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Impact of surgical treatment of benign prostate hyperplasia on lower urinary tract symptoms and quality of life

Procena efekata operativnog lečenja benignog uvećanja prostate na simptome donjeg urinarnog trakta i kvalitet života

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Abstract

Background/Aim. Benign prostatic hyperplasia (BPH) is a pathological process, which is one of the most common causes of so-called lower urinary tract symptoms (LUTS). LUTS affect many aspects of daily activities and almost all domains of health-related quality of life (HRQoL). The objective of this study was to evaluate the effects of operative treatment of BPH using standard clinical diagnostic procedures and effects on LUTS using the symptom-score validated to Serbian language as well as implications on HRQoL. **Methods.** Seventy-four patients underwent surgical treatment for BPH. The study protocol included objective and subjective parameters of the following sets of variables measured before and after the surgery: voiding and incontinence symptoms were measured using the International Continence Society male Short Form (ICS male SF) questionnaire, HRQoL was measured using the SF-36 questionnaire along with standard clinical measurement of residual urine and urine flow. **Results.** After the surgery, all patients had decrease of voiding scores (13.5 ± 3.3 before and 1.5 ± 1.4 after surgery) and incontinence symptoms (5.7 ± 3.9 before and 0.6 ± 0.8 after surgery) in comparison to period before operative treatment. Significant improvements in all dimensions of HRQoL were noticed, particularly in emotional health. Although mental and physical total scores were significantly better than prior to the surgery, the level of improvement of voiding and incontinence scores were significantly correlated only with the level of improvement of mental score. **Conclusion.** After BPH surgery, patients are likely to have normal voiding symptoms, barely some involuntary control over urination and overll better HRQoL, particularly in emotional domain.

Key words:
prostatic hyperplasia; urologic surgical procedures; preoperative care; postoperative period; quality of life; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Benigno uvećanje prostate ili benigna hiperplazija prostate (BPH) je patološki proces koji vrlo često uzrokuje brojne simptome donjeg urinarnog trakta (*Lower Urinary Tract Symptoms* – LUTS) i posredno ometa obavljanje dnevnih aktivnosti, umanjuje kvalitet života (*Health-Related Quality of Life* – HRQoL) muškaraca. Cilj ovog istraživanja bio je procena efekata operativnog lečenja BPH na LUTS i na HRQoL koja je izvršena uz pomoć standardnih kliničkih dijagnostičkih procedura kao i primenom simptom-skora validiranog na srpski jezik. **Metode.** Sedamdeset četiri bolesnika podvrgnuta su operativnom lečenju zbog BPH. Simptomi mokrenja i inkontinencije mereni su upitnikom Internacionalnog udruženja muške inkontinencije – skraćena forma [*International Continence Society Male Short Form* (ICS male SF)], a kvalitet života upitnikom SF-36, i to pre i šest meseci nakon operacije. Procena kliničkih efekata operativnog lečenja je utvrđena merenjem toka i jačine mlaza urina tokom uriniranja i količine rezidualnog urina pre i posle operacije. **Rezultati.** U odnosu na period pre operacije, posle operacije svi bolesnici imali su devetostruko smanjenje učestalosti mokrenja i simptoma inkontinencije. Njihov kvalitet života bio je značajno poboljšan, izrazito u domenu emocionalnog zdravlja. Iako su bili značajno ukupno poboljšani skorovi mentalne i fizičke komponente kvaliteta života i zdravlja, nivo promene vrednosti skora mokrenja i skora inkontinencije jedino je korelisao sa nivoom promene vrednosti skora mentalnog aspekta kvaliteta života. **Zaključak.** Posle operacije zbog BPH, bolesnici će vrlo verovatno

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mokriti uobičajeno, skoro bez nevoljnog mokrenja, imaće značajno bolji kvalitet života, a posebno poboljšanje će biti u domenu emocionalnog zdravlja.

Ključne reči:
prostata, hipertrofija; hirurgija urološka, procedure; preoperativna priprema; postoperativni period; kvalitet života; ankete i upitnici.

