Original article

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IMPACT OF ANDROGEN DEPRIVATION THERAPY AND OPEN RADICAL RETROPUBIC PROSTATECTOMY ON LOWER URINARY TRACT SYMPTOMS IN PATIENTS WITH PROSTATE CANCER

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The aim of this study was to show the impact of open radical prostatectomy (ORP) and primary hormone therapy on lower urinary tract symptoms (LUTS) and quality of life (QoL) related to these symptoms based on the International Prostate Symptom Score (IPSS).

A total of 128 patients with localized prostate cancer were analyzed and divided into two groups. The first group consisted of subjects who underwent ORP, and the second group consisted of subjects who were primarily treated with hormone therapy for 12 months. To assess the impact of ORP and hormone therapy on LUTS and QoL, the IPSS and IPSS QoL questionnaires were used before the start of treatment and after 3, 6 and 12 months from the start of treatment.

In both groups of subjects, the IPSSt score consistently significantly decreased during the follow-up period compared to the baseline ($p < 0.001$ for all). After 12 months IPSSt and IPSSv were significantly higher in group with hormonal therapy compared to ORP group ($p < 0.001$) and IPSSs was significantly higher ORP group compared to hormonal therapy group. In both groups of subjects, IPSS QoL consistently decreased significantly during the follow-up period ($p < 0.001$). IPSS Qol was significantly higher in ORP group compared to hormonal therapy group at baseline ($p < 0.001$), after 3 months ($p=0.003$), after 6 months ($p = 0.002$).

ORP and hormone therapy as the primary treatment methods for patients with localized PC led to a statistically significant decrease in IPSS scores and a clinically significant improvement in LUTS. Also, QoL related to LUTS significantly improved in both groups of subjects after 12 months.

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Introduction

Prostate cancer (PC) is the second most frequently diagnosed cancer among men worldwide (1), and in Serbia it is the leading malignant neoplasm after lung cancer. Localized PC is an indication for radical prostatectomy (RP), radiation therapy, or active surveillance (2). In recent years, primary hormone therapy has gained popularity in the treatment of localized PC. Although no randomized control studies that would compare hormone therapy with other therapeutic options in localized PC have been published (3), according to literature data, this method of treating localized PC is becoming the second most common method of treatment after RP (4). In the majority of men, cancer develops from the peripheral zone of the prostate, causing local symptoms, and when growth involves or compresses proximal structures such as the prostatic urethra, urinary bladder or neurovascular bundles, lower urinary tract symptoms (LUTS) appear (5). Also, with the development of PC, prostate volume also increases due to benign hypertrophy, the prevalence of which increases with age, which is another reason for the occurrence of lower urinary tract symptoms (LUTS) (6). PC is a hormone-dependent neoplasm, so it can be effectively treated with agents that either block androgen receptors or reduce

testosterone production (6). Androgen deprivation therapy (ADT) is both cytotoxic and cytostatic for hormone-sensitive PC cells and therefore has a strong effect on tumor growth and viability (7), which consequently leads to a reduction in both prostate and tumor volume and can alleviate LUTS symptoms in patients with PC. Following RP, there is a temporary disturbance of the function of the lower urinary tract in the early phase after the operation, which is a consequence of the removal of the prostate and the subsequent reanastomosis of the urethra and bladder neck (2). Several studies have reported the effect of open RP (ORP) on LUTS (8, 9, 10), however, almost no studies have reported the effect of hormone therapy on LUTS in patients with localized PC, nor a comparison of the effect of these two treatment modalities on LUTS in localized PC.

We investigated and compered effects of 12-month hormone therapy and ORP on LUTS and LUTS-related quality of life (QoL) using the International Prostate Symptom Score (IPSS).

Material and methods

A prospective clinical study was conducted in the period from January 2016 to March 2021 in which 128 patients with histologically proven PC in clinical stage ≤ T2 participated. In the first group, there were 64 patients who underwent ORP with a modified approach described by Walsh. Another 64 patients in the second group underwent primary hormone therapy with an LHRH (luteinizing hormone-releasing hormone) agonist, with quarterly doses for 12 months. Respondents from this group refused operative treatment (ORP) even if this method of treatment was proposed to them as primary. Urinary incontinence and erectile dysfunction as possible complications after ORP were the reason for not accepting operative treatment.

