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M.E. Efremov[1,2], V. L. Medvedev[1,2], A.D. Anosov[1,2], D.P. Akopov[1,2], M.I. Kogan[3], D.V. Sizyakyn[3]

PROSPECTIVE COMPARISON OF THE IPSS, MIPSS AND VPSS QUESTIONNAIRES WITH UROFLOWMETRY AND COGNITIVE FUNCTIONS CONTROL IN MEN WITH BENIGN PROSTATIC HYPERPLASIA

[1]Regional Clinical Hospital No. 1 named after Prof. S.V. Ochapovsky, Krasnodar, Russia; [2]Kuban State Medical University, Ministry of Health of the Russian Federation, Krasnodar, Russia; [3]Rostov State Medical University, Ministry of Health of the Russian Federation, Rostov-on-Don, Russia

Corresponding author: M.E. Efremov – Cand.Sc.(Med), assistant of the urology Dept. of the Kuban State Medical University of the Ministry of Health of the Russian Federation; urologist of the Research Institute – Regional Clinical Hospital №1 Prof. S.V. Ochapovsky, Krasnodar, Russia; e-mail: efremov.uro@yandex.ru

Introduction. Accurate assessment of lower urinary tract symptoms (LUTS) in patients with benign prostatic hyperplasia (BPH) is one of the key tasks of a urologist for selecting adequate therapy, monitoring treatment, and determining indications for surgical treatment. The International Prostate Symptom Score (IPSS) questionnaire, developed in 1992, has become a simple and widely used method to grade the presence, type, and severity of LUTS in men with BPH. However, the IPSS has certain limitations: the poorer a patient's cognitive abilities, the greater the likelihood of incorrect responses due to the complexity and abstract nature of the questions and the difficulty in translating subjective sensations into a written numerical score.

In 2011, a new tool, namely the Visual Prostate Symptom Score (VPSS), was proposed as a visual analogue of the IPSS, in which the questions are presented in pictorial form, thereby reducing the dependence on literacy and cognitive function. Despite these advances, the search for the most rational and cognitively accessible questionnaire for assessing LUTS remains relevant.

Aim. To compare the IPSS, modified IPSS (mIPSS), and VPSS questionnaires in men with BPH, with reference to uroflowmetry and cognitive function, and to improve the diagnostic accuracy of IPSS through its modification.

Materials and Methods. A total of 72 men with symptomatic BPH presenting for initial outpatient evaluation were included in the prospective study. The median age was 68 [64–72] years. All patients underwent standard assessments according to the Russian Society of Urology clinical guidelines: urinalysis, complete blood count, prostate-specific antigen (PSA) testing, transrectal ultrasound (TRUS) with measurement of prostate volume and post-void residual urine, renal ultrasonography, and uroflowmetry. Inclusion criteria were: prostate volume 40–180 cc, residual urine ⩽150 mL, and PSA < 4 ng/mL. Exclusion criteria were suspicion of prostate cancer or other causes of voiding dysfunction unrelated to BPH.

All patients provided written informed consent, and the study was approved by the local ethics committee. Each participant completed four questionnaires, including the newly developed modified IPSS (mIPSS). In this version, the IPSS items were divided into two groups: voiding (obstructive) symptoms: questions 1, 3, 5, 6; storage (irritative) symptoms: questions 2, 4, 7.

Results. For most questions, the proportion of identical responses between questionnaires exceeded 50%, and all correlation coefficients were r > 0.6, indicating a strong association between the results and suggesting that the tools measure similar constructs and are largely interchangeable. Uroflowmetry parameters correlated significantly only with the total mIPSS score. Both Qmax and Qave showed a significant inverse correlation with mIPSS total score, while voided volume showed no correlation with any questionnaire scores. The urinary stream strength item correlated significantly with Qmax and Qave, and nocturia correlated with all three parameters (Qmax, Qave, and voided volume). This indicates that the mIPSS questionnaire can be used as a rational and sufficiently quick tool for assessing lower urinary tract symptoms (LUTS).

The mIPSS and IPSS questionnaires are interchangeable in terms of the evaluated characteristics of urination; however, mIPSS shows a stronger correlation with objective uroflowmetry parameters and is therefore considered a more reliable assessment method.

Conclusion. The results demonstrate the advantages of the modified IPSS (mIPSS) compared with the standard IPSS, owing to its stronger correlation with objective urodynamic findings and greater ease of use. The mIPSS and VPSS questionnaires may be effectively applied to identify voiding disorders, particularly in patients with cognitive impairment. At the same time, the interchangeability of the questionnaire items and the rationale for dividing the questions into obstructive and irritative categories by splitting them into two columns have been demonstrated.

