

ASSESSMENT OF LOWER URINARY TRACT DYSFUNCTION IN WOMEN WITH MULTIPLE SCLEROSIS

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Multiple sclerosis (MS) is a chronic disorder of the central nervous system affecting primarily young women. Neurogenic lower urinary tract dysfunction (NLUTD) represents one of the disease manifestations creating the risk of infectious complications and kidney disease. Today, there is insufficient data on the urinary microflora composition obtained by advanced high-tech diagnosis methods. The study aimed to perform clinical assessment of NLUTD associated with MS and its impact on the quality of life (QOL), as well as to clarify the data on the urinary microflora composition. A total of 33 women with MS aged 36 [39.5; 30.5] years were assessed using the customized questionnaires for estimation of the NLUTD prevalence and severity, as well as for QOL evaluation. Qualitative determination and quantification of urinary opportunistic microflora (OM) were performed using the real-time polymerase chain reaction. A total of 19 (57.6%) women with MS had symptoms of NLUTD: symptoms of the storage (15 individuals, 45.5%) and emptying (16 individuals, 48.5%) phases. In almost half of women with MS, the complaints included abnormalities of both bladder functioning phases (12 individuals, 36.4%); moderate abnormalities prevailed (12 individuals, 34.6%). Women with MS and NLUTD were more disabled based on the EDSS score (3.5 [5.0; 3.0] points; $p < 0.001$) and had longer disease duration (13 [20.0; 5.0] years; $p < 0.001$). The QOL index of women with NLUTD showed dissatisfaction with bladder function. The study revealed bacteriuria in patients with MS and NLUTD. The data on the urinary microflora composition are provided: OM members (bacteria of the ESKAPE group) have been found in 8 samples obtained from women with MS and NLUTD. Bacteriuria was asymptomatic.

Keywords: multiple sclerosis, bacteriuria, urinary tract infections, neurogenic bladder dysfunction, nocturia, urinary microflora**Funding:** the study was conducted as part of the RSF project No. 23-25-10076.**Author contribution:** Luzanova EI — clinical assessment, data analysis and interpretation, manuscript writing; Karpova MI, Abramovskikh OS — study design and supervision, approval of the final version of the manuscript; Chetvernina EA, Zotova MA — laboratory tests; Kupriyanov SV — statistical analysis; Bershadskiy AV — data interpretation.**Compliance with ethical standards:** the study was approved by the Ethics Committee of the South Ural State Medical University (protocol No. 8 dated 15 September 2023). All subjects submitted the informed consent to enrollment.✉ **Correspondence should be addressed:** Ekaterina I. Luzanova
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ИССЛЕДОВАНИЕ ДИСФУНКЦИИ НИЖНИХ МОЧЕВЫВОДЯЩИХ ПУТЕЙ У ЖЕНЩИН С РАССЕЯННЫМ СКЛЕРОЗОМ

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Рассеянный склероз (РС) — хроническое заболевание центральной нервной системы, преимущественно поражающее молодых женщин. Нейрогенная дисфункция нижних мочевыводящих путей (ДНМП) — одно из проявлений заболевания, оно создает риски инфекционных осложнений и поражения почек. В настоящее время недостаточно данных о составе микрофлоры мочи, полученных современными высокотехнологичными методами диагностики. Целью исследования было дать клиническую оценку ДНМП при РС, влияния ее на качество жизни (КЖ), а также уточнить данные о составе микрофлоры мочи. Для обследования 33 женщин с РС в возрасте 36 [39,5; 30,5] лет использовали специализированные опросники для оценки частоты и степени тяжести ДНМП, оценки уровня КЖ. Качественный и количественный состав условно-патогенной микрофлоры (УПМ) мочи определяли методом полимеразной цепной реакции в режиме реального времени. У 19 (57,6%) женщин с РС были симптомы ДНМП: симптомы фазы накопления (15 человек, 45,5%) и фазы опорожнения (16 человек, 48,5%). Почти у половины женщин с РС жалобы включали симптомы нарушения обеих фаз работы мочевого пузыря (12 человек, 36,4%), преобладали среднетяжелые нарушения (12 человек, 34,6%). Женщины с РС и ДНМП были более инвалидизированы согласно шкале EDSS (3,5 [5,0; 3,0] баллов; $p < 0,001$) и имели больший стаж болезни (13 [20,0; 5,0] лет; $p < 0,001$). Индекс КЖ у женщин с ДНМП отражал неудовлетворенность функцией мочевого пузыря. В результате исследования выявлено наличие бактериурии у пациенток с РС и ДНМП. Представлены данные о составе микрофлоры мочи: в 8 образцах от женщин с РС и ДНМП обнаружены представители УПМ (бактерии группы ESKAPE). Бактериурия имела бессимптомный характер.

