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Effect of preoperative prostate volume on the improvement of lower urinary tract symptoms in patients with benign prostatic hyperplasia undergoing transurethral resection of prostate

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ABSTRACT

Introduction: Benign prostate hyperplasia, pathophysiology contributes to bladder outlet obstruction due to functional obstruction caused by gland size enlargement resulting in the lower urinary tract symptoms (LUTS).

Objectives: To determine the correlation of the prostate volume with surgical outcomes and postoperative LUTS in patients with benign prostatic hyperplasia (BPH) undergoing transurethral resection of the prostate (TURP).

Patients and Methods: Patients with BPH who were refractory for medical treatment enrolled in the study. Patients divided into three groups with attention to their prostate volume conducted by transabdominal ultrasonography. To evaluate patients' LUTS, the International Prostate Symptom Score (IPSS) questionnaire was filled for all patients preoperatively and during the first and third months follow up sessions.

Results: In the current study, mean age of the patients was 66.92 ± 1.08 years. Of 111 patients, eight patients (7.2%) had prostate volume less than 30 cc, 59 patients (53.2%) had prostate volume between 30-60 cc, and 44 patients (39.6%) had prostate volume more than 60 cc. During first month postoperative, mean decrease in IPSS scores in patients with prostate volume less than 30 cc, prostate volume between 30–60 cc and prostate volume more than 30 cc were 27.72 ± 3.53 , 27.32 ± 3.37 and 27.45 ± 2.87 , respectively. The ANOVA test showed no significant difference between the groups ($P=0.93$). Mean decrease in IPSS score during third month postoperative, had no significant difference between the three groups, too ($P=0.71$). Symptoms alleviation observed in 94.6% and 95.5% of the patients, during first and third months follow-up, respectively.

Conclusion: There was no correlation between the IPSS scores decrease and patients' symptoms recovery and preoperative prostate volume in patients with BPH who underwent TRUP.

Implication for health policy/practice/research/medical education:

IPSS scores cannot predict the patients' symptoms recovery and preoperative prostate volume in patients following TRUP.

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Introduction

Benign prostatic hyperplasia (BPH) is a common condition in elderly men, which occurs due to increase in number of the epithelial and stromal cells of the periurethral prostate. The incidence of the BPH arises from 10% during the

4th decade to 88% in 8th and 100% in 9th decades of men life (1). The BPH pathophysiology contributes to bladder outlet obstruction due to functional obstruction caused by gland size enlargement (2). BPH is one of the leading causes of the lower urinary tract symptoms (LUTS)

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including urinary frequency and urinary urgency in men which varies in terms of severity in different patients (3). Although pharmacological therapies for BPH including 5- α reductase inhibitor and α -1 receptor antagonists are the choice for patients who suffer LUTS, surgical interventions are needed to relieve symptoms in many patients who are refractory to medication or developed other complications such as hematuria, recurrent UTI and subsequent kidney diseases (2,4). Among various surgical approaches for BPH treatment, transurethral resection of the prostate (TURP) and transurethral incision of the prostate are two well-known surgical procedures. However, due to its more efficacy in relieving patients' symptoms including bladder outlet obstruction, TURP is now considered the gold standard method (2,5). Nevertheless, the surgical intervention has not been satisfactory to all patients, which has a dissatisfaction rate of 5%-35% among patients who underwent operations (6,7). Regarding the previous studies, the voiding dysfunctions such as frequency, urgency, dysuria and urinary incontinence are the most prevalent complaints of the patients after TURP (4, 8). Therefore, it seems that defining the underlying etiology of the voiding dysfunctions subsequent to TURP in BPH patients is important to take action for preventing poor surgical results. Some reports suggested that evaluation of the prostate size before surgical intervention in patients with BPH is important and may have correlation with surgical results in patients underwent TURP (9). Previously, some studies have discussed the prostate volume changes in trans-rectal ultrasonography (TRUS) and magnetic resonance imaging (MRI) before and after the TURP, but studies that have investigated the correlation between the prostate gland size and outcomes after the TURP, reported no significant correlation between the prostate size and surgery outcomes (10-12). In addition, it is proved that patients with similar prostate sizes do not develop the same LUTS (4). Therefore, international prostate symptom score (IPSS) has been introduced to rate the severity of the LUTS in patients with BPH which divides into three groups as follows: mild, moderate and severe.