Introduction

Benign enlargement of prostate, or benign prostatic hyperplasia (BPH) is a pathological process, which is one of the most common causes of the so-called lower urinary tract symptoms (LUTS) [1]. A multinational population-based survey points to the high prevalence of LUTS in older population [1], suggesting that focus should be on finding treatment strategies of LUTS and BPH that are efficacious, safe and manageable solution which also improves quality of life of patients [2] having in mind an increasing likelihood that a male will seek help for LUTS attributable by BPH along with a prolonged life expectancy [3]. LUTS affect many aspects of daily activities, and almost all health dimensions: Physical Function (PF), Role Physical (RP), Body Pain (BP), Global Health (GH), Vitality (Vit), Social Function (SF), Role Emotional (RE), Mental Health (MH) 4. Among many factors attributable to LUTS 2, benign enlargement of prostate is a major clinical and public health problem [5]. Recent attempts to improve diagnosing of LUTS attributable by BPH include a number of questionnaires for patients in addition to standard clinical examination and diagnostic procedures to document how LUTS affects in particular a quality of patient's life. These surveys became an indispensable part of the algorithm tests prior decision-making about the treatment and are common element of every assessment of the treatment effects [6, 7]. Although the International Prostate Symptom Score (IPSS) is the most famous [8], its variations are used in practice [9, 10]; their biggest drawback is that they do not examine the symptoms of incontinence, since it was thought that incontinence is primarily a female issue. In recent years evidence have shown that men also suffer from urination difficulties and incontinence leading to the deterioration of health-related quality of life (HRQoL) [11]. A short form of the questionnaire of the International Association for Incontinence thoroughly and accurately defines the urinary symptoms and incontinence [9, 10, 12]. Additionally, it is important to measure the patient's quality of life appropriately and to provide a valid and psychometrically proper patient's opinion and experience in an efficient way [13].

To evaluate the effects of operative treatment of BPH on LUTS and on HRQoL in this study, apart from the standard clinical diagnostic procedures, the new symptom-score standardized instruments were applied: 36-item short-form health survery (SF-36) [13] for self-assessment of HRQoL of patients with various chronic diseases, and a short form of the questionnaire of the International Association for Incontinence that is culturally adapted to the Serbian context[10].

Methods

Study design and participants

This prospective study was conducted at the Clinic of Urology, University Clinical Centre of Serbia in Belgrade in the period from December 2015 to August 2016. The sample size of the study participants was calculated based on the formula for calculating the sample size for the error level $\alpha = 0.05$ and power of the study $1\beta = 0.8$. The required sample size to detect a statistically significant difference in LUTS and HRQoL was projected to 41 patients [13]. The study included 74 patients. All of them underwent endoscopic transurethral prostatectomy (TURP) or classic transvesical prostatectomy (PTV). The criteria for inclusion into the study were patients with informed consent and a diagnosed subvesical obstruction due to BPH, previously treated pharmacologically (alpha blockers and 5-alpha reductase inhibitors), and age of 40 years and above. The criteria for exclusion from the study were: mental inability of the patient to fill out the questionnaire, depression (established by Beck's Depression Scale the day before surgery) and patients who refused to participate in the study.

Study instruments and variables

The study included both subjective and objective approach for measurement of the outcomes of surgical treatment of BPH with regard to the LUTS and HRQoL. On admission to the Clinic, patients filled two Serbian version questionnaires of ICS male SF questionnaire, and then the SF-36, a general questionnaire used for assessing the quality of life. After that, they underwent ultrasound examination with measurement of prostate volume, residual urine and uroflowmetry. The patients with urinary catheter did not take the uroflow preoperative testing (Qmax – maximum flow rate), average flow rate and residual urine. For comparison with the original condition of the patient, the study protocol and clinical measurements were repeated 6 months after the date of the operation.

Statistical analysis

Data are presented as means ± standard deviations. The preoperative and postoperative values were compared using *t*-test and Wilcoxon Signed Ranks Test. Correlation analysis was used to assess the relationship between voiding and incontinence delta scores and quality of life delta scores. The Delta score was calculated as difference between the first and the second measurement of examined variable. The first measurement was obtained during hospital admission and the second measurement was obtained 6 months after the surgery. All *p* values less than 0.05 were taken as the values for the rejection of the null hypothesis. All data were analyzed in the SPSS 20.0 (IBM Corporation) software package.