All respondents were informed about the objectives of the research and signed their consent to participate in the research. The study was conducted at the Clinic of Urology and Clinic of Oncology in the University Clinical Center Niš. The basic inclusion criteria in the study were: value of prostate specific antigen (PSA) < 40 ng/ml, verification of PC by transrectal biopsy, assessment of the clinical stage of the disease up to T2c stage, Gleason score (GS) ≤ 9. Basic data analyzed for both groups were: age, PSA, GS, clinical stage, level of serum hemoglobin, urea (Ur), creatinine (Cre) and the American Society of Anesthesiologists (ASA) score. The International Prostate Symptom Score (IPSS) questionnaire was used to assess the impact of applied treatment methods on LUTS and urination quality. LUTS was assessed on the basis of the IPSS (IPSSt) and the IPSS QoL score. The IPSS is a self-administered seven-item questionnaire comparing items of incomplete emptying, intermittency, straining, weak stream (voiding symptoms) and voiding frequency, nocturia, and urgency (storage symptoms). Each scale is scored separately from 0 to 5, with a higher score indicating a worse symptom. The IPSS is scored from 0 to 35 in all, with scores of 0–7, 8–19, and 20–35 indicating absent or mild, moderate, and severe symptoms, respectively (11). The IPSS QoL score is a questionnaire that quantifies the QoL for LUTS and is scored from 0 to 6, with a higher score representing a worse health state. A cut-off IPSS score of 7 points was used to determine the number of patients who significantly improved voiding quality. All patients included in the study filled out both questionnaires before surgery and before the start of hormone therapy and in the third, sixth and twelfth months after the start of treatment. Voiding symptom composites (IPSSv) and storage symptom composites (IPSSs) were analyzed independently. All procedures on human subjects were done in accord with the ethical standards of Helsinki Declaration.

Results

Demographic and clinical characteristics are presented in Table 1. Patients who underwent hormone therapy were statistically significantly older than patients who underwent ORP ($p < 0.001$). A statistically significant difference between the two groups was in the results of GS on biopsy ($p = 0.003$).

A repeated-measures ANOVA indicated a significant time x group interaction for IPSSt, IPSSv, and IPSSs ($p < 0.001$ for all). In both groups of subjects, the IPSSt score consistently significantly decreased during the follow-up period compared to the baseline ($p < 0.001$ for all). At baseline, 3 months and 6 months, IPSSv and IPSSs were significantly different between groups ($p < 0.001$ for all) (Table 2). Three months after ORP, IPSSs significantly increased compared to the baseline ($p < 0.001$), and then from the 6th month it did not differ significantly compared to the period before surgery ($p > 0.05$ for all). In the hormone group, IPSSs did not differ significantly between measurements ($p > 0.05$ for all). After 12 months IPSSt, IPSSv and IPSSs were significantly higher in patients with hormonal therapy compared to ORP group ($p < 0.001$). After 12 months IPSSt and IPSSv were significantly higher in patients with hormonal therapy compared to ORP group ($p < 0.001$) and IPSSs was significantly higher in patients after ORP compared to hormonal therapy group (Table 2).

Analysis of IPSS Qol showed a significant time x group interaction ($p = 0.010$). In both groups of subjects, IPSS QoL consistently decreased significantly during the follow-up period ($p < 0.001$). IPSS Qol was significantly higher in patients with ORP compared to hormonal therapy at baseline ($p < 0.001$), after 3 months ($p = 0.003$), after 6 months ($p = 0.002$) (Figure 1).

Before the start of treatment, the number of subjects with IPSSt score ≤ 7 was equal (26.6% and 17.2%, respectively, $p = 0.285$) (Figure 2).