Ключевые слова: рассеянный склероз, бактериурия, инфекции мочевых путей, нейрогенная дисфункция мочеиспускания, nocturia, микрофлора мочи**Финансирование:** работа выполнена в рамках проекта РФФ № 23-25-10076.**Вклад авторов:** Е. И. Лузанова — клиническое исследование, анализ и интерпретация данных, написание статьи; М. И. Карпова, О. С. Абрамовских — дизайн исследования и руководство, окончательное утверждение рукописи; Е. А. Четвернина, М. А. Зотова — лабораторные исследования; С. В. Куприянов — статистический анализ данных; А. В. Бершадский — интерпретация данных.**Соблюдение этических стандартов:** исследование одобрено этическим комитетом ФГБОУ ВО ЮУГМУ Минздрава (протокол № 8 от 15 сентября 2023 г.). Все участницы подписали добровольное информированное согласие на участие в исследовании.✉ **Для корреспонденции:** Екатерина Игоревна Лузанова
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Multiple sclerosis (MS) is a chronic demyelinating neuroinflammatory and autoimmune disease of the central nervous system (CNS) associated with degenerative phenomena and having a variable course. It usually affects young people, has a great effect on the quality of life (QOL), and places considerable burden on public health services.

Lower urinary tract dysfunction (LUTD) is a common symptom of multifocal CNS lesion underlying the development of MS. Neurogenic lower urinary tract dysfunction (NLUTD) develops on average 8 years after establishing the diagnosis of MS; up to 10% of patients complain of alterations in urination associated with the disease manifestation [1, 2]. In the course of the disease more than 80% of individuals with MS experience NLUTD symptoms, up to 91% have appropriate urodynamic abnormalities [2, 3]. In 35% of patients with MS, focal lesions damaging reticulospinal tracts usually result in detrusor sphincter dyssynergia [4–6]. This syndrome is characterized by impaired coordination between detrusor contraction and relaxation of bladder sphincters resulting urinary retention [7]. Clinical manifestations of such abnormal urodynamics are uncontrolled overactive detrusor contractions with or without urinary incontinence, sphincter dysfunction, which often result in considerable residual urine volume and high intravesical bladder pressure. Within the framework of obstructive symptoms the most common manifestations are weak urine stream, difficulty starting urinating, and the need to force urination. This creates conditions for functional obstruction and abnormal urinary outflow. Complete and partial urinary retention representing the extreme forms of obstructive disorder results in residual urine accumulation [4]. As a result, negative effects on the upper and lower urinary tract can be expected. High intravesical bladder pressure contributes to reflux into the upper urinary tract and secondary kidney injury. Urinary tract infections (UTIs) represent a major challenge of treatment of individuals suffering from MS. Neurogenic urodynamic disturbances worsen the patients' QOL and ensure the increased risk of UTIs [8]. When discussing UTIs in MS, it is important to consider the issues of prevention. Risk factors of UTIs in patients with MS require thorough clinical assessment. The long-term immunosuppressive therapy with disease-modifying drugs for MS (DMDs), female sex, pelvic abnormalities and disability, treatment with corticosteroids, dysbiotic processes in the urogenital tract are discussed as predictors of UTIs in individuals with MS [1, 8]. To date, the composition of microflora of the lower urinary tract (LUT) and adjacent loci in patients with MS is poorly understood. The study aimed to perform clinical assessment of lower urinary tract dysfunction to assess its impact on the QOL using the customized questionnaires validated in Russia, as well as to perform qualitative assessment and quantification of the LUT microflora composition by molecular genetic methods in women with MS.