Results

Mean age of patients was 66.7 ± 10.1 years and 37 (50%) patients had urinary catheter at hospital admission. All patients had prostate volume measured and average volume was 55.6 ± 30.8 mL.

According to the results in Table 1, a significant decrease of voiding and incontinence symptoms was observed in all patients. At the same time, all dimensions of quality of life revealed a significant increase of the scores, except mental health. The highest change was observed in the emotional health dimension.

Table 1

New system-score measurements of LUTS and HRQoL: ICS-male SF and SF-36 results before and after the surgery of BPH (n = 75)

Tests	Before surgery (mean ± SD)	After surgery (mean ± SD)	*p* value
ICS-male SF			
Voiding	13.49 ± 3.30	1.50 ± 1.37	< 0.001[a]
Incontinence	5.74 ± 3.97	0.57 ± 0.79	< 0.001[a]
SF-36			
Physical function	60.34 ± 27.11	66.92 ± 24,10	< 0.001[a]
Role Physical	44.18 ± 40.07	61.30 ± 31.74	< 0.001[a]
Body pain	47.64 ± 26.46	60.73 ± 22.72	< 0.001[a]
Global health	42.78 ± 15.72	45.37 ± 14.28	0.008[a]
Vitality	51.64 ± 10.99	57.12 ± 11.21	< 0.001[b]
Social function	49.88 ± 21.01	62.53 ± 18.55	< 0.001[b]
Emotional	29.64 ± 36.27	65.36 ± 34.05	< 0.001[b]
Mental health	53.59 ± 6.76	52.82 ± 6.32	0.305[a]

[a]Paired samples *t*-test; [b]Wilcoxon Signed ranks test.
LUTS – lower urinary tract symptoms; ICS-male SF – International Continence Society male Short Form; SF – 36 item short- form survey; BPH – benign prostatic hyperplasia; SD – standard deviation.

Clinical parameters measured before and after surgery revealed an objective improvement (Table 2). While Qmax and flow rate revealed 2 and 6 times higher values, respectively, residual urine decreased 6 times.

The level of change of the voiding and incontinence parameters correlated with levels of change of the HRQoL parameters. According to results of correlation analysis, only significant correlation was observed between Role Emotional change and voiding and incontinence change (Table 3). Other correlation coefficients that were near conventional significance level were between incontinence change and Bodily Pain and Social Function change. Since those coefficients were near conventional level of significance (0.05), they were taken in further consideration.

Discussion

Benign prostatic hyperplasia and subsequent LUTS are very frequent pathology in Europe [1, 5, 14] . Global predictions are that by 2018, nearly 1,6 billion people will suffer from the symptoms of urine storage, and over 540 million people will suffer from symptoms of overactive bladder [2]. As well as globally, aging of the population in Serbia is also contributing factor to the growth of incidence and prevalence. This study found that a majority of the patients with LUTS was in the seventh and eighth decade of life. BPH is a progressive disease and untreated enlargement of the prostate leads over time to LUTS and may be further complicated by acute or chronic infections. LUTS compromises everyday functionality and affects all HRQoL domains causing numerous psycho-physical disorders [4].

Table 2

Clinical parameters used for evaluation of surgical procedure

Clinical parameters of the patients (n = 75)	Before surgical procedure (mean ± SD)	After surgical procedure (mean ± SD)	*p* value
Qmax	8.82 ± 3.05	22.76 ± 4.08	< 0.001
Average flow rate	4.21 ± 1.59	10.55 ± 3.58	< 0.001
Residual urine	87.50 ± 44.47	12.63 ± 18.69	< 0.001

[a]Paired samples *t*-test.
SD – standard deviation; Qmax – maximum flow rate.