Objectives

With due attention to current controversy on the effect of the prostate size on TURP results, we aimed to investigate the correlation of the preoperative prostate size and LUTS severity after TURP in patients suffer BPH.

Patients and Methods

Study design

From March 2014 to March 2015, a prospective study was carried in a single center in Urmia, West Azerbaijan of Iran. During this period, with due attention to pilot

studies, 100 patients with LUTS secondary to BPH, refractory to medication and candidates for TURP, were enrolled in our study. Our exclusion criteria were bladder stone or diverticulitis, small bladder capacity, cystitis due to chemicals, tuberculosis or radiation, patients with urinary bladder tumors, urinary trauma, previous LUT operation, urethral stone retention, neurologic disorders, history of brain or spine trauma, complicated diabetes mellitus, cardiac or respiratory diseases and LUTS secondary to some drugs.

At first, all patients underwent transabdominal ultrasonography by a skilled sinologist, conducted using real-time scanning with a 3500 MHz transducer probe to determine the prostate volume. The prostate volume was estimated as the length \times width \times height \times 0.52 and maximum dimensions of the whole prostate were used for total prostate volume estimation. Subsequently, patients divided into three groups with due attention to their prostate volume including patients with <30 cc prostate volume, patients with prostate volume of 30–60 cc, and patients with \geq 60 cc prostate volume. To assess the LUTS severity, the IPSS questionnaire was completed for all patients, preoperatively.

During TURP, subsequent to spinal anesthesia by 3F epidural catheter, patients settled in lithotomy position and single urologist (supervisor) performed transurethral resection of the prostate using 24F resectoscope. In order to bladder washing, the saline infused into the bladder at speed of 50 mL/min through the 24F urethral catheter. Right after resection completion and removing the prostate chips, resectoscope removed. All patients were discharged during 24 hours postoperatively and oral antibiotics were given for 3 days to prevent UTI. However, Foley catheters were removed 3 days after TURP and voiding trial performed at this time.

Two weeks postoperatively, IPSS score, LUTS severity and need for medical treatment to reveal LUTS were evaluated. In case of patients' satisfaction with symptoms, next follow up session would take place at first and third months postoperatively, to calculate the IPSS score. However, in case of dissatisfaction, follow up sessions would take place at shorter intervals. During session's interval, any drug consumption for one week was recorded.

Ethical considerations

This study was approved by the Ethics Committee of the Urmia University of Medical Sciences (IR.USMU. REC.1393.233). All procedures performed in studies involving human participants in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments. All participants provided written and informed consent.

Statistical analysis

All data were analyzed using SPSS version 18. Software (SPSS Inc., Chicago, IL). To express the quantitative values, we used mean \pm SD. Comparison between groups was performed using student *t* test and χ^2 test for paired data and results with $P < 0.05$ were considered as statistically significant.

Results

In the current study, patients with symptomatic or complicated BPH and refractory to medical treatment who underwent TURP, participated. Of 143 patients, 23 patients were excluded and 120 patients were eligible to be enrolled in our study, however, out of 120 patients, 9 patients did not complete their follow up sessions and 111 patients enrolled in analysis. Mean age of the patients was 66.92 ± 1.08 years, ranging from 44 to 100 years old. Of 111 patients, 8 patients (7.2%) had the prostate volume less than 30cc, 59 patients (53.2%) had the prostate volume between 30 cc to 60 cc, and 44 patients (39.6%) had the prostate volume more than 60 cc.

LUTS recovery was considered as IPSS score ranging diminish to mild. During the first postoperative month, recovery observed in 105 patients (94.6%) and in 106 patients (95.5%) during the third month. IPSS scores during preoperative, first month postoperative and third month postoperative in patients with the total prostate volume less than 30cc were as follows; 32.62 ± 2.19 , 4.87 ± 2.41 and 3.62 ± 3.20 . However, in patients with the total prostate size between 30 cc to 60 cc, IPSS scores in the mentioned periods were 31.32 ± 2.89 , 4 ± 1.88 and 3.25 ± 2.06 . Finally, 31.04 ± 2.63 , 3.59 ± 1.22 and 2.68 ± 1.47 were the preoperative, first month postoperative and third month postoperative IPSS scores in patients with the total prostate volume more than 60 cc, respectively (Table 1).