METHODS

We performed observational clinical and laboratory study of 33 non-pregnant women. Inclusion criteria: definite diagnosis of MS based on the McDonald criteria (2017); EDSS up to 6.5 points; age 18–45 years; no corticosteroid therapy and antibacterial drugs at the moment of sample collection or within a month before enrollment; no sexually transmitted infections; no history of any urinary tract disorder or follow-up by urologist or nephrologist. Exclusion criteria: pregnancy and lactation, acute infection, history of surgery within a month before the study, participation in other studies, mental disorders, refusal of submitting the informed consent. Outpatients followed-

up at the consulting and diagnostic clinics for demyelinating disorders and MS in Chelyabinsk and Chelyabinsk Region were randomly enrolled. Inclusion criteria for the control group ($n = 20$): conditionally healthy non-pregnant women of fertile age with no nervous system disorder, pelvic organ function impairment or the history of urogenital infection; the median age was 35 [37.5; 30.0] years. Clinical assessment of women with MS involved the use of the generally accepted methods available to neurologists: neurological status assessment using the Expanded Disability Status Scale (EDSS), pelvic organ function assessment using the Pelvic Organ Function Questionnaire [9, 10], and the Neurogenic Bladder Symptom Score (NBSS) [11]. The median age of women with MS was 36 [39.5; 30.5] years. The majority of patients received DMDs for MS: 11 individuals (33.3%) used interferon beta, 11 (33.3%) used ocrelizumab, 6 (18.2%) used cladribine, and 5 (15.2%) were naïve. The median EDSS was 2.5 [4.0; 2.0] points; all the patients had the relapsing-remitting disease course.

Urinary microflora composition was assessed using the reagent kit for detection of DNA of opportunistic bacteria of the classes Bacilli, Betaproteobacteria and Gammaproteobacteria (BacScreen; BacScreen OM REAL-TIME PCR Detection Kit, DNA-Technology, Russia) by real-time polymerase chain reaction. Bacterial contamination of urine (total bacterial mass (TBM)) was quantified; the amount of DNA of the identified microorganism was presented as a logarithm Lg, the values of which were proportionate to microbial contamination of the biotope. The kit used in this study enables detection of 25 bacterial representatives of opportunistic microflora (OM): *Enterococcus spp.*, *Streptococcus spp.*, *Streptococcus agalactiae*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*, *Staphylococcus spp.*, *Staphylococcus aureus*; *Achromobacter ruhlandii*, *Achromobacter xylosoxidans*, *Burkholderia spp.*; *Acinetobacter spp.*, *Citrobacter freundii*, *Citrobacter koseri*, *Enterobacteriales*, *Enterobacter cloacae*, *Escherichia coli*, *Haemophilus spp.*, *Haemophilus influenzae*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Morganella morganii*, *Proteus spp.*, *Pseudomonas aeruginosa*, *Serratia marcescens*, *Stenotrophomonas maltophilia*. All the patients complaining of LUTD and having the symptoms of LUTD were advised to consult urologist, undergo bladder ultrasound involving determination of post void residual urine. Statistical analysis was performed using Windows 10, Excel 2016 (Microsoft; USA), IBM SPSS Statistics 26 (IBM; USA). Descriptive statistics included frequency indicators, median values, 25th and 75th percentiles (Me [LQ; UQ]). The Mann–Whitney U test, Kruskal–Wallis test, and χ^2 test were used to compare the groups. The correlation analysis was performed using the Spearman's rank correlation coefficient (ρ); the correlation strength was estimated using the Chaddock scale. The differences were considered significant at $p < 0.05$.

RESULTS

The use of the Pelvic Organ Function Questionnaire revealed signs of urination disorder of varying severity in 19 individuals (57.6%). Patients with MS and LUTD were included in the study group; the age range was 21–45 years. The comparison group included 14 women with MS having no bladder dysfunction aged 19–42 years. The EDSS of patients with LUTD were different from that of patients having preserved bladder function (3.5 [5.0; 3.0] and 2.0 [2.0; 1.0] points, respectively; $p < 0.001$); there were no differences in age. Women with LUTD had longer MS duration (13 [20.0; 5.0] years) compared to patients with no urination disorder (4 [7.0; 2.75] years; $p < 0.001$).