Table 3

Correlation of voiding and incontinence scores changes and HRQoL score changes, n = 75 patients

Health dimensions	Delta voiding		Delta incontinence	
	Correlation coefficient.	*p* value*	Correlation coefficient	*p* value*
ΔPF	0.027	0.824	-0.149	0.208
ΔRP	-0.049	0.679	-0.129	0.278
ΔBP	-0.197	0.095	-0.210	0.074
ΔGH	-0.187	0.113	-0.013	0.914
ΔVit	-0.149	0.210	0.012	0.918
ΔSF	-0.145	0.220	-0.208	0.078
ΔRE	-0.229	0.049	-0.237	0.043
ΔMH	-0.057	0.631	0.113	0.341

PF – physical function; RP – role physical; BP – body pain; GH – global health; Vit – vitality; SF – social function; RE – role emotional; MH – mental health.
***Pearson's correlation analysis.**

An urgent condition in urology and one of the major complications and unambiguous sign of BPH disease progression is acute urinary retention (AUR) [15]. Progression of the disease is rarely linear and an acute detrusor decompensation of bladder may be the reason for the occurrence of AUR, and the other way is a chronic, weakening of the detrusor, RU accumulation and retention. Verhamme et al. [16] stated that in almost a half of the patients included in their study, AUR was the first reason for reporting to the urologist.

The volume of the prostate as a risk for the AUR occurrence and surgical treatment is the most studied entity. Studies affirm the assumption that patients with the prostate volume greater than 30 mL are in a higher risk of BPH complications, or progress to a stage when the surgical treatment becomes a modality of choice [17, 18]. Measurement of residual urine in the bladder after urination is a common diagnostic procedure for patients with LUTS. Finding larger quantities of RU along with weak Qmax is often considered as a sufficient indication for surgical treatment [6]. Large quantities of RU, especially with hydronephrosis, are an indication for a urinary catheter placement. Kolman et al. [19] indicated that the patients with RU greater than 50 mL were in a high risk of developing AUR. Mochtar et al. [20] suggested that the patients with RU larger than 300 mL were in prospective likely candidates for surgical treatment. The RU values in the present study ranged from 40 to 300 mL. In the postoperative follow-up of the treated patients in our study, similarly to a study by Varkarakis et al. [21] , a drastic reduction (almost as much as seven-times) in the average values of residual urine occured. Uroflowmetry is an essential part of the diagnostic algorithm, and, despite all the constraints, uroflow is a significant indicator of urination disorders. Crawford et al. [18] found that the value of Qmax below 10 mL per second represents a probable disease progression in prospective. Uroflowmetry was done preoperatively for the patients who did not have a catheter and postoperatively for all the patients. The low values of Qmax, from 4 to a maximum of 14 mL/s were recorded preoperatively. A drastic increase in Qmax was determined postoperatively. This finding is similar to the findings in the study by Varkarakisa et al. [21], or Hakenberg et al. [22] as well as the meta-analysis of Lee et al. [23], who agreed that surgical treatment of BPH, among other things, lead to an increase in Qmax. When conservative treatment does not produce satisfactory results, a surgical treatment is becoming the treatment of choice. TURP is the gold standard in the treatment of BPH, but for prostate of greater volume PTV is the method of choice. In the United States, this operation is applied to only 3% of patients surgically treated for BPH [24]. In our study, 23% of patients underwent transvesical prostatectomy. There is a generalized belief that this traditional, open surgical technique is represented only in the economically less developed countries, however, studies suggest somewhat a greater representation of these operations, so that in Sweden, almost 12% of the patients are operated on by this technique [25], and 14% in France [26]. Some studies suggest an even larger share of PTV of the total number of the operated, so Serretta et al. [27] in the Italian study stated that 32% of the total number of patients were subjected to PTV, and 40% in the study by Mozes et al. [28] conducted in Israel.

The change of summary scores of voiding and incontinences on discharge was analyzed subsequently and 6 months after the date of surgery. The values obtained before and after surgery were significantly different in terms of reduction of the voiding scores during the second measurement. These results are complementary with the results of different studies dealing with similar comparative analysis of pre- and postoperative treatment both for TURP and PTV [21, 29, 30]. The intervention drastically reduces the detrimental impact of voiding on quality of life of all patients and this finding is consistent to other studies [21,29,30]. Namely, a large number of patients who had a deteriorating quality of life prior the surgery due to frequent voiding, after the surgery reported “it does not affect” or “little”.

Physical Function (PF) is one of the domains of quality of life of SF 36 scale affected by LUTS. Incontinence rather than voidance significantly reduces the PF [2, 5, 31]. Slight, but statistically significant increase of the score of PF was determined 6 months after the surgery. Engstrom et al. [32] reported that difficulties related to urination, especially waiting for the voiding, straining during voiding and incomplete emptying of the bladder lowered the physical score. In our study, the surgical treatment statistically significantly increased the ability of patient’s physical role approximately for 20%. According to Speakman et al. [14] the quality of overall health was affected by symptoms of LUTS, though insignificantly. Our study found a little, but a statistically significant improvement of the overall health score and vitality 6 months after the treatment.

