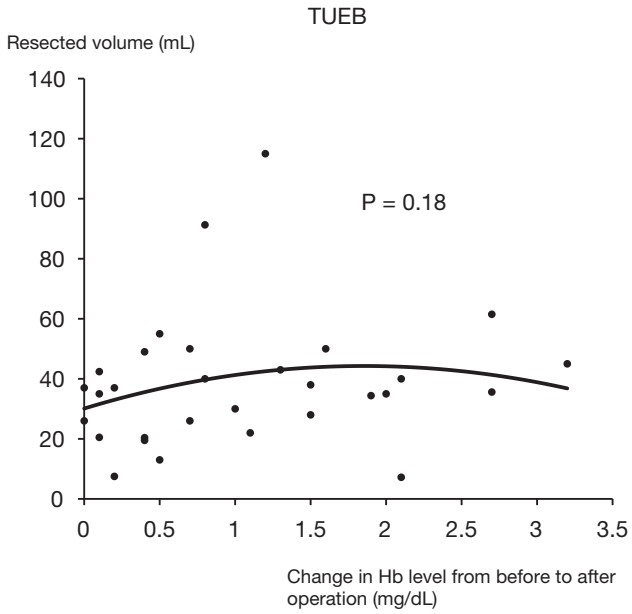
RESULTS

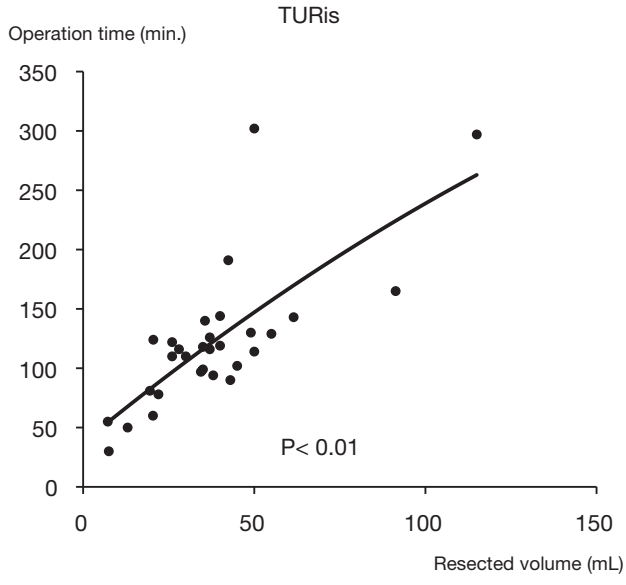
Patient characteristics are shown in Table 1. Perioperative outcomes are shown in Table 2. The surgical time of the TURis group (mean, 75.1 minutes; range, 28–115 minutes) was shorter than that of the TUEB group (mean, 123.1 minutes; range, 50–297 minutes) (P < 0.01). A morcellator was used in 9 of the 30 patients in the TUEB group.

There was no significant difference in the enucleated tissue weight between the TUEB group (mean, 39.1 g; range, 7.5–115 g) and the TURis group (mean, 25.9 g; range, 4–55 g) (P = 0.012). In addition, there was no significant difference in the enucleated tissue weight per unit time (g/minute) between the TUEB group (mean, 0.32 g/minute; range, 0.18–0.55 g/minute) and the TURis group (mean, 0.33 g/minute; range, 0.12–0.51 g/minute) (P = 0.71). There was also no significant difference in the decrease in hemoglobin levels between the TUEB group (mean, 0.98 g/dl; range, -0.1 to 3.4 g/dl) and the TURis group (mean, 1.18 g/dl; range, -1 to 6.5 g/dl) (P = 0.5). However, in the analysis of those with an estimated prostate volume of 50 g or more, the decrease in hemoglobin (Hb) levels of the TUEB group (mean, 0.99 g/dl; range, -0.1 to 3.4 g/dl) tended to be less than that of the TURis group (mean, 1.23 g/dl; range, 0.3–2.1 g/dl) (P = 0.44). In addition, while the correlation of the resected volume with surgical time was significant in both groups, the correlation of the resected volume with the change in Hb levels after surgery was not significant, especially in the TUEB group (Fig. 1 and 2). There was no significant difference in the duration of postoperative catheterization between the TUEB group (mean, 2.6 days; range, 1–7 days) and the TURis group (mean, 3.1 days; range, 2–10 days) (P = 0.12), although that of the TUEB group tended to be shorter. Incidental carcinoma was observed in 2 patients in each group; these were followed up on an outpatient basis with no signs of progression.