Using ANOVA test, the mean \pm SD of the IPSS score changes during first month postoperative compared in three group, which were 27.75 ± 3.53 in patients with the prostate volume less than 30cc, 27.32 ± 3.37 in patients with the prostate volume of 30cc to 60cc and 27.45 ± 2.87 in patients with the prostate volume more than 60cc, since no statistically significant difference was observed between the prostate volume and IPSS score decrease in patients ($P=0.93$).

During third month postoperative, the mean \pm SD of IPSS score decreasing, in patients with the prostate volume less than 30 cc, patients with the prostate volume between 30–60 cc and patients with the prostate size more than 60 cc were 29 ± 4.20 , 28.06 ± 3.31 and 28.36 ± 3.23 , respectively. The ANOVA test showed no significant difference between the prostate volume and IPSS score decrease during the third month postoperative ($P=0.71$). During postoperative follow up period, 18 patients received medical treatment due to LUTS, whereas three patients (16.7%) had the prostate volume less than 30cc, 10 patients (55.6%) had the prostate volume more than 60 cc. Chi-square test proved no significant relationship between the prostate volume and postoperative medical treatment in patients ($P > 0.05$) (Table 2).

Discussion

In the current study, the results showed that the preoperative total prostate volume in patients of the three groups had no significant effect on the postoperative IPSS score decrease or patients' symptom recovery. In addition, the preoperative prostate size is not a significant predictor of the postoperative need for medical treatment in order to decrease LUTS.

BPH is a pathologic increase in glandular and stromal tissues of the prostate that causes different complications including bladder outlet obstruction and LUTS in aging

Table 1. Preoperative, first and third month postoperative IPSS score mean \pm SD in patients of the three groups

Prostate volume	IPSS score		
	Preoperative	First month postoperative	Third month postoperative
≤ 30 cc	32.62 ± 2.19	4.87 ± 2.41	3.62 ± 3.20
30–60 cc	32.32 ± 2.89	4 ± 1.88	3.25 ± 2.06
≥ 60 cc	31.04 ± 2.63	3.59 ± 1.22	2.68 ± 1.47

Table 2. Comparison of IPSS decrease mean \pm SD between three groups during first and third months follow up

Prostate volume	IPSS decrease mean \pm SD		ANOVA test			
	First month postoperative	Third month postoperative	First month postoperative		Third month postoperative	
			Group	P value	Group	P value
≤ 30 cc	27.75 ± 3.53	29 ± 4.20	30 – 60 CC	0.72	30 – 60 CC	0.44
			≥ 60 cc	0.81	≥ 60 cc	0.61
30-60 cc	27.32 ± 3.37	28.06 ± 3.31	≤ 30 cc	0.72	≤ 30 cc	0.44
			≥ 60 cc	0.83	≥ 60 cc	0.64
≥ 60 cc	27.45 ± 2.87	28.36 ± 3.23	-	-	-	-

men (4,13,14). Although two hypotheses have been described to have a role in BPH including epithelial cell proliferation and defect in cell apoptosis, the main etiology of the BPH is still unknown. LUTS subdivides to voiding symptoms such as frequency and urgency and storage symptoms (2). Despite focus of the medical and surgical treatments on alleviation of the voiding symptoms, Irwin et al believe that storage symptoms are more prevalent than voiding symptoms that effect patient's quality of life significantly (15). Since there is an incompatibility between the prostate volume and LTUS, in order to categorize the LTUS in BPH patients, urologists IPSS which subdivides patients' symptoms to three subgroups as follows; mild, moderate and severe. According to previous studies, the BPH prevalence increases from 50-60% during the seventh decade of life to approximately 90% during eighth decades (16). The aim of the BPH treatment is to decrease IPSS score, eliminating hematuria secondary to BPH, improving bladder emptying, diminishing post-void residual and preventing acute urinary retention (17). Medical treatment is the treatment of the choice in BPH patients, but in the future many patients become refractory to medical therapy and need surgical interventions. Although several minimally invasive procedures have been described for BPH treatment, TURP is still considered as gold standard for BPH treatment (18). However, some studies reported dissatisfactory subsequent to TURP in approximately one-third of the patients, due to persistent voiding dysfunction (6,7). Some studies suggest that the prevalence of urgency and frequency is 20%-35% postoperatively, however urodynamic obstruction develops in 4%-37% of the patients after TURP (4,8,19,20). Nevertheless, preoperative symptoms are not a reliable predictor of the postoperative outcomes.

