Does the Intensity of Cutting Power Affect Postoperative Symptoms During Transurethral Resection with a Monopolar System?

Mustafa Kirac · Çağrı Guneri · Nuri Deniz · Hasan Biri

Received: 21 January 2013 / Accepted: 3 June 2013 / Published online: 19 June 2013
© Association of Surgeons of India 2013

Abstract The aim of this study was to investigate the effect of intensity of cutting power on postoperative symptoms after transurethral resection (TURP) with a monopolar system for benign prostatic hyperplasia. One hundred thirty-six men with benign prostatic obstructions undergoing elective transurethral prostatectomy were enrolled in the study. Patients were divided into three groups according to the intensity of cutting power. The cutting power intensities were 80–119 W for group 1, 120–159 W for group 2, and 160–200 W for group 3, respectively. In the postoperative period, patients were evaluated with International Prostate Symptom Score (IPSS) and quality-of-life (QoL) questionnaires. In the postoperative period, maximal flow rate ($Q_{\max}$), and post-voiding residue (PVR) were significantly improved in patients who had monopolar TURP performed. When compared to the other groups, the IPSS score was found to be significantly higher in group 3 at 3, 4, and 8 weeks. In addition, the QoL assessment scores for group 3 were superior at 3 weeks. The improvements of $Q_{\max}$ and PVR were similar among the three groups ($p < 0.0001$). At the end of 3 months, IPSS and QoL were significantly improved in all groups. The intensity of cutting power during prostate resection with a monopolar system may affect the postoperative improvements and symptoms.

Keywords Cutting power · IPSS · QoL · Monopolar system · Symptom

Introduction

Benign prostatic hyperplasia (BPH) is pathologically characterized by cellular proliferation of epithelial and stromal tissues in the prostate gland and clinically defined by progressive development of lower urinary tract symptoms (LUTS). Transurethral resection of the prostate is a treatment option for elderly men with LUTS caused by benign prostatic hyperplasia or benign prostatic obstruction. Today, transurethral resection of the prostate (TURP) is still the gold standard for surgical management of symptomatic BPH and has proven to be a highly efficient technique with a low mortality rate [1, 2]. According to the European Association of Urology Guidelines, monopolar TURP represents “the gold standard” therapeutic approach in cases of average-sized BPH (30–80 mL) with indication for surgery [3]. The monopolar transurethral resection is performed by a high-frequency current with a cutting power of 200 W. In this technique, the effects of coagulation and cutting currents depend on the intensity of the power (watt). The intensity of the power used may affect the degree of the prostatic and periprostatic electro injury. In this study, we investigated the effects of the intensity of cutting power on postoperative symptoms and on improvement after monopolar transurethral resection for BPH.

Materials and Methods

Patient and Grouping

The study was conducted retrospectively. From January 2011 to August 2012, written informed consent was obtained from 136 men with benign prostatic obstructions undergoing elective transurethral prostatectomy. All procedures were performed by two experienced surgeons (MK and ND). Indications for TURP were the presence of moderate or severe LUTS (International Prostate Symptom Score (IPSS) > 8), failed previous medical

The Effect of Cutting Power on Postoperative Symptoms

M. Kirac · Ç. Guneri · N. Deniz
Department of Urology, Korum Hospital, Ankara, Turkey

H. Biri
Department of Urology, University of Gazi, Ankara, Turkey

M. Kirac (✉)
Bağlica mah. Karaçamur caddesi Green park sitesi A blok no:
25-Etimesgut, Ankara, Turkey
e-mail: mkirac@gmail.com

therapy, and a maximum urinary flow rate ($Q_{\max}$) <15 mL/s. Prostate cancer was excluded by measuring serum prostate-specific antigen (PSA) levels, a digital rectal examination (DRE), and, if necessary, a prostate biopsy. Exclusion criteria were prostate volume greater than 100 cc, a previous diagnosis of urethral stricture, detection of urethral stricture during the operation, dementia, previous TURP operation, prostatic or bladder malignancy, neurogenic bladder, and previous myocardial infarction within the 6 months preceding surgery.