Complications are shown in Table 3. Among perioperative complications, perforation of the prostate capsule was observed in 1 patient in the TUEB group. Although there was no bladder perforation, 2 patients







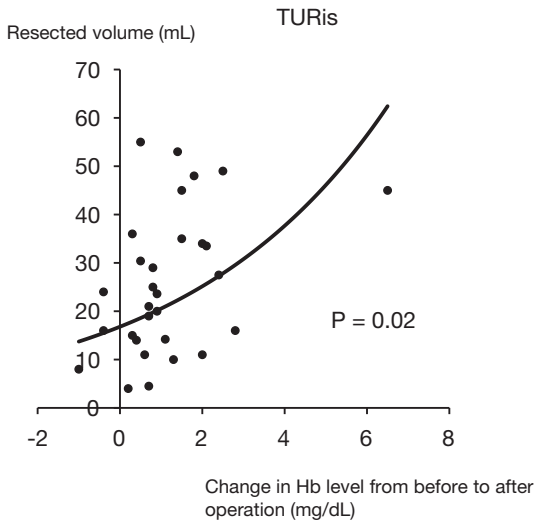


Fig. 1 Correlation between resected volume and surgical time.

Fig. 2 Correlation between resected volume and postoperative change in Hb values.

Table 3 Complications

Complications	TUEB	TURis
Perioperative	Perforation of prostate capsule 1/30	Perforation of prostate capsule 0/30
	Bladder perforation 0/30	Bladder perforation 0/30
	Allogenic transfusion 0/30	Allogenic transfusion 0/30
Postoperative	Catheter reinsertion 1/30	Catheter reinsertion 2/30
	Urethral stricture 4/30	Urethral stricture 4/30
	Repeat surgery due to postoperative bleeding 0/30	Repeat surgery due to postoperative bleeding 1/30
	Urinary incontinence (1 or more pad per day)	Urinary incontinence (1 or more pad per day)
	at 6 months after surgery 0/30	at 6 months after surgery 0/30

Table 4 Results of treatment

Treatment effects			
	Preoperative	One month postoperative	P
IPSS (score)			
TUEB	15.7 (1-37)	5.3 (1-16)	*<0.01
TURis	17.1 (3-34)	5.7 (0-24)	*<0.01
P	0.47	0.75	
QOL (score)			
TUEB	4.2 (1-6)	1.4 (1-4)	*<0.01
TURis	4.4 (0-6)	2.1 (0-6)	*<0.01
P	0.57	* <0.01	
Q_{max} (ml/s)			
TUEB	5.6 (2-11.4)	12.6 (3-27.4)	*<0.01
TURis	6.6 (1.9-17.4)	13.1 (1.5-31.7)	*<0.01
P	0.26	0.78	
Q_{ave} (ml/s)			
TUEB	4.1 (1-6.7)	8.4 (2-15.1)	*<0.01
TURis	4.9 (2-10.9)	9.1 (3.1-21.9)	*<0.01
P	0.09	0.54	
PVR (ml)			
TUEB	133.4 (0-700)	40.7 (0-122)	*<0.01
TURis	205.2 (0-800)	45.8 (0-236)	*<0.01
P	0.15	0.65	

Mean values

had a bladder injury caused by the morcellator. No allogenic transfusion was required. Among the postoperative complications, catheter reinsertion was required in 1 patient in the TUEB group, and in 2 patients in the TURis group, although these were removed later. Urethral stricture was observed in 4 patients in each group, although the condition resolved after bougie dilatation at our outpatient clinic. Repeat surgery due to postoperative bleeding was observed in 1 patient in the TURis group. No patients showed urinary incontinence (1 or more pad use per day) at 6 months after surgery in either group.