According to the available literature, the Social Function (SF) score is most deteriorated by incontinence, particularly among elderly patients [32]. In our study, surgical treatment yielded an evident, a statistically significant improvement in the score of the SF. Welch et al. [33] in their study showed that LUTS significantly and negatively affect the Role Emotional (RE) due to diseases such as gout, hypertension, angina pectoris, and diabetes mellitus. Our testing showed that surgical treatment lead to a statistically significant improvement in this score. The impact of LUTS on Mental Health (MH) is one of many variables that we examined. Hunter et al. [31] stated that LUTS affected mental health significantly more negatively than back pain, varicose veins or ulcers. In our study, only patients with good or satisfactory mental status were included, since all patients with a score over 20 at Beck depression test were excluded from the study. That may explain why differences in the average mental health values before and after the surgery in our study were small and statistically insignificant. However, a comparative analysis of the total physical and mental scores before and after surgery undoubtedly indicated their significant increase after the surgery, which supports the justification and appropriateness of the operative treatment to solve LUTS caused by BHP.

Welch et al. [33] emphasized the impact of surgical treatment on the following domains: physical role, vitality, emo-

tional role, the total physical score, PF, bodily pain, social functioning and mental health. At the same time, they indicated a deterioration of HRQoL that was directly proportional to deterioration of LUTS. Welch et al. [33], Hunter et al. [31] and Engstrom et al. [32] recognized that LUTS, and especially incontinence, disturbed most of the domains of quality of life. The total score of quality of life was of significantly higher value after the intervention compared to the value before the intervention. The lowered total score of quality of life caused by severe LUTS was also present in the study by Quek [34] and the study by Haltbakk et al. [35], which especially emphasized the population of advanced age but also in a population study conducted in Serbia [2]. Meta analysis made by Ahyai et al. [29] showed that TURP reduced the IPSS QoL score ($p > 0.3$), similar to bipolar TURP and the HoLEP laser's resection of the prostate. Varkarakis et al. [21] showed the chronology of statistically significant improvement in the IPSS QoL score after the PTV in the immediate postoperative period, then 8 and 12 months after surgery.

This is a pioneer study in Serbia, which assessed the effects of operative treatment of BPH on LUTS and HRQoL by applying the new system-score instruments, but it had some limitations. Although the sample was representative to detect statistically significant results, the study findings are specific to the Serbian patients and should not be generalised prior verifying them on a larger sample. In addition, it represents the work results of one clinic, which is the tertiary level one and the university based inpatient care facility, therefore service differences should be considered in a comparative analysis. Though both system-score instruments, the SF-36 questionnaire and ICS male SF, are standardised questionnaires and culturally adapted, they are self-administered and may contain a portion of under- or overestimation of some aspects of quality of life and LUTS, due to the patients' cognitive abilities, such as memory, or willingness to report private issues. Finally, this study showed results of 6 months follow-up after surgery which is a short-term effect rather than impact assessment which requires recording 12 months and more after the surgical treatment.

Conclusion

After the surgery, almost all dimensions of quality of life keep changing significantly towards greater score, which clearly suggests the positive impact of the intervention on patient's quality of life, including very large (e.g. emotional role) and small (e.g. overall health) improvements. After the BPH surgery, the patients are likely to have normal voiding symptoms, almost annulated involuntary control over voiding and better all HRQoL dimensions.

The surgical treatment of BPH either as classic or endoscopic surgery, leads to the improvement of the objective clinical parameters, to the release from catheter as well as to a reduction of residual urine and increase in Qmax. The operation significantly reduces the subjective parameters in voiding symptom score and incontinence measured by the ICS male SF questionnaire, in contrast to the most famous IPSS score. This approach precisely measure difficulties in voiding and incontinence and is a reliable diagnostic tool, highly recommended as complementary measurement of the subjective and objective parameters of LUTS and HRQoL prior and after the treatment of BPH.

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