After 3, 6 and 12 months there were no subjects on hormone therapy with IPSSt ≥ 20, and after 6 and 12 months in the group after ORP. After 12 months from ORP, 38 patients (59.4%) moved to the category IPSSt ≤ 7. Comparing the same period, 1 patient moved to the category IPSSt ≤ 7 and one patient (1.6%) moved to the category IPSSt > 7 in the hormone therapy group. There was significant difference in IPSS categories between treatment group after 3 months ($p = 0.003$), 6 months ($p < 0.001$), and 12 months ($p < 0.001$). Comparing the baseline values with the period after 12 months, it was determined that 16 patients (25.0%) had and maintained an IPSSt score ≤ 7, 46 patients (71.9%) had and kept an IPSSt score > 7, and one patient moved to a lower and a higher category (1.6% each) in the hormone therapy group (Figure 2). Within the same time interval in ORP group, it was found that 11 patients (17.2%) had and maintained an IPSSt score ≤ 7, 12 patients (18.8%) had and maintained an IPSSt score > 7, and 41 patients (64.1%) moved to a lower score category.

Table 1. Baseline demographic and clinical characteristics of population

Characteristics	**RRP**		**Hormonal Therapy**		**p**
Age	64.3 ± 4.0	53-71	67.3 ± 4.7	61–72	0.002[1]
Ur (mmol/l) before treatment †	6.1 ± 1.0		5.7 ± 1.3		0.053[1]
Ur (mmol/l) 3, month †	5.7 ± 1.2		5.8 ± 1.2		0.638[1]
Cre (mmol/L) before treatment†	94.7 ± 16.4		93.1 ± 17.4		0.593[1]
Cre (mmol/L) 3, month †	91.5 ± 15.3		94.6 ± 16.2		0.269[1]
Hemoglobin (g/L)†	125.7 ± 16.0		123.0 ± 14.5		0.319[1]
Hemoglobin (g/L)†	127.2 ± 14.1		123.0 ± 12.1		0.073[1]
Clinical stage					
T2 a, b	57	89.1	55	85.9	0.593[2]
T2c	7	8.9	9	14.1	
Gleason score on biopsy					
≤ 6	37	57.8	31	48.4	0.003[3]
7	20	31.2	17	26.6	
8	7	11.0	15	23.4	
9	0	0.0	1	1.6	
Basic PSA, (ng/ml) †	10.9 ± 5.1	1.6-23.2	20.0± 11.0	3.6-38.6	< 0.001[4]
ASA score					
0	6	9.4	1	1.6	0.052[2]
1	7	10.9	14	21.8	
2	51	79.7	49	76.6	
Pathological stage					
T1	1	1.6			
T2a,b	55	85.9			
T2c	8	12.5			0.742*[2]
Pathological Gleason score					
≤6	30	46.9			
7	24	37.5			
8	9	14			0.097*[2]
9	1	1.6			

Data are presented as n or (%); † Mean ± standard deviation, Min-Max.; ASA = American Society of Anesthesiologists; * Comparison of stage and GS in the RP group, 1 Student's t-test, 2 Chi-Square test, 3 Fisher's exact test, 4 Mann-Whitney U test.

Table 2. IPSS scores in patients with hormonal and RRP therapy

		Baseline	**After 3 months**	**After 6 months**	**After 12 months**	**p**
IPSSt	Hormonal th	12.41 ± 4.86	10.09 ± 3.39	9.23 ± 2.54	9.08 ± 2.5	< 0.001[1] < 0.001[2] < 0.542[3]
	ORP	11.98 ± 4.57	10.45 ± 4.72	9.53 ± 3.7	7.41 ± 2.56	
IPSSv	Hormonal th	8.22 ± 3.56	5.94 ± 2.32	4.97 ± 1.78	4.84 ± 1.75	< 0.001[1] 0.003[2] < 0.001[3]
	ORP	6.02 ± 2.85	3.38 ± 3.27	3.36 ± 2.44	1.91 ± 1.41	
IPSSs	Hormonal th	4.19 ± 1.59	4.16 ± 1.35	4.27 ± 1.16	4.23 ± 1.16	< 0.001[1] < 0.001[2] < 0.001[3]
	ORP	5.97 ± 1.98	7.08 ± 1.83	6.17 ± 1.74	5.5 ± 2.02	

[1] time effect, [2] interaction time x group, [3] group effect.