Previous studies have noted that mean rate of the symptoms recovery after TURP is 88%, ranging from 70% to 96%, so that Jang et al reported that among interventional treatments for BPH, TURP is increasing since 2000 (21). Moreover, Bozdar et al used IPSS to evaluate LTUS improvement in BPH patients subsequent to TURP. During a 12-month follow up, of 70 patients, IPSS scores reduce to mild degree in 88.5% of the patients after TURP (22). In the current study, results showed symptoms improvement in 94.6% of the patients during the first month postoperative and in 95.9% of the patients during the third month postoperative, which proves the TURP efficacy in our study.

Since, postoperative LTUS in patients who underwent TURP has a significant impact on the patients' quality of life, it is essential to investigate its underlying pathophysiology. In addition, considering the underlying pathophysiology will help to predict the probable poor surgical results in patients. Hakenberg et al demonstrated

that initial improvement subsequent to TURP does not depend on the ratio of the complete resection of the prostate tissue (23). In addition, they believed that more amount of the resected tissue leads to significant improvement of the LUTS (23). In another study by Chen et al, the results showed that less prostate tissue residue after TURP leads to better surgical results (9). However, in the current study postoperative symptoms improvement after TURP in patients with smaller prostate volume had no significant difference in comparison to other groups.

In our study, some patients still suffer from LUTS after TURP, since the IPSS score decrease, subsequent to TURP varies in BPH patients. In a study, Kang et al evaluated efficacy of the TURP with due attention to postoperative changes in storage symptoms and the prostate volume of the patients (2). The results showed that TURP is an efficient procedure for BPH treatment, however, no significant difference in storage symptoms recovery between patients with the prostate volume less than 30 cc and patients with the prostate volume more than 30 cc was observed. In the present study, patients were divided to three groups with due attention to their prostate volume, and IPSS scores recorded pre and postoperatively. In comparison to previous studies, our results showed that all groups had decrease in postoperative IPSS scores in comparison to preoperative scores, especially in patients with prostate volume less than 30cc. In other word, even in patients with low-prostate volume appropriate patient selection can lead to better surgical results. Moreover, there were no significant differences between IPSS scoring decrease between three groups during the follow up period.

Despite previous studies, our results showed that the prostate volume had no significant correlation with the decrease of IPSS scores in follow up period, and it was not a reliable predictor of the postoperative LUTS, which can be related to the selection of patient in the current study.

Recently, Lin et al carried out a retrospective study to investigate the correlation between the resected prostate adenoma weight and postoperative need for medical treatment. Their results showed that smaller prostate volume can significantly predict medical treatment need after TURP (24). In our study, we observed no significant correlation between the preoperative prostate volume with postoperative medical treatment.

Our study was of some limitations. First, some patients received anticholinergic drugs for maximum four weeks due to their postoperative voiding symptoms, which could alter the IPSS score of the patients during first month follow up. However, since similar results observed during third month follow up, its alteration impact may be diminished. Second, multi-centric study can provide much more reliable results.

Conclusion

The preoperative prostate volume had no correlation with IPSS score decrease and patients' symptoms recovery. Therefore, urologists can candidate patients with severe LUTS to undergo TURP without taking prostate volume into consideration since prostate volume has no correlation with surgical outcomes and postoperative medical treatment.

Study limitations

Given that this study was prospective, however the sample size was relatively small due to the nature of the disease. Also, this study was single center and cannot be generalized enough.

Authors' contribution

MMR, MA and MMF are responsible for study design, data acquisition, critical revision and final approval of the work. SF and RV contributed to data analysis, critical revision and final approval of the study. ML and MA contributed to data acquisition, critical review and final approval of the study. ML, SF and MMF contributed to the conception of the work, data acquisition, critical review and final approval of the study. RV contributed to data acquisition, the conception of the work and translated the paper. Finally, MMR is the corresponding author and was responsible for data acquisition and interpretation, drafting and final approval of this work. All authors read and approved the final paper.

Conflicts of interest

All authors declare no potential conflicts of interest.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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