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Original Article

Effect of Transurethral Resection of the Prostate on Storage Symptoms in Patients with Benign Prostatic Hyperplasia of Less than 30 ml

Yu Jin Kang, Ki Ho Kim, Youngjin Seo, Kyung Seop Lee

Department of Urology, College of Medicine, Dongguk University, Gyeongju, Korea

Purpose: Many patients with benign prostatic hyperplasia (BPH) have not only voiding symptoms but also storage symptoms. Despite the many types of treatment that have been developed for BPH, storage symptoms persist. We conducted an assessment of the efficacy of transurethral resection of the prostate (TURP) and the change in the International Prostate Symptoms Score (IPSS) storage sub-score after the procedure according to prostate size in patients with BPH.

Materials and Methods: Men aged 50 years or older who had BPH were enrolled in this study. 186 patients were divided into two groups according to prostate size measuring using transrectal ultrasonography: In group 1, prostate size was less than 30 ml (51 patients), and in group 2, prostate size was greater than 30 ml (135 patients). All of the patients underwent TURP. We examined whether the degree of change in the IPSS, voiding symptoms, storage symptoms, and quality of life (QoL) differed before and after TURP and according to prostate size.

Results: After three months of TURP, the subjects in both groups showed significant improvement in the IPSS, voiding symptoms, storage symptoms, QoL, and maximum flow rate ($p<0.05$). The scores for the IPSS, voiding symptoms, storage symptoms, and QoL of group 1 and 2 after three months of TURP were 16.36, 14.25 ($p=0.233$), 8.21, 8.24 ($p=0.980$), 8.11, 5.16 ($p=0.014$), 2.89, and 2.10 ($p=0.030$), respectively.

Conclusions: TURP is an effective treatment for patients with BPH, regardless of prostate size. However, while the improvement in the storage symptoms of patients with a prostate size of less than 30 ml was not significant, it was in patients with a prostate size greater than 30 ml.

Key Words: Transurethral resection of prostate; Prostatic hyperplasia; Lower urinary tract symptoms

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a disease that causes bladder outlet obstruction (BOO) resulting from functional obstruction due to an increase in the size of the prostate gland. Current pharmacological treatments for BPH include α1-receptor antagonist and 5-α reductase inhibitors. In surgical treatment for BPH, transurethral resection of the prostate (TURP) is now considered the gold standard for treatment of BPH. Lower urinary tract symp-

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Correspondence to: Kyung Seop Lee
Department of Urology, College of Medicine, Dongguk University, 123 Dongdae-ro, Gyeongju 780-714, Korea
Tel: +82-54-770-8266, Fax: +82-54-770-8378, E-mail: ksleemd@dongguk.ac.kr

toms (LUTS) of BPH can be classified into voiding symptoms and storage symptoms. Many pharmacological treatments and surgical treatments have focused on alleviation of voiding symptoms. However, as reported by Irwin et al,[1] among LUTS, storage symptoms are more common than voiding symptoms, and are known to have a more significant effect on quality of life (QoL).[2,3] Alleviation of storage symptoms after pharmacological and surgical treatments of patients with BPH is an important issue. The aim of this study was to conduct a retrospective evaluation of the change in the International Prostate Symptoms Score (IPSS) storage sub-score after TURP in patients with BPH according to prostate size.

MATERIALS AND METHODS

The current study was a single center, retrospective analysis; it was approved by the institutional review board of our medical institution. We retrospectively enrolled 186 patients with LUTS secondary to BPH who were treated from January 2008 to December 2011. Patients with LUTS (IPSS $\geq$8 points), aged $\geq$50 years, who were treated with mono-polar TURP due to recurrent urinary retention, recurrent urinary tract infection, or hematuria, and who wanted to undergo surgery were enrolled in this study. Evaluations 3 months postoperatively included clinical determination of completion of the IPSS questionnaire, QoL index, serum prostate-specific antigen (S-PSA) measurement, maximum flow rate (Qmax), postvoid residual urine (PVR), and transrectal ultrasonography (TRUS). The IPSS was divided into two subgroups, voiding symptoms and storage symptoms. A TRUS-guided 10- or 12-core biopsy was recommended for patients whose S-PSA level was elevated by more than 4 ng/ml. Patients who had confirmed prostate cancer, urethral stricture, or another previous surgical intervention related to BPH including TURP and laser surgery, were excluded.