Fig. 1. Frequency of storage phase symptoms in women with remittent MS based on the Pelvic Organ Function Questionnaire

The storage symptoms were found in 15 individuals (45.5%), while the voiding symptoms were reported in 16 individuals (48.5%) (Fig. 1, 2). The combination of symptoms of abnormalities of both urination phases was observed in 12 individuals (36.4%). All the patients developed symptoms of bladder dysfunction after the MS onset. The bladder symptoms were presented near 3 [5.0; 2.0] years after the MS onset, the latest time of the LUTD onset was 10 years since the diagnosis, and the minimum duration of bladder disorder was 1 year. The urgency more frequent than once a week was experienced by 12 women (36.4%) with varying frequency, 12 women (36.4%) reported they «can't hold urine because of urgency». A total of 7 individuals urinated 10 or more times per day (21.2%). Three women (9.1%) complained of the storage symptoms only. Six women with MS (18.2%) woke up to urinate more than once a night, but all of them had other bladder disorder symptoms. Nocturia was not found in patients having no symptoms of LUTD.

Persistent voiding symptoms occurring at least several times per week was represented by complaints of slower urine flow — in 14 individuals (42.4%), weak stream sensation, increase in the time needed to urinate — in 13 (39.4%); 13 individuals (39.4%) described their interrupted urine flow, 11 (33.3%) felt the need to strain to empty the bladder, feeling of incomplete bladder emptying after voiding was reported by 12 individuals (36.4%). Four women (12.1%) complained of the voiding symptoms only. Stress incontinence was experienced by 4 women with MS (12.1%), aged 35–46 years (median age 40.5 [44.25; 36.0] years), furthermore, 3 women had other bladder symptoms. One patient suffered from the storage abnormalities, 2 other patients had a combination of complaints. Among 19 women, 10 patients had a consultation of urologist, all of them were diagnosed with LUTD based on bladder ultrasound involving estimation of residual urine volume, the volume of 160 mL was revealed in one case.

According to the QOL index, women with MS and bladder disorder were dissatisfied with their bladder condition, in contrast to women having no such symptoms, $p < 0.05$ (Fig. 3). The median QOL index was 2.0 [2.0; 1.0] points. The worst values of the urological QOL index were reported in patients having the storage symptoms and a combination of bladder

dysfunction symptoms (2.0 [2.75; 2.0]; 2.0 [2.0; 1.0] points, respectively; $p > 0.05$).

The bladder disorder severity assessment results are provided in Table. The increased average scores were reported for all NBSS domains. The total NBSS score exceeding 20 was reported in 12 women (34.6%), which suggests moderate bladder dysfunction, 10–20 (mild form) — in 4 women (12.1%), other patients had the values below 10. Weak positive correlations between the LUTD severity based on the NBSS score, disability score ($p = 349$; $p > 0.05$), and disease duration ($p = 145$; $p > 0.05$) were revealed.

The QOL index reflected negative impact on the well-being of patients with any clinical manifestations of bladder disorder; the worst values were reported in women having a combination of symptoms (3.0 [3.0; 2.0] points; $p > 0.05$). Almost one third of women with MS (9 individuals, 27.3%) and LUTD said that they would feel unhappy and dissatisfied, “if the bladder would function like now for the rest of life”.

Molecular genetic testing of urine in women with MS revealed DNA of opportunistic microorganisms (OM) in 8 individuals (24.2%). We identified microorganisms of the order *Enterobacteriales* (4 individuals), including *Enterobacter cloacae* (1 individual), *Escherichia coli* (1 individual), *Klebsiella pneumoniae* + *Klebsiella oxytoca* (1 individual); species of the order *Pseudomonadales*: *Acinetobacter spp.* (1 individual), and species of the class *Bacilli*: *Staphylococcus spp.* (3 individuals) and *Streptococcus spp.* (2 individuals). A combination of members of all the bacterial classes identified was found in 3 women (9%). Variation in the amount of OM detected was 2.5–5.7 Lg, which corresponded to $10^{2.5}$ – $10^{5.7}$ GE/sample. The questionnaire survey revealed obstructive symptoms manifested by weak urine stream, the need to strain, and intermittent urination, in all 8 patients, among them 5 (62.5%) had a combination of the storage and emptying phase symptoms, and 6 (75%) had episodes of cystitis in their urological history. A total of 12 women (36.4%) had episodes of UTIs since the moment of establishing the diagnosis of MS: cystitis, including recurrent form, and one case of pyelonephritis. No microorganisms were found in urine of the control group ($p < 0.001$).