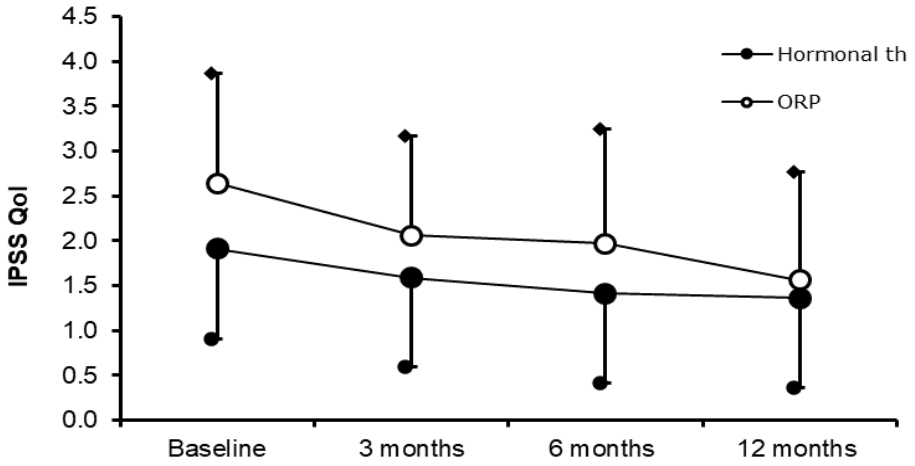

Figure 1. IPSS QoI in patients with hormonal therapy and ORP therapy in the 12-month follow-up

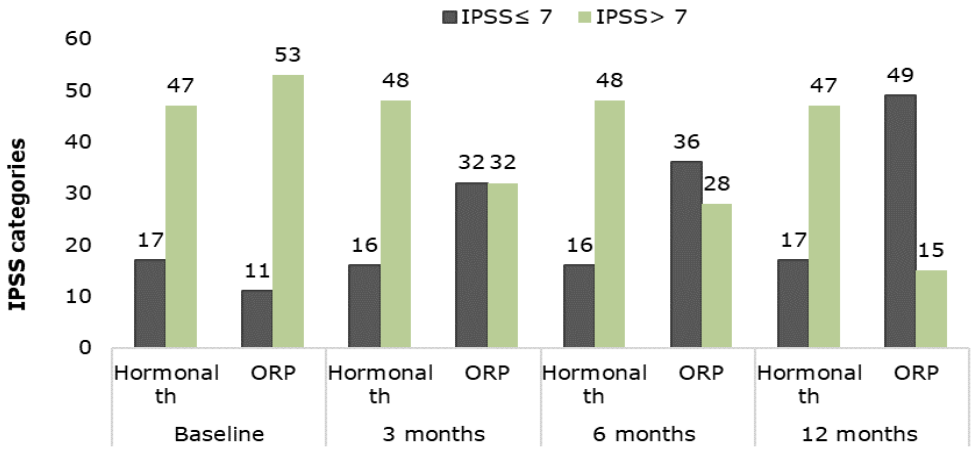

Figure 2. IPSS categories in the 12-month follow-up period

Discussion

Our results showed a positive influence of both hormonal therapy and ORP with LUTS, as a statistically significant improvement of the mean IPSSt compared to the baseline value was verified in each of the follow-up time intervals after 12 months. It is the nature of PC to react to hormones, so the application of ADT has a cytostatic and cytotoxic effect on PC cells and thus on the growth and viability of the tumor (7). Similar results to ours were published by other authors (6, 12).

Choi et al., analyzing the effect of ADT on total prostate volume and LUTS, concluded that after 12 months from the beginning of this therapy, there was a significant reduction in average prostate volume, average IPSSt, IPSSv and IPSSs (12). The average prostate volume decreased from 36.6 ± 14.6 to 19.4 ± 12.4 ml in 51.1% of treated patients, IPSSt from 17.4 ± 8.5 to 12.2 ± 7.6, IPSSv from 9.8 ± 6.1 to 6.7 ± 5.1, and IPSSs from 7.6 ± 3.7 to 5.5 ± 3.5 points after 12 months (12). They also showed an average 1-point improvement in IPSS QoL (4.0 ± 1.9 vs. 3.2 ± 0.9) and an improvement in maximum urine flow of 3 ml/s. However, in patients who continued to receive hormonal therapy, the values of these parameters did not change significantly compared to the results after 12 months. In relation to the mentioned study, in our research a significantly smaller average decrease in both IPSSt and IPSSv and IPSS QoL was verified after 12 months, which can be explained by the significantly lower baseline values of these scores compared to the previous study. We did not verify a drop in the average values of IPSSs until the end of the follow-up and in relation to the compared results, in our patients the basic average value of this