Before the surgery, patients were evaluated with a detailed clinical history, a digital rectal examination (DRE), uroflowmetry, a measurement of post-voiding residual urine volume (PVR), and urodynamic studies, if necessary. Patients were also asked to complete the International Prostate Symptoms Score (IPSS) and quality-of-life (QoL) questionnaires. The following routine analyses and tests were also carried out: serum hemoglobin, urea, creatinine, electrolytes, bleeding and clotting tests, prostate-specific antigen (PSA), and a urine analysis. Prostate volume was measured by transrectal ultrasound, and PVR was measured by transabdominal ultrasound. In the postoperative period, patients were evaluated with uroflowmetry, and measurement PVR, IPSS (at first, second, third, fourth, eighth, and 12th weeks), QoL questionnaires (at first, second, third, fourth, eighth, and 12th weeks), and QoL questionnaires (first, second, third, fourth, eighth, and 12th weeks).

Patients were divided into three groups according to the intensity of the cutting power during the monopolar transurethral resection of their prostates. The intensities of cutting power were 80–119, 120–159, and 160–200 W for group 1 (low cutting power), group 2 (mild cutting power), and group 3 (high cutting power), respectively.

Surgical Technique

The electroresections in monopolar TURP were performed with a standard tungsten wire loop by a high-frequency current having a cutting power of 80–119, 120–159, and 160–200 W (blend mode) for groups 1, 2, and 3, respectively. In all groups, the coagulating power was 80 W (spray mode). All treatments were performed with the same electrocautery equipment (Force FX™-8C, Valleylab, CO, USA, 8031–3299). In the TURP application, a 26F continuous flow resectoscope (Karl Storz, Tuttlingen, Germany, 26050 E), a 30° wide-angled optic (Karl Storz, Tuttlingen, Germany 26105 BA), a wire loop electrode (Karl Storz, Germany 27050 G24-CH), and resectisol (mannitol/sorbitol solution, Eczacıbaşı, Turkey) were used. Antibiotic prophylaxis was applied by 1 g of third-generation cephalosporin used preoperatively and 12 h after the operation. Patients were prescribed oral ciprofloxacin for 2 weeks postoperatively. Diclofenac sodium and hyoscine-*N*-butylbromide were used for postoperative pain. All operations were performed using a similar technique under spinal or general anesthesia. A 22F three-way urinary catheter was left in place

after the operation, and saline irrigation was continued until the effluent fluid was completely clear.

Statistical Analysis

Data are presented as the mean $\pm$ SD. The results were analyzed using SPSS 17.0 software (SPSS, Inc. Chicago, IL, USA). For descriptive statistics and the IPSS, QoL, $Q_{\max}$, PVR parameter *t* tests, and one-way ANOVA were used, and nonparametric values were analyzed with chi-square test. A *P* value less than 0.05 was considered statistically significant.

Results

The mean age of the 136 patients undergoing TURP was 64.1 $\pm$ 6.2 years (49–78). Transurethral resection was performed with low cutting power (80–119 W, group 1), mild cutting power (120–159 W, group 2), and high cutting power (160–200 W, group 3) in 45, 42, and 49 patients, respectively. A total of 78.5 % of the patients underwent surgery under spinal anesthesia, and general anesthesia was used for 21.5 % of patients. The mean operation time was 67.8 $\pm$ 24.1 min. The mean prostate volume of the patients was 58.7 $\pm$ 23.1 and the mean transitional zone volume was 43.8 $\pm$ 22.7 mL. The mean resected tissues were 41.2 $\pm$ 8.8, 39.3 $\pm$ 7.4, and 40.6 $\pm$ 6.5 g for groups 1, 2, and 3, respectively. There were no statistically significant differences among the groups in terms of baseline characteristics. The preoperative and operative parameters of the patients are shown in Table 1.