K e y w o r d s: *benign prostatic hyperplasia, questionnaire, lower urinary tract symptoms, nocturia, uroflowmetry*

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Introduction. In 1992, the American Urological Association developed the Benign Prostatic Hyperplasia Symptom Index, later adapted for international use and known as the IPSS (International Prostate Symptom Score). Owing to its simplicity and broad accessibility, the IPSS became widely used in urological practice to evaluate the severity of lower urinary tract symptoms (LUTS) in patients with benign prostatic hyperplasia (BPH) [1]. With accumulating clinical experience, the questionnaire began to be applied not only in BPH but also in other male conditions presenting with LUTS, both for initial assessment and for monitoring the efficiency of various medical and surgical treatments [2].

Despite the overall positive evaluation of the IPSS as a diagnostic instrument, several limitations have been identified. Due to the subjective nature of self-assessed voiding symptoms and patients' difficulty in understanding certain questions, it became apparent that not all respondents are capable of interpreting the items correctly, often requiring clarification from healthcare personnel. The time needed to complete the questionnaire, as well as the patient's physical and psychological state, also plays a role. Importantly, proper completion of the IPSS requires cognitive abilities corresponding to at least an incomplete secondary education level [3]. A significant inverse correlation has been demonstrated between the patient's educational level and correct comprehension of questionnaire items [4–5]. Incorrectly formed responses may distort diagnostic results and lead to inappropriate treatment choices.

Aim. To compare the IPSS, mIPSS, and VPSS questionnaires with uroflowmetry and cognitive function assessment in men with BPH, and to improve the diagnostic accuracy of the IPSS through its modification.

Materials and methods. A prospective study included consecutive 72 men with symptomatic BPH presenting for their initial outpatient visit. The median age of the patients was 68 [64; 72] years. All patients underwent standard diagnostic evaluation in accordance with the clinical guidelines of the Russian Society of Urology (RSU): complete blood count, urinalysis, prostate-specific antigen (PSA) testing, transrectal ultrasound (TRUS) of the prostate with measurement of post-void residual urine, renal ultrasound, and uroflowmetry. Inclusion criteria were prostate volume 40–180 cc, post-void residual urine ⩽150 ml, PSA < 4 ng/ml. Exclusion criteria were suspected prostate cancer and any causes of voiding dysfunction not related to BPH. All patients provided written informed consent. The study was approved by the institutional ethics committee. Before consultation with the physician, each patient completed four questionnaires:

a) the classic IPSS containing 7 questions;
b) a modified questionnaire (mIPSS) developed by the authors, in which the questions were divided into two groups: voiding function (questions 1, 3, 5, and 6 of the IPSS) and storage function (questions 2, 4, and 7 of the IPSS);
c) VPSS questionnaire;
d) MoCA test (Montreal Cognitive Assessment), a screening tool for cognitive impairment, requiring up to 10 minutes to fill in [6].

To assess the impact of cognitive impairment on associations between uroflowmetry parameters and mIPSS responses, Spearman correlation coefficients were recalculated separately for patient subgroups stratified by cognitive performance.

Statistical analysis of the associations between uroflowmetry variables and scores obtained from IPSS, mIPSS, and VPSS included calculation of Spearman correlation coefficients (due to the non-normal distribution of uroflowmetry parameters and the ordinal nature of questionnaire responses). Normality was tested using the Shapiro–Wilk test with significance assessed by the t-test; median and interquartile ranges were also calculated.

To evaluate the effect of cognitive impairment on the relationship between questionnaire results and uroflowmetry data, linear regression analysis was performed. Given the limited sample size, significance testing of the regression coefficients was performed using bootstrap resampling (1000 iterations). A p-value < 0.05 was considered statistically significant.

Results. To compare the standard IPSS and the modified mIPSS questionnaires, correlation coefficients were calculated (*Table 1*), as well as the frequency of identical patient responses to individual items. For most questions, the rate of identical scoring exceeded 50%, and all correlation coefficients were above $r = 0.6$, indicating a sufficiently strong relationship between the assessments obtained using the two questionnaires. This suggests that both tools measure the same underlying constructs and can be considered largely interchangeable.