The patients were divided preoperatively into two groups according to prostate size. Group 1 was classified as having a prostate size less than 30 ml, and group 2 as having a prostate size greater than 30 ml. We compared the two groups preoperatively and three months postoperatively.

The Student's t-test and paired t-test were used to assess the prognostic significance of the variables; statistical software SPSS version 19 for Windows (IBM Co., Armonk, NY, USA) was used in performance of all of the statistical analyses and a p value <0.05 was considered statistically significant.

RESULTS

Of the 186 patients, 51 (27.4%) patients had a prostate volume less than 30 ml (group 1) and 135 (72.6%) patients had a prostate volume greater than 30 ml (group 2). The age of the subjects in each group (groups 1 and 2) were 72.90$\pm$8.03 yr (50$\sim$90 yr) and 70.70$\pm$6.78 yr (53$\sim$85 yr); prostate volume, 25.22$\pm$3.58 ml (14$\sim$29 ml) and

Table 1. Baseline clinical characteristics of each group

Variable	Group 1 (n=51) less than 30 ml	Group 2 (n=135) greater than 30 ml	p value
Age (yr)	72.90$\pm$8.03	70.70$\pm$6.78	0.24
Prostate volume (ml)	25.22$\pm$3.58	49.06$\pm$21.67	<0.05
S-PSA (ng/ml)	2.93$\pm$2.79	5.23$\pm$5.15	<0.05
Resection weight (g)	4.79$\pm$2.28	16.05$\pm$13.37	<0.05
Resection weight: preop. prostate volume ratio	0.18$\pm$0.11	0.30$\pm$0.14	<0.05
IPSS	25.60$\pm$6.30	25.60$\pm$7.10	0.20
VS	14.70$\pm$3.90	14.60$\pm$4.20	0.41
SS	10.30$\pm$3.30	9.80$\pm$3.80	0.29
QoL	4.20$\pm$0.60	4.30$\pm$1.20	0.61
Qmax	9.60$\pm$3.70	7.50$\pm$2.90	0.68

S-PSA: serum prostate-specific antigen, Preop.: preoperative, IPSS: International Prostate Symptoms Score, VS: voiding symptoms, SS: storage symptoms, QoL: quality of life, Qmax: maximum flow rate.

49.06±21.67 ml (30～140 ml); S-PSA, 2.93±2.79 ng/ml (0.24～10.01 ng/ml) and 5.23±5.15 ng/ml (0.19～35.36 ng/ml); resection weight, 4.79±2.28 g (2～16 g) and 16.05±13.37 g (2～90 g), respectively (Table 1). In group 1, the IPSS values before and after TURP were 25.6±6.3 and 16.4±6.4 ($p<0.05$); voiding symptoms, 14.7±3.9 and 8.2±3.7 ($p<0.05$); storage symptoms, 10.3±3.3 and 8.1±3.8 ($p<0.05$); QoL, 4.2±0.6 and 2.9±0.9 ($p<0.05$), and Qmax, 9.6±3.7 and 17.8±6.9 ($p<0.05$), respectively. In group 2, the IPSS values before and after TURP were 25.6±7.1 and 14.4±7.3 ($p<0.05$); voiding symptoms, 14.6±4.2 and 8.2±4.9 ($p<0.05$); storage symptoms, 9.8±3.8 and 5.8±3.2 ($p<0.05$); QoL, 4.3±1.2 and 2.1±1.5 ($p<0.05$); and Qmax 7.5±2.9 and 14.2±5.0 ($p<0.05$) (Table 2). After three months of TURP, the IPSS values were 16.4±6.4 and 14.4±7.3 ($p=0.233$); voiding symptoms, 8.2±3.7 and 8.2±4.9 ($p=0.980$); storage symptoms, 8.1±3.8 and 5.8±3.2 ($p<0.014$); and QoL 2.9±0.9 and 2.1±1.5 ($p=0.030$) in groups 1 and 2, respectively (Table 3).

With the results above, in BPH patients with prostates less than 30 ml in size, the IPSS, voiding symptoms, storage symptoms, and QoL were significantly improved after three months of TURP. For the storage symptoms and QoL, however, the amount of improvement was not as great as that of patients with prostates greater than 30 ml in size.