score was almost twice as low (4.19 ± 1.59 vs. 7.65 ± 3.75) (12), so we can assume that this is one of the reasons for this obtained result. Another study showed similar results for all IPSSs after a follow-up of 24 weeks and did not verify significant changes in IPSSs (6).

Regardless of the statistically significant overall decrease in mean IPSSt after 12 months, our results verified only one patient (1.6%) who moved to a lower category IPSSt ≤ 7 and one patient who moved to the category IPSSt > 7 which is significantly less compared to the ORP group. Despite the use of ADT, in a certain number of patients LUTS may persist, progress and often lead to acute or chronic development of retention. Several studies have confirmed that half of patients who started ADT with severe LUTS or had an indwelling urinary catheter still had severe symptoms at 12 months, and half still have an indwelling catheter (6, 13).

Of course, hormone therapy leads to a reduction in the volume of the prostate and tumors, so this can explain the improvement in LUTS in patients with PC (6). These clinical effects may be explained by another potential mechanism. Namely, receptors for gonadotropic releasing hormone are located on smooth muscle cells of the bladder neck and prostate. Indirect effects of testosterone deprivation by pituitary receptors can favorably affect the static and dynamic components responsible for bladder emptying (14, 15). Blockade of receptors on these cells is associated with a decrease in pro-inflammatory cytokines, various growth factors and alpha adrenoreceptors (16). Therefore, reduction of prostate volume under the effect of ADT is not the only mechanism that can improve LUTS and voiding quality. Changes in the tissues of the prostate and bladder under the effect of ADT can cause additional morbidity of the urinary tract, which results in the appearance of irritative and obstructive symptoms that patients with PC complain about.

Although both treatment methods showed a positive impact on reducing LUTS and improving LUTS-related QoL, this impact was significantly greater in patients after ORP. Analysis of the results of ORP on LUTS showed that only men with clinically significant urinary symptoms (IPSSt > 7) could benefit from ORP, because IPSSt significantly decreased after 12 months and urinary quality improved. In a study similar to ours (10), the authors analyzed the results of IPSSt, IPSSv,IPSSs and IPSS QoL in 254 men who were divided into three groups (IPSS < 8, IPSS 8-19 and IPSS 20+) 12 months after ORP. The results of this study showed a statistically significant decrease in the mean values of IPSSt, IPSSv and IPSS QoL scores, which was also confirmed by our results (10). The results of the mentioned study showed a significant drop in the mean value of IPSSt after 12 months (10), but by almost 50% compared to our results (2.3 vs. 4.57). The reason for this difference in IPSSt values is the consequence of the basically lower mean value of IPSSt in the mentioned study compared to ours (10.69 ± 4.88 vs. 11.98 ± 4.57). Also, the same authors confirmed the improvement of QoL related to urinary symptoms after ORP, because IPSS QoL after 12 months improved on average by 0.5 points (10), and in our study this improvement was on average by 1 point (2.64 vs. 1.56). This minimal difference is the result of the basically lower mean IPSS QoL value obtained in the mentioned study in comparison to our result (1.95 vs. 2.64).

Slova and Lepor analyzed the results of IPSSt, IPSSv and IPSSs 12 and 48 months after RP (9). They showed a significant decrease in mean IPSSv at 12 months, but not IPSSt. Contrary to the results of these authors, our results showed a statistically significant decrease in mean IPSSt values after 12 months. The reason for this discrepancy can be explained by the existence of a basically higher mean value of IPSSt (11.98 vs. 6.9) and a greater number of patients operated with IPSS > 7 (73.5 vs. 50.4%) in our study compared to the mentioned study. Also, the authors showed a significant decrease in the mean values of IPSSt and IPSSv after 48 months. The improvement in LUTS and decrease in mean IPSSt was attributed primarily to a decrease in mean IPSSv in the first 12 months and a decrease in IPSSs in the period 12−48 months after surgery (9). And our results after 6 and 12 months after ORP showed a significant decrease in the mean values of both IPSSv and IPSSt, which suggests or justifies the role of IPSSv in the improvement.