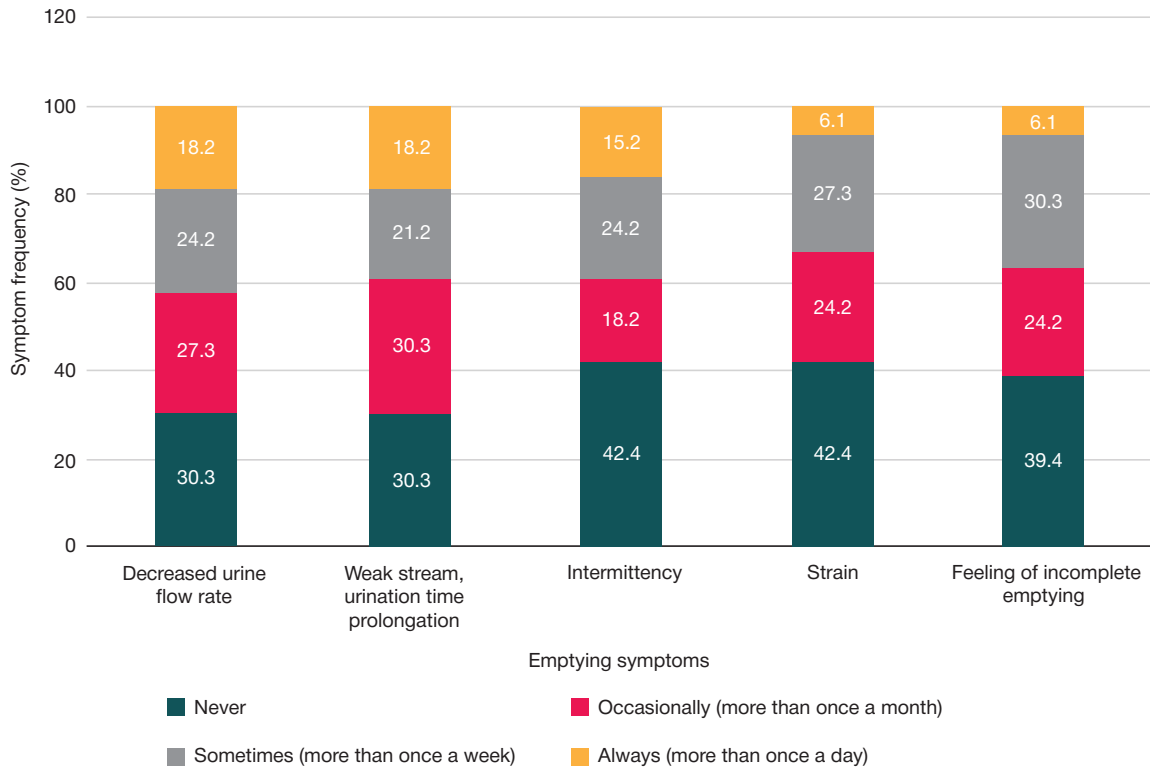


Fig. 2. Frequency of voiding symptoms in women with relapsing-remitting MS based on the Pelvic Organ Function Questionnaire

DISCUSSION

Patients with MS and healthcare professionals often face an important interdisciplinary problem: neurourological disorders. A number of foreign authors report that the type of bladder disorder associated with MS varies between detrusor hyperactivity (34–91% of patients) and areflexia (20–37% of patients) [1, 2]. In the recent study focused on the epidemiology and nature of bladder disorders associated with MS, NLUTD

was found in 65% of patients [12]. Among our patients more than a half (57.6%) had various symptoms of bladder dysfunction. The most common neurourologic symptoms are urinary frequency and detrusor overactivity [13]. In the surveyed women with MS, the storage and voiding symptoms were almost equally represented (45.5% and 48.5%, respectively), which resulted primarily from the CNS lesion localization. Perhaps, this can explain the lack of significant correlation between the disease duration and the bladder dysfunction