DISCUSSION

BPH is a pathologic condition that contributes to, but is not the sole cause of, LUTS in aging men. It is also assumed that BOO results in bladder dysfunction leading to LUTS, impaired bladder emptying (e.g. postvoid residual urine), and urinary tract infection.[4] In men older than 85 years, the prevalence of BPH increases from approximately 50% at 60 years to 90%, and its prevalence has also shown a recent increase in Korea.[5]

The aims of treatment of BPH include the following: alleviation of LUTS, elimination of hematuria secondary to BPH, improvement of bladder emptying, prevention of progression of LUTS, relief of acute urinary retention (AUR), and prevention of development of AUR.[4]

Over the past two decades, pharmacological treatment, including α1-receptor antagonists and 5-α reductase inhibitors, has been the standard first-line treatment for BPH.[6] α1-receptor antagonists are the most commonly used first line medication for treatment of BPH, and an improvement of approximately 30～45% in the IPSS total

Table 2. Comparison of IPSS, VS, SS, QoL, and Qmax of each group, before and after TURP

Variable	Group 1 (n=51) less than 30 ml			Group 2 (n=135) greater than 30 ml		
	Preop.	Postop.	p value	Preop.	Postop.	p value
IPSS	25.6±6.3	16.4±6.4	<0.001	25.6±7.1	14.4±7.3	<0.001
VS	14.7±3.9	8.2±3.7	<0.001	14.6±4.2	8.2±4.9	<0.001
SS	10.3±3.3	8.1±3.8	<0.001	9.8±3.8	5.8±3.2	<0.001
QoL	4.2±0.6	2.9±0.9	<0.001	4.3±1.2	2.1±1.5	<0.001
Qmax	9.6±3.7	17.8±6.9	<0.001	7.5±2.9	14.2±5.0	<0.001

IPSS: International Prostate Symptoms Score, VS: voiding symptoms, SS: storage symptoms, QoL: quality of life, TURP: transurethral resection of the prostate, Preop.: preoperative, Postop.: postoperative.

Table 3. Comparison of IPSS, VS, SS, and QoL of each group, after three months of TURP

Variable	Group 1 (n=51) less than 30 ml	Group 2 (n=135) greater than 30 ml	p value
Postop. IPSS	16.4±6.4	14.4±7.3	0.233
Postop. VS	8.2±3.7	8.2±4.9	0.980
Postop. SS	8.1±3.8	5.8±3.2	0.014
Postop. QoL	2.9±0.9	2.1±1.5	0.030

IPSS: International Prostate Symptoms Score, VS: voiding symptoms, SS: storage symptoms, QoL: quality of life, TURP: transurethral resection of the prostate, Postop.: postoperative

score has been reported.[7]

The effectiveness of pharmacological treatment is well known. However, surgical treatment for BPH is still required. For patients with very bothersome symptoms who may wish to pursue the most effective treatment as a primary treatment, pharmacological treatments may not be viewed as a requirement.

Many types of minimally invasive treatments, such as laser surgery, have been introduced; however, the safety and efficacy of these other methods are controversial, compared to TURP. Despite advancements in techniques for performance of minimally invasive surgical procedures, TURP remains the gold standard surgical intervention for treatment of BPH.[8] Techniques for performance of TURP, including bipolar electrodes and improvement of the camera system, have been developed, and have resulted in decreased complication of the TURP procedure. According to a number of reports, the chance for improvement of a patients' symptoms after TURP was a mean of 88% with a 70～96% confidence interval. This was significantly better than the outcomes of other minimally invasive procedures. Jang et al[9] reported that, despite the availability of other treatment modalities for BPH, the annual number of TURP procedures performed for treatment of BPH increased during the mid 2000s. According to one study, following up on IPSS, after six years of TURP, the average decrease in IPSS was 14 points, representing a 67% reduction in symptoms.[10] Surgical indications of BPH are still recommended under certain conditions, including the presence of refractory urinary retention, recurrent infection, recurrent hematuria, and azotemia secondary to BPH.[11] BPH patients with more severe IPSS ($\geq$17) and a larger prostate volume (>40 ml) have a higher risk of having to undergo surgical treatment, suggesting that the IPSS and prostate volume may be useful predictors at the initial visit for surgical treatment.[12]