On the other hand, we could not assess whether the results of IPSSs positively or negatively influenced IPSSt after 12 months because the mean values of IPSSs preoperatively and after 12 months remained approximately the same (5.9 vs. 5.5). Similar results for the same follow-up time interval were presented by the authors in the above-mentioned study (4.2 vs. 4.5) (9). Also, they showed a statistically significant decrease in the mean value of IPSSs after 48 months compared to 12 months (9), which we did not follow in our research. After 6 and 12 months of ORP, a significant improvement in LUTS was observed, which resulted in a significant decrease of the mean IPSSt by 2.5 and 4.5 points compared to the baseline value. We believe that this improvement in LUTS mainly occurred in patients who had a baseline IPSSt > 7 (82.8%), as there was a significant decrease in the number of patients in this category after 6 (43.8%) and 12 months (23.4%). Results from other studies have also shown improvement in LUTS after RP in men with IPSS ≥ 8 (9, 17).

Bayoud and colleagues analyzed LUTS in 804 men after RP (18). They showed a significant increase in the mean value of IPSSt after the 1st and 3rd month (11.1 ± 7.1 vs. 7.6 ± 6.1) compared to the baseline value (5.5 ± 6.6), and in the 6th, 12th and 24th month they found no statistically significant difference (18). Contrary to the above, our results showed a slight decrease in the mean value of IPSSt in the 3rd month (11.9 ± 4.5 vs. 10.5 ± 4.7) with a gradual decrease in the

6th and 12th months. This difference in the downward trend of the mean IPSSt can be explained by the very high basic IPSSt in relation to the observed study and the larger number of patients who had IPSSt > 7 (82.8% vs. 34.5%). The authors also showed a decreasing trend in the number of patients in the IPSS > 7 subgroup: 42.4%, 32.9%, 21.7% and 17% after 3, 6, 12 and 24 months, respectively (18), which we also confirmed in the 3rd, 6th and 12th months (50.0%, 43.8% and 23.4%) after ORP. The beneficial role of RRP on LUTS is also discussed in a study by Papadopoulos and colleagues who analyzed 240 men after RRP (19). Analyzing maximal urine flow rate (Qmax) and IPSS, their results showed an increase in median Qmax after 12 months from 12 to 21 ml/s in patients who had Qmax ≤ 10 ml/s at baseline, and a significant decrease in IPSSt in the groups of patients with baseline moderate and severe urination symptoms (19).

Analyzing QoL as a consequence of LUTS after ORP, our results showed a significant improvement in IPSS QoL after 12 months with a significant difference compared to baseline (2.6 ± 1.2 vs. 1.5 ± 1.2), and thus the positive impact of operative treatment on IPSS QoL. We also observed that changes in IPSS QoL mean values directly correlated with improvement and worsening trends in LUTS and IPSSt after ORP. Similar results were published by other authors (20, 21). Mastubara et al. showed a significant improvement in IPSSt and IPSS QoL after 3, 6 and 12 months of RRP, especially in those patients operated with a baseline IPSSt ≥ 8 (20).

Schwartz et al. showed a significant improvement in all urinary symptoms except nocturia after 12 months of RRP and an improvement in IPSS QoL regardless of the 10% of patients who had severe urinary incontinence (21). They concluded that the majority of patients who had undergone RRP were satisfied with their choice of treatment method and that the improvement in IPSS QoL and IPSSt had a more significant positive impact on patients than the negative impact of urinary incontinence (21).