Uroflowmetry parameters demonstrated significant associations only with the total mIPSS score. Maximum urinary flow rate (Q_{max}) and average flow rate (Q_{ave}) were inversely correlated with the total mIPSS score. Voided volume did not correlate with total scores of

Table 1

Correlation between IPSS and mIPSS questionnaires

Questionnaire items	Number of identical responses	Proportion of identical responses, %	Correlation coefficient	*p*
Incomplete emptying of the bladder	42	58.3	0.796**	< 0.001
Urination more often than every 2 hours	31	43.1	0.679**	< 0.001
Intermittent urinary stream	39	54.2	0.617**	< 0.001
Urgency (difficulties in postponing urination)	40	55.6	0.713**	< 0.001
Weak urinary stream	33	45.8	0.623**	< 0.001
Straining during urination	44	61.1	0.791**	< 0.001
Nocturia	50	69.4	0.825**	< 0.001
Total score	–	–	0.861**	< 0.001

Note. ** – coefficient significant at the 0.01 level. Statistically significant coefficients are shown in bold.

Table 2

Correlation between uroflowmetry parameters and VPSS questionnaire items

Uroflowmetry parameter	Stream	Day	Nocturia
Qmax	−0.248* (0.035)	0.094 (0.433)	−0.238* (0.044)
Qave	−0.260* (0.028)	0.053 (0.661)	−0.238* (0.044)
Voided volume	0.042 (0.725)	−0.028 (0.817)	−0.341** (0.003)

Note. * – coefficient significant at the 0.05 level; ** – at the 0.01 level. Statistically significant coefficients are shown in bold.

any questionnaire. To confirm these findings, an item-by-item correlation analysis was performed between questionnaire responses and uroflowmetry parameters. For the VPSS questionnaire, results are shown in *Table 2*.

The "urinary stream" item significantly correlated with both Q_{max} and Q_{ave}, and the nocturia item correlated with all three parameters. These findings indicate that VPSS may be used as an instrument for evaluating LUTS. *Table 3* presents the comparison between urinary stream assessment by uroflowmetry and VPSS. According to uroflowmetry, a non-obstructive flow curve was observed in 38.9% of patients, while 59.7% demonstrated an obstructive pattern. In the VPSS questionnaire, the majority of patients (44.4%) rated their stream as 3 points; 26.4% as 2 points; and 23.6% as 4 points.

Table 4 summarizes correlations between individual IPSS items and uroflowmetry parameters. Among all IPSS items, only nocturia showed significant correlations with Q_{max}, Q_{ave}, and voided volume. An analogous analysis was performed for mIPSS (*Table 5*). Q_{max} and Q_{ave} demonstrated significant correlations with intermittent stream, weak urinary stream, and straining. The nocturia score correlated with Q_{max} and voided volume.

To explore the influence of cognitive impairment on questionnaire performance, the MoCA test was administered. The median MoCA score was 26 [23; 28] out of 30. Normal cognitive performance was found in 34.7% of patients, mild impairment in 54.2%, and moderate impairment in 11.1%. In total, 65.3% of the cohort exhibited some degree of cognitive impairment. Of the participants, 33 (45.8%) lived in urban areas and 39 (54.2%) in rural areas; no significant association was found between cognitive function and place of residence ($p = 0.873$).

The correlation coefficient between MoCA scores and age was −0.45 ($p < 0.001$), indicating age-related cognitive decline.

This prompted a re-evaluation of the relationship between uroflowmetry and mIPSS scores while controlling for cognitive impairment using MoCA test results (*Table 5*). The mIPSS items that were significantly associated with Q_{max} and Q_{ave} before adjustment for MoCA remained significant after adjustment, with minimal change in coefficient magnitude.

These findings confirm a significant relationship between Q_{max}, Q_{ave}, and total mIPSS score, as well as the mIPSS items "weak stream," "straining," and "nocturia," independent of cognitive performance.

When MoCA scores were transformed into a three-tier ordinal scale ("normal," "mild impairment," "moderate impairment"), no significant correlations were found between mIPSS scores and uroflowmetry measures within

Table 3

Agreement between stream assessment by uroflowmetry and VPSS

VPSS stream score (abs.)	Non-obstructive (%)	Equivocal (%)	Obstructive (%)	Total (n)
1	1 (3.6%)	0	1 (2.3%)	2 (2.8%)
2	8 (28.6%)	1 (100%)	10 (23.3%)	19 (26.4%)
3	13 (46.4%)	0	19 (44.2%)	32 (44.4%)
4	6 (21.4%)	0	11 (25.6%)	17 (23.6%)
5	0 (0%)	0	2 (4.7%)	2 (2.8%)
Total	28 (38.9%)	1 (1.4%)	38 (59.7%)	72 (100%