The mean follow-up was 15.7 weeks (15.9 in group 1, 14.9 in group 2, and 16.3 weeks in group 3). In the postoperative period, $Q_{\max}$ and PVR significantly improved in patients after monopolar TURP. $Q_{\max}$ increased from 7.9 $\pm$ 2.7 to 21.5 $\pm$ 4.3 mL/s ($p<0.0001$), and PVR decreased from 104.4 $\pm$ 65.7 to 15.6 $\pm$ 5.9 ($p<0.0001$). The improvements in $Q_{\max}$ and PVR were similar among three groups ($p<0.0001$). At the end of 3 months, IPSS and QoL had significantly improved in all groups. IPSS decreased from 26.8 $\pm$ 4.9 to 6.8 $\pm$ 1.6 ($p<0.0001$) and QoL decreased from 4.5 $\pm$ 1.0 to 1.2 $\pm$ 0.4 ($p<0.0001$).

In the early postoperative period, a delayed improvement was shown in IPSS scores for group 3. The improvement rate of IPSS scores was found to be similar for each of the groups at weeks 1 and 2. However, for group 3, the IPSS score was statistically significantly higher at weeks 3, 4, and 8 (Table 2). For group 1, IPSS score was higher than the other groups at the end of third month ($p: 0.019$).

We found similar improvements on QoL scores at weeks 1 and 2. In addition, for group 3, the QoL scores were significantly higher at week 3. However, at the fourth week assessment, QoL scores were found to be significantly higher for groups 2 and 3. When compared to the other groups, QoL

Table 1 Preoperative and postoperative parameters of patients

Parameters (mean±SD)	Total	Group 1	Group 2	Group 3	P value
Patient no.	136	45	42	49	–
Preoperative					
Age (years)	64.1±6.2	62.9±6.4	64.2±5.6	65.5±6.4	0.261
Prostate volume (mL)					
Total	58.7±23.1	60.2±23.4	58.3±22.6	57.7±23.4	0.863
TZ	43.8±22.7	46.2±21.1	42.8±20.1	42.6±25.7	0.855
PSA (ng/mL)	2.35±2.1	2.36±1.7	2.26±1.8	2.44±1.9	0.802
$Q_{\max}$ (mL/s)	7.9±2.7	7.8±2.9	7.84±2.9	8.1±2.4	0.903
PVR (mL)	104.3±65.7	101.1±57.3	107.1±57.3	105.1±62.4	0.912
IPSS	26.8±4.9	27.1±1.6	26.6±4.5	26.7±5.5	0.869
QoL	4.5±1.0	4.5±1.0	4.7±1.0	4.26±0.9	0.119
Postoperative					
Operation time (min)	67.8±24.1	70.1±23.8	65.4±25.7	67.7±23.2	0.658
Irrigated fluid during TURP (L)	7.67±3.1	7.97±3.0	7.87±3.2	7.20±2.9	0.400
Hemoglobin decrease (g/dL)	2.86±2.1	2.72±0.8	2.82±0.7	3.0±3.2	0.756
Catheterization time(h)	64.6±20.6	68.5±21.0	58.6±18.8	66.1±20.0	0.068

SD Standard deviation, PSA prostate-specific antigen, PVR Post-voiding residue, $Q_{\max}$ maximum urine flow rate, QoL quality of life questionnaire, IPSS International Prostate Symptom Score

$P<0.05$ (statistical significance)

scores were significantly higher for group 3 at week 8. For each of the groups, the improvement in QoL score was similar at week 12 ($p>0.05$) (Table 3).

There were no intraoperative complications in any patients. Of the patients, five in group 1, five in group 2, and six in group 3 required blood transfusions for hemoglobin decreases. Two in group 1, one in group 2, and three in group 3 underwent a second operation for postoperative clot retention. The postoperative complications of all groups were given in Table 4.