Several authors have studied the negative impact of RRP on LUTS, and the basis of the hypothesis of this phenomenon is damage to the pelvic plexus, a lesion of nerves from the neurovascular bundle during surgical dissection (20, 22, 23). *De novo* incontinence and an increase in the frequency of day and night urination are associated with the resulting weakness of the sphincter, which impairs the filling and emptying phases of the bladder (20, 22, 23). In addition to the positive impact, our results also showed a negative RRP on IPSSt QoL in the five operated patients, which is probably a consequence of some degree of incontinence and occurrence of nocturnal urination, which we did not analyze in this research. This observation of ours was confirmed by other authors (23). After 3, 6, 12, and 24 months of RRP, Namiki et al. showed statistically significant improvements in IPSSt and IPSS QoL at 6 postoperative months, but after 24 months, 26% of those operated on reported having worsening LUTS (17). The reason for this was the occurrence of nocturnal urination in the operated patients who, preoperatively, did not or only got up once to urinate at night. They suggest that nocturia is due to detrusor contractility disorders and sphincter weakness as a consequence of surgery (17). Our study has several limitations. This is not a randomized control trial. Assessment of the impact of ORP and hormone therapy on LUTS is subjective. Assessment of urinary symptoms is based on IPSS and IPSS QoL questionnaires. On the other hand, the results of the impact of hormone therapy lasting 12 months on LUTS in patients with localized PC are shown, which has not been published in the literature so far.

Conclusion

ORP and hormone therapy as the primary treatment methods for patients with localized PC led to a statistically significant decrease in IPSS scores and a clinically significant improvement in LUTS. Also, QoL related to LUTS significantly improved in both groups of subjects after 12 months. We observed that in patients with moderate to severe LUTS, ORP led to a clinically significant improvement in LUTS compared to primary hormone therapy.

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UTICAJ ANDROGENE DEPRIVACIONE TERAPIJE I OTVORENE RADIKALNE RETROPUBIČNE PROSTATEKTOMIJE NA SIMPTOME U DONJEM URINARNOM TRAKTU KOD BOLESNIKA SA KARCINOMOM PROSTATE

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Cilj ove studije bio je da se prikaže uticaj otvorene radikalne prostatektomije (engl. *open radical prostatectomy* – ORP) i primarne hormonoterapije na simptome donjeg urinarnog trakta (engl. *lower urinary tract symptoms* – LUTS) i na kvalitet života (engl. *quality of life* – QoL) u vezi sa ovim simptomima na osnovu Internacionalnog prostata simptom skora (engl. *International Prostate Symptom Score* – IPSS).

Analizirano je 128 bolesnika sa lokalizovanim karcinomom prostate, podeljenih u dve grupe. Prvu grupu činili su ispitanici koji su podvrgnuti ORP-u, a drugu grupu ispitanici koji su primarno lečeni hormonoterapijom u trajanju od dvanaest meseci. Za procenu uticaja ORP-a i hormonoterapije na LUTS i QoL korišćeni su upitnici IPSS i IPSSQoL, i to pre početka lečenja i nakon tri meseca, šest meseci i dvanaest meseci od početka lečenja.

U obema grupama ispitanika IPSSt skor konstatno se statistički značajno smanjivao u periodu praćenja u odnosu na bazičnu vrednost ($p < 0,001$ za sve). Nakon dvanaest meseci, IPSSt i IPSSv bili su značajno veći u grupi na hormonoterapiji nego u ORP grupi ($p < 0,001$), a IPSSs je bio značajno veći u ORP grupi nego u grupi bolesnika lečenih hormonoterapijom. U obema grupama ispitanika IPSSQoL se konstatno značajno smanjivao u periodu praćenja ($p < 0,001$). IPSSQoL je bio značajno viši u ORP grupi nego u grupi bolesnika lečenih hormonoterapijom, i to pre početka lečenja ($p < 0,001$), nakon tri meseca ($p = 0,003$) i nakon šest meseci ($p = 0,002$).

ORP i hormonoterapija su kao primarne metode lečenja bolesnika sa lokalizovanim PC-om dovele do statistički značajnog pada IPSS skorova i klinički značajnog poboljšanja LUTS-a. Takođe, QoL u vezi sa LUTS-om značajno se popravio nakon dvanaest meseci u obema grupama ispitanika.

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***Ključne reči**: hormonoterapija, karcinom prostate, radikalna prostatektomija, urinarni simptomi*