Table 4

Correlation between uroflowmetry parameters and IPSS questionnaire items

IPSS item	Q_{max}	Q_{ave}	Voided volume
Incomplete emptying	−0.107 (0.373)	−0.140 (0.242)	−0.096 (0.423)
Urination more often than every 2 hours	0.077 (0.520)	0.050 (0.678)	0.077 (0.520)
Intermittent urinary stream	−0.097 (0.418)	−0.073 (0.544)	0.024 (0.841)
Urgency (difficulties in postponing urination)	−0.076 (0.524)	−0.079 (0.507)	−0.108 (0.368)
Weak urinary stream	−0.109 (0.361)	−0.115 (0.338)	0.018 (0.884)
Straining during urination	−0.141 (0.237)	−0.086 (0.474)	0.020 (0.868)
Nocturia	−0.271* (0.021)	−0.255* (0.030)	−0.380** (0.001)

Note. * – coefficient significant at the 0.05 level; ** – at the 0.01 level. Statistically significant coefficients are shown in bold.

Table 5

Dependence of uroflowmetry parameters on mIPSS scores with adjustment for cognitive impairment

mIPSS item	Q_{max}		Q_{ave}	
	Without MoCA control	With MoCA control	Without MoCA control	With MoCA control
Total score	-0.252* (0.038)	-0.253* (0.049)	-0.152* (0.027)	-0.152* (0.027)
Incomplete emptying	-0.652 (0.306)	-0.643 (0.322)	-0.493 (0.127)	-0.486 (0.118)
Urination more often than every 2 hours	-0.428 (0.524)	-0.413 (0.523)	-0.388(0.291)	-0.378 (0.348)
Intermittent urinary stream	-1.156 (0.156)	-1.177 (0.143)	-0.627 (0.077)	-0.641 (0.073)
Urgency (difficulties in postponing urination)	-0.112 (0.826)	-0.103 (0.845)	-0.276 (0.291)	-0.269 (0.303)
Weak urinary stream	-1.847** (0.007)	-1.861** (0.008)	-0.977** (0.005)	-0.986** (0.010)
Straining during urination	-1.900* (0.014)	-2.146** (0.008)	-0.886* (0.011)	-1.026* (0.011)
Nocturia	-1.774* (0.029)	-1.755* (0.032)	-1.012* (0.023)	-0.998* (0.022)
Qol (Quality of life)	0.046 (0.933)	-0.076 (0.882)	-0.150 (0.632)	-0.256(0.422)

Note. p-values were estimated using bootstrap based on 1,000 samples. *: coefficient significant at the 0.05 level; **: at the 0.01 level. Statistically significant coefficients are shown in bold.

the group with normal cognitive function (*Table 6*). The greatest number of significant correlations was observed in patients with mild cognitive impairment, followed by those with moderate impairment. This suggests that cognitive impairment may influence the accuracy with which patients complete the mIPSS questionnaire.

A similar analysis was performed for VPSS responses (*Table 7*). The correlation between the "stream" item and uroflowmetry parameters, observed in the overall cohort, did not persist within subgroups stratified by cognitive impairment. The association between nocturia and uroflowmetry was preserved only in patients with mild impairment. Additionally, a significant correlation was identified between total VPSS score and voided volume in the subgroup with moderate cognitive impairment.

Discussion. The IPSS questionnaire is the standard initial assessment tool for men with LUTS and is recommended by leading urological associations as well as national clinical guidelines, including those of the Russian Society of Urology [7–9]. However, more than 30 years of clinical use have revealed several limitations, not inherent to the questionnaire itself, but rather related to the psychosomatic and demographic characteristics of respondents [10]. Age, educational level, pain, and LUTS severity have all been shown to influence the final test results [11]. The importance of cognitive functioning has been reported in studies from African countries, India, Indonesia, Turkey, and Brazil [12]. In response to these criticisms, a new instrument, namely the Visual Prostate Symptom Score (VPSS), was introduced in 2011. Its items are displayed as pictograms, and VPSS was found to correlate significantly with IPSS, Q_{max}, and Q_{ave}, making it potentially helpful for patients with limited literacy. However, VPSS was not superior to IPSS in elderly populations [13]. Additionally, VPSS requires less time to complete than IPSS [2]. The significance of cognitive status for accurate completion of both IPSS and VPSS was also demonstrated by V.A. Dudarev, who reported cognitive impairment in 70.8% of patients and its measurable impact on questionnaire performance [14].