Treatment effects are shown in Table 4. Comparison between pre- and 1-month postoperative measurements showed that both groups had statistically significant improvement in the IPSS, QOL index, Q_{max}, Q_{ave}, and post-void residual urine volume. In addition, comparison of the 1-month postoperative measurements between the TUEB group and the TURis group showed that there were no significant differences in the IPSS, Q_{max}, Q_{ave}, or post-void residual urine volume, while the improvement in the QOL index was more significant in the TUEB group, compared with the TURis group ($P < 0.01$).

DISCUSSION

TUR-P, the standard operative technique for treatment of BPH, is generally safe; however, absorption of irrigation fluids by the bladder may lead to TUR syndrome. The TURis system was originally developed to avoid TUR syndrome by using normal saline solution, but its use with a monopolar electrode continued to pose a risk of hemorrhage. The HoLEP system was intended as a more reliable and safer replacement for the TURis system, but its high cost has limited its use. Subsequently, Ken Nakagawa introduced TUEB, which combines a bipolar electrode and spatula in one device [1]. For TUR-P-trained surgeons, TUEB may be easier to learn and perform than HoLEP. In the present study, the 30 patients in the TUEB group were operated on by 7 different surgeons, and the 30 patients in the TURis group were operated on by 5 different surgeons, and surgery was usually performed by multiple surgeons; therefore, the learning curve of the surgical procedure could not be estimated. Comparison between the TUEB and TURis group showed that there were no significant differences in perioperative outcomes, treatment effects, and complications, while the surgical time was longer in the TUEB group, compared with the TURis group; however, the prostate

volume might have had an influence on the results. This may be because a morcellator was not available for most of the cases, and many of the patients in the TUEB group had large prostate glands. We felt that TUEB could reduce the risk of bleeding during surgery in patients with a large estimated prostate volume.

In this study, surgical outcomes were acceptable and comparable with the results of previous studies [2–6]. Intraoperatively, normal saline was used as the irrigation fluid, resulting in minimal blood loss and preventing hyponatremia. After monopolar TURis surgery, our patients often experienced postoperative hemorrhage, but after we introduced TUEB, its incidence diminished considerably, probably because TUEB allows the capsular blood vessels to be treated more carefully. Uchida *et al.* [7] reported that of 2260 cases of TUR-P, 305 (13.5%) required blood transfusion, whereas none of our TUEB patients required allogeneic blood transfusion. Only 1 patient, who had an estimated preoperative prostate volume of 191 mL, required autologous blood transfusion. This was because the middle portion of the adenoma, which we had divided into 2 lobes, dropped down into the urethral lumen, hindering irrigation so that we were unable to wash out blood clots and blocking the view, which resulted in disorienting continuous bleeding that forced us to switch to standard TUR-P. Thus, our disregard for the large prostate volume and attempt to separate the entire middle portion at a stroke prevented us from completing TUEB. Our experience demonstrates the importance of careful disposal of the adenoma and step-by-step isolation of each lobe. The best way to minimize blood loss when estimated prostate volume is close to or more than 200 mL remains to be determined.

Concerning intraoperative complications, capsular perforation was seen in 1 case, but it was not serious. None of the patients required reoperation because of postoperative bleeding. Postoperative stress incontinence was seen in 3 patients (10%), but 2 of them improved within 1 month and the other within 2 months. Postoperative urethral stricture was seen in 4 cases (13.3%), a higher incidence than reported for other series [2–6], possibly because we did not dilate the urethra prior to inserting the 26-Fr endoscope; thus, surgeons should consider the preoperative use of bougies. The invention of a smaller-caliber endoscope would also reduce the risk of urethral stricture.

CONCLUSION

In our experience, TUEB performed with the TURis system is a safe and effective operative method for the treatment of BPH that produces significant improvement in subjective and objective symptoms, similar to the outcome of TURis, but with only a small risk of hemorrhage. TUEB is cost-effective and affordable by any institute, in contrast to the costly HoLEP method.

CONFLICT OF INTEREST

None declared.

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