The extent of LUTS is typically assessed by symptoms as measured by the IPSS. The IPSS is a popular method for assessment of symptoms before and after treatment. The IPSS is subdivided into voiding and storage sub-scores.[13] Notably, as four of the seven questions belong to the voiding sub-score, the IPSS is somewhat biased toward voiding symptoms. Although the pathological link between BPH and associated obstruction and LUTS mainly implies the presence of voiding symptoms, storage symptoms are also common.[14]

Although BPH is not a fatal disease, it is a bothersome condition influencing QoL. In general, treatments for BPH, such as surgical treatment, like TURP, or laser treatment and pharmacological treatment, like α1-receptor antagonists or 5-α reductase inhibitors, are focused on alleviation of voiding symptoms. Even after alleviation of voiding symptoms by pharmacological and surgical treatment, storage symptoms remain in approximately 30% of cases.[15-17] The storage symptoms that patients with BPH complain of are closely associated with the detrusor muscle as a secondary change to BOO. Several morphologic and functional modifications of the bladder detrusor have been described in patients with BPH and could play a direct role in determining symptoms.[18] Therefore, use of surgical treatments such as TURP can result in reduction of BOO, leading to improvement of storage symptoms.

After long-term pharmacological treatment for BPH and TURP, the IPSS showed improvement, not only of voiding symptoms, but also storage symptoms. However, many patients experience storage symptoms predominantly. The impact of LUTS on patients with BPH is directly related to their QoL, and most troublesome are storage symptoms such as urgency, frequency, and nocturia. In a study conducted in Japan, urgency was the strongest QoL determinant in Japanese patients awaiting prostatic surgery after failure of conservative management, such as watchful waiting and α-adrenoreceptor antagonists.[19] We observed significant improvement in the mean change not only in voiding symptoms but also storage symptoms after TURP in the two groups. However, those with a small prostate of less than 30 ml did not show significantly improved storage symptoms, while those with a prostate greater than 30 ml did. The QoL score also did not show significant improvement in prostates with a size less than 30 ml compared to a prostate greater than 30 ml.

Hakenberg et al[20] reported that, in TURP, early improvement of symptoms after TURP will depend on the amount of tissue removed during resection, and symptomatic improvement after TURP is not primarily dependent on the relative completeness of resection. In addition, in TURP for patients with a large prostate, the volume of the removed prostate tissue is larger, leading to significant

symptomatic improvement after TURP, by creating a wider bladder outlet.

Chen et al[21] reported on the prostate weight ratio, before and after TURP; the smaller residual prostate weight ratio showed a better clinical outcome. Therefore, in patients with a large prostate, increasing the volume of the prostate tissue removed by TURP can result in symptomatic improvement after TURP. However, in this study, TURP showed no better postoperative symptomatic improvement in patients with a small prostate, particularly in storage symptoms. Improvement of LUTS results from not only volume reduction of the prostate, but also destruction of the α1 sympathetic receptor, which is spread on the prostate stroma.[22] In a small prostate, not only the smaller volume having been removed after TURP, but also the lesser effect of destruction of the α1 sympathetic receptor, leads to less symptomatic improvement.[23] Even if surgical treatment includes TURP, storage symptoms persist after TURP when the prostate is small. In addition, storage symptoms played a greater role in QoL irrespective of the form of treatment. If necessary, a preoperative urodynamic study will aid in decision making with regard to surgical treatment. Therefore, it is thought that, prior to TURP, patients, with a small prostate should be informed that storage symptoms might not be sufficiently improved after the operation.

The limitations of this study include the lack of a sufficient number of cases, and not performing a preoperative urodynamic study, but research on more cases and urodynamic studies will be presented later.

CONCLUSIONS

TURP is an effective treatment for patients with BPH regardless of prostate size. However, although in this study, the storage symptoms of patients with a prostate size of less than 30 ml had significantly improved after surgery, they improved less than those of patients with a prostate size greater than 30 ml. Therefore, it is thought that, prior to TURP, patients with a small prostate should be informed that storage symptoms might not be sufficiently improved after the operation.

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