There is growing consensus that VPSS may serve as an alternative to IPSS for evaluating LUTS in elderly

Таблица 6

Корреляция показателей урофлоуметрии и ответов на вопросы mIPSS по группам когнитивных способностей

mIPSS item	Normal			Mild impairment			Moderate impairment		
	Q_{max}	Q_{ave}	Voided volume	Q_{max}	Q_{ave}	Voided volume	Q_{max}	Q_{ave}	Voided volume
Incomplete emptying	0.024 (0.909)	0.068 (0.746)	0.002 (0.994)	-0.238 (0.145)	-0.243 (0.136)	-0.096 (0.560)	0.048 (0.909)	-0.424 (0.295)	0.764* (0.027)
Urination more often than every 2 hours	0.014 (0.946)	-0.118 (0.933)	-0.193 (0.356)	-0.099 (0.548)	-0.154 (0.339)	-0.136 (0.409)	0.038 (0.931)	-0.282 (0.498)	0.282 (0.498)
Intermittent urinary stream	-0.204 (0.327)	-0.120 (0.567)	0.056 (0.789)	-0.238 (0.144)	-0.318* (0.049)	-0.131 (0.427)	-0.728* (0.041)	-0.664 (0.073)	0.255 (0.542)
Urgency (difficulties in postponing urination)	0.141 (0.503)	0.212 (0.309)	-0.169 (0.419)	-0.032 (0.846)	-0.104 (0.528)	-0.039 (0.811)	-0.125 (0.768)	-0.576 (0.135)	0.726* (0.041)
Weak urinary stream	-0.180 (0.388)	-0.108 (0.609)	-0.076 (0.717)	-0.613** (<0.001)	-0.579** (<0.001)	-0.366* (0.022)	-0.135 (0.750)	-0.344 (0.404)	0.344 (0.404)
Straining during urination	-0.138 (0.510)	-0.065 (0.759)	0.014 (0.946)	-0.613** (<0.001)	-0.579** (<0.001)	-0.366* (0.022)	-***	-***	-***
Nocturia	-0.079 (0.707)	-0.062 (0.770)	-0.308 (0.134)	-0.356* (0.026)	-0.297 (0.067)	-0.332* (0.039)	-0.170* (0.688)	-0.218* (0.604)	0.570 (0.140)
Qol (Quality of life)	0.058 (0.785)	0.123 (0.558)	-0.060 (0.775)	-0.104 (0.529)	-0.102 (0.539)	-0.060 (0.715)	-0.074 (0.862)	-0.395 (0.332)	-0.124 (0.771)
Total score	-0.062 (0.768)	0.005 (0.980)	-0.121 (0.564)	-0.371* (0.020)	-0.402* (0.011)	-0.274 (0.091)	-0.167 (0.693)	-0.548 (0.160)	0.762* (0.028)

Note. *: coefficient significant at the 0.05 level; **: at the 0.01 level. Statistically significant coefficients are shown in bold; ***: correlation coefficient could not be calculated due to lack of variability (all patients in the group gave the same score: 1).

Table 7

Correlation between uroflowmetry parameters and VPSS items by cognitive status

VPSS item	Normal			Mild impairment			Moderate impairment		
	Q_{max}	Q_{ave}	Voided volume	Q_{max}	Q_{ave}	Voided volume	Q_{max}	Q_{ave}	Voided volume
Stream	-0.320 (0.118)	-0.307 (0.135)	0.060 (0.774)	-0.177 (0.280)	-0.212 (0.195)	-0.130 (0.429)	-0.504 (0.203)	-0.630 (0.094)	0.630 (0.094)
Day	0.204 (0.328)	0.193 (0.356)	0.070 (0.740)	0.101 (0.542)	0.084 (0.610)	-0.080 (0.628)	-0.121 (0.775)	-0.412 (0.310)	0.691 (0.058)
Nocturia	-0.091 (0.664)	-0.081 (0.701)	-0.389 (0.055)	-0.349* (0.029)	-0.320* (0.047)	-0.397* (0.012)	-0.012 (0.977)	-0.344 (0.404)	0.491 (0.217)
Qol	-0.140 (0.504)	-0.128 (0.542)	-0.065 (0.757)	0.159 (0.334)	0.151 (0.360)	0.135 (0.412)	0.358 (0.385)	-0.051 (0.904)	0.255 (0.542)
Total score	-0.022 (0.919)	0.001 (0.996)	-0.176 (0.401)	-0.125 (0.447)	-0.126 (0.443)	-0.250 (0.124)	-0.180 (0.670)	-0.515 (0.192)	0.826* (0.011)

Note. *: coefficient significant at the 0.05 level; **: at the 0.01 level. Statistically significant coefficients are shown in bold.

men with insufficient educational level to correctly comprehend the IPSS [15]. Domestic experience also confirms the usefulness of VPSS in evaluating LUTS in men. Our study confirmed the interchangeability of IPSS and VPSS and demonstrated the influence of cognitive impairment, which is present in 65.3% of patients, on selected VPSS responses. Thus, neither IPSS nor VPSS can be considered fully reliable for LUTS assessment in older men with BPH given the high prevalence of cognitive deficits in this population.