Discussion

With the development of surgical techniques for the treatment of symptomatic BPH in recent years, extremely effective results can be achieved. TURP is still considered the gold

standard for the treatment of these patients. In spite of the widespread use of bipolar resection systems, monopolar TURP is still an effective treatment modality. In this study, we investigated the effects of the intensity of cutting power on early postoperative symptoms for BPH patients who had TURP with a monopolar system.

The transurethral resection technique was first described in 1943 by Nesbit [4]. This procedure starts with the ventral parts of the gland, followed by both lateral lobes, the midlobe and, finally, the apex. In Europe, the technique was developed by Maurmayer and Hartung [5, 6]. In that technique, TURP is divided into four steps: midlobe resection, paracollicular transurethral resection, resection of lateral lobes, and apical resection.

Numerous technical improvements of TURP have been implemented within recent years, including video-TURP, continuous-flow instruments, special loop designs, and

Table 2 Postoperative IPSS during the early (3 months) follow-up

IPSS (postoperative)	Group 1	Group 2	Group 3	P value
1 week	18.7±2.1	19.2±2.4	18.5±3.6	0.440
2 weeks	16.7±2.2	17.3±2.8	17.8±3.4	0.143
3 weeks	12.7±2.1	11.4±1.9	17.9±3.1	0.0001
1 month	11.3±1.9	12.8±2.4	15.8±3.4	0.0001
2 months	8.9±2.3	8.3±1.5	11.1±1.5	0.0001
3 months	7.3±1.7	6.6±1.5	6.5±1.4	0.019

IPSS International Prostate Symptom Score

$P<0.05$ (statistical significance)

Table 3 Postoperative QoL during the early (3 months) follow-up

QoL (postoperative)	Group 1	Group 2	Group 3	P value
1 week	2.4±1.02	2.6±1.1	2.5±1.1	0.570
2 weeks	2.1±1.05	2.5±1.0	2.4±1.0	0.244
3 weeks	1.8±0.8	2.1±0.8	2.3±0.9	0.024
1 month	1.3±0.5	1.4±0.5	1.8±0.8	0.0001
2 months	1.1±0.5	1.1±0.3	1.5±0.8	0.013
3 months	1.2±0.4	1.3±0.5	1.2±0.4	0.634

QoL Quality of life questionnaire

$P<0.05$ (statistical significance)

Table 4 Postoperative complication of all patients

Complications (postoperative)	Total	Group 1	Group 2	Group 3
Bleeding (%)	20/136 (14.7)	7/45 (15.5)	6/42 (14.2)	7/49 (14.2)
Transfusion (%)	16/136 (11.7)	5/45 (11.1)	5/42 (11.9)	6/49 (12.2)
Urinary retention (%)	2/136 (1.5)	1/45 (2.2)	0/42 (0.0)	1/49 (2.0)
Clot retention (%)	8/136 (5.9)	2/45 (4.4)	3/42 (7.1)	3/49 (6.1)
UTI (%)	8/136 (5.8)	3/45 (6.6)	3/42 (7.1)	2/49 (4.1)
Incontinence				
Transient (%)	7/136 (5.1)	3/45 (6.6)	2/42 (4.7)	2/49 (4.1)
Permanent (%)	1/136 (0.7)	0/45 (0.0)	0/42 (0.0)	1/49 (2.0)
Erectile dysfunction (%)	1/136 (0.7)	0/45 (0.0)	1/42 (2.3)	0/49 (0.0)
TUR syndrome (%)	0/136 (0.0)	0/45 (0.0)	0/42 (0.0)	0/49 (0.0)

UTI Urinary tract infection, TUR transurethral resection

modifications of high-frequency (HF) generators [7]. Depending on the device used, the degree of cutting and the coagulating current are adjustable for the monopolar transurethral resection. The maximum cutting power for the conventional electroresection (which is performed with monopolar resection) is 200 W. In our study, we preferred to use the monopolar system, and we performed TURP with its four stages. Keeping the coagulating current constant, we changed the cutting current. Different levels of energy were contained in the cutting current degrees (80–119, 120–159, or 160–200 W) while performing the resections. We investigated postoperative effects (such as irritative and obstructive effects) of using different cutting power degrees while doing the resections.

Previous studies have shown the efficacy of monopolar TUR-P. In our study, the postoperative efficacy rate of monopolar TUR-P was similar to the previous data on this subject. Taşçı et al. [8], in a study that also performed TUR-P with monopolar resection, reported a total of 3,589 patients enrolled in this study. They found the improvement rate of IPSS and QoL to be 75.0 and 57.5 %, respectively; their $Q_{\max}$ increase was measured to be 65.7 %. In addition, Sinanoglu et al. [9] found an improvement rate of IPSS and increase of $Q_{\max}$ of 41.3 and 55.2 %, respectively. In a similar study performed by Hon et al. [10], improvement rates of IPSS, QoL, and increase of $Q_{\max}$ for patients were found to be 66.5, 65.1, and 49.3 %, respectively. For the third month of our study, we obtained a similar result: IPSS decreased from 26.8 ± 4.9 to 6.8 ± 1.6 , QoL decreased from 4.5 ± 1.0 to 1.2 ± 0.4 , and $Q_{\max}$ increased from 7.9 ± 2.7 to 21.5 ± 4.3 mL/s. The improvement rates of IPSS and QoL were 74.6 and 63.25 %, and the increase in $Q_{\max}$ was 63.25 %. In addition, a significant improvement in PVR was found. The complications of previous studies included bleeding, TUR syndrome, perforation, urethral stricture, clot retention, and rehospitalization, and similar occurrences of each were found in our study [7, 11–13].

IPSS and QoL are the two important parameters that indicate the effectiveness of TUR-P. The International Prostate Symptom Score (I-PSS) is used in the assessment of lower urinary

tract symptoms in men and was created in 1992 by the American Urological Association [14]. IPSS contains some questions about the lower urinary tract symptoms of patients and, therefore, is an objective indicator of postoperative improvements [15, 16]. In our study, there was no difference between IPSS scores at 1 and 2 weeks, but we observed significantly higher IPSS scores in those patients who had undergone high current resection at 3, 4, and 8 weeks. As a result, we can conclude that the lower urinary tract symptoms of these patients showed less improvement during this period.

In recent years, electrical energy has been harnessed in urological practice to decrease the morbidity rate by the development of modified monopolar electrodes [17, 18]. We used thin wire loop monopolar electrodes for each of the groups in our study. An increase in the cutting power degree caused a prolonged postoperative recovery period on IPSS. We can say that high current resections bring a late improvement on IPSS compared with low and moderate current resections. However, after 3 months, there was no difference in terms of improvement in patients who were resected with high current.

QoL is another indicator of postoperative improvement. When compared with the other groups, QoL scores of patients who were resected with high current were found superior at 3, 4, and 8 weeks. Otherwise, QoL scores were found to be similar for each of the groups at 3 months. These results indicate that the recovery period for QoL lasts longer for high current resections.

Our study has some limitations. The bipolar systems are very common in resection of the prostate. Monopolar TURP is replaced by bipolar TURP in many institutions. The study was retrospectively conducted. We think that prospective and randomized trials are needed for effect of cutting power on postoperative symptoms.

As a conclusion, TUR-P is a reliable technique that is considered the gold standard for the treatment of BPH. High current resection may affect the irritative symptoms at the postoperative stage. Increase of cutting power degrees during the resection creates a longer recovery period at the postoperative stage, as

assessed by IPSS and QoL. Therefore, the intensity of cutting power should be as low as possible during monopolar transurethral resection of prostate.

Acknowledgments All authors made a contribution to this study. There was no financial support.

References

1. Horninger W, Unterlechner H, Strasser H, Bartsch G (1996) Transurethral prostatectomy: mortality and morbidity. *Prostate* 28:195–200
2. Chacko KN, Donovan JL, Abrams P, Peters TJ, Brookes ST, Thorpe AC et al (2001) Transurethral prostatic resection or laser therapy for men with acute urinary retention: the ClasP randomized trial. *J Urol* 166:166–171
3. De La Rosette J, Alivizatos G, Madersbacher S, Perachino M, Thomas D, Desgrandchamps F et al (2011) Guidelines on benign prostatic hyperplasia. *Eur Urol* 40:256–263
4. Nesbit RM (1943) Transurethral prostatectomy. Thomas Springfield
5. Mauermayer W (1962) Die transurethralen Operationen. Lehmanns, München
6. Hartung R, May F (2002) Die transurethrale Elektresektion der Prostata. *Akt Urol* 33:469–482
7. Rassweiler J, Teber D, Kuntz R, Hoffman R (2006) Complications of transurethral resection of prostate (TURP)-incidence, management, and prevention. *Eur Urol* 50:969–980
8. Tasci AI, Ilbey YO, Tugcu V, Cicekler O, Cevik C, Zoroglu F et al (2011) Transurethral resection of the prostate with monopolar resectoscope: single-surgeon experience and long-term results of after 3589 procedures. *Urology* 78:1151–1155
9. Sinanoglu O, Ekici S, Tatar MN, Turan G, Keles A, Erdem Z (2012) Postoperative outcomes of plasmakinetic transurethral resection of the prostate compared to monopolar transurethral resection of the prostate in patients with comorbidities. *Urology* 80:402–406
10. Hon NHY, Brathwaite D, Hussain Z, Ghiblawi S, Brace H, Hayne D et al (2006) A prospective, randomized trial comparing conventional transurethral prostate resection with PlasmaKinetic vaporization of the prostate: physiological changes, early complications and long-term follow-up. *J Urol* 176:205–209
11. Geavlete B, Georgescu D, Multescu R, Stanescu F, Jecu M, Geavlete P (2011) Bipolar plasma vaporization vs. monopolar and bipolar TURP-A prospective, randomized, long-term comparison. *Urology* 78:930–935
12. Berger AP, Wirtenberger W, Bektic J, Steiner H, Spranger R, Bartsch G et al (2004) Safer transurethral resection of the prostate: coagulating intermittent cutting reduces hemostatic complications. *J Urol* 171:289–291
13. Marszalek M, Ponholzer A, Pusman M, Berger I, Madersbacher S (2009) Transurethral resection of the prostate. *Eur Urol Suppl* 8:504–512
14. Barry MJ, Fowler FJ Jr, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK et al (1992) The American Urological Association symptom index for benign prostatic hyperplasia. The Measurement Committee of the American Urological Association. *J Urol* 148:1549–1564
15. Bosch JL, Hop WC, Kirkels Schröder FH (1995) The International Prostate Symptom Score in a community-based sample of men between 55 and 74 years of age: prevalence and correlation of symptoms with age, prostate volume, flow rate and residual urine volume. *Br J Urol* 75:622–630
16. Wadie BS, Ibrahim EH, de la Rosette JJ, Gomha MA, Ghoneim MA (2001) The relationship of the International Prostate Symptom Score and objective parameters for diagnosing bladder outlet obstruction Part I: when statistics fail. *J Urol* 165:32–34
17. Kaplan SA, Te AE (1995) A comparative study of transurethral resection of the prostate using a modified electro-vaporizing loop and transurethral laser vaporization of the prostate. *J Urol* 154:1785–1790
18. Stewart SC, Benjamin D, Ruckle H, Lui P, Hadley R (1995) Electrovaporization of the prostate: new technique for treatment of symptomatic benign hyperplasia. *J Endourol* 9:413–416