At the same time, we found that reorganizing the IPSS into two functional categories (voiding and storage) improved the reliability of responses. Whereas only one IPSS item correlated significantly with uroflowmetry parameters, four of seven mIPSS items showed significant correlations, three of which were obstructive symptoms. Therefore, IPSS and mIPSS correlate not only in terms of item responses and total scores, but mIPSS also demonstrates a stronger association with objective uroflowmetry measurements than the original IPSS. These findings support the conclusion that mIPSS and IPSS evaluate the same domains of urinary function, yet mIPSS provides higher diagnostic accuracy due to its stronger correlation with objective functional data. The limitations of our study include the relatively small sample size; however, the observed correlations between the questionnaires and uroflowmetry parameters were highly significant.

Conclusion. The results of this study demonstrate the advantages of the modified mIPSS questionnaire over the standard IPSS, owing to its stronger correlation with objective uroflowmetry parameters and its simplified structure. VPSS and mIPSS may be used to identify voiding dysfunction, particularly in patients with cognitive impairment.

Furthermore, the demonstrated interchangeability of questionnaire items and the rational separation of obstructive and irritative symptoms into two columns support the clinical usefulness of the modified structure.

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Information about the authors:

Mikhail E. Efremov – Cand.Sc.(Med), assistant of the urology Dept. of the Kuban State Medical University of the Ministry of Health of the Russian Federation; urologist of the Research Institute – Regional Clinical Hospital №1 Prof. S.V. Ochapovsky. Address: 350063, Krasnodar Region, Krasnodar, Mitrofan Sedin Street, 4; e-mail: efremov.uro@yandex.ru. ORCID: 0000-0003-2733-0619.

Vladimir L. Medvedev – Dr.Sc. (Med.), PhD, DMS, Full Professor; Head, Dept. of Urology, Kuban State Medical University; Chief, Urology and Nephrology Center, Deputy Chief Physician for Urology, Research Institute – Regional Clinical Hospital №1 Prof. S.V. Ochapovsky. Address: 350063, Krasnodar Region, Krasnodar, Mitrofan Sedin Street, 4; e-mail: medvedev_vl@mail.ru. ORCID: 0000-0001-8335-2578.

Anatoly D. Anosov – first year Postgrad. Student of the Dept. of Urology of the Kuban State Medical University of the Ministry of Health of the Russian Federation, urologist of the Research Institute – Regional Clinical Hospital №1 Prof. S.V. Ochapovsky. Address: 350063, Krasnodar Region, Krasnodar, Mitrofan Sedin Street, 4; e-mail: vester.orient@gmail.com. ORCID: 0009-0002-2126-3136.

Dmitry P. Akopov – Assist. of the urology Dept. of the Kuban State Medical University of the Ministry of Health of the Russian Federation; urologist of the Research Institute – Regional Clinical Hospital №1 Prof. S.V. Ochapovsky. Address: 350063, Krasnodar Region, Krasnodar, Mitrofan Sedin Street, 4; e-mail: akopov-mitya@mail.ru. ORCID: 0009-0006-3649-6337.

Mikhail I. Kogan – M.D., Dr.Sc.(Med), Full Prof., Honored Scientist of the Russian Federation; Head, Dept. of Urology, Pediatric Urology and Reproductive Health, Rostov State Medical University. Address: 344022, Rostov-on-Don, Nakhichevansky Lane, 29; E-mail: dept_kogan@mail.ru. ORCID: 0000-0002-1710-0169.

Dmitry V. Sizyakin – M.D., Dr.Sc.(Med), Full Prof., Honored Doctor of the Russian Federation; Head, Dept. of Urology, Pediatric Urology and Reproductive Health, Rostov State Medical University. Address: 344022, Rostov-on-Don, Nakhichevansky Lane, 29; e-mail: center@gb-1.ru. ORCID: 0000-0001-7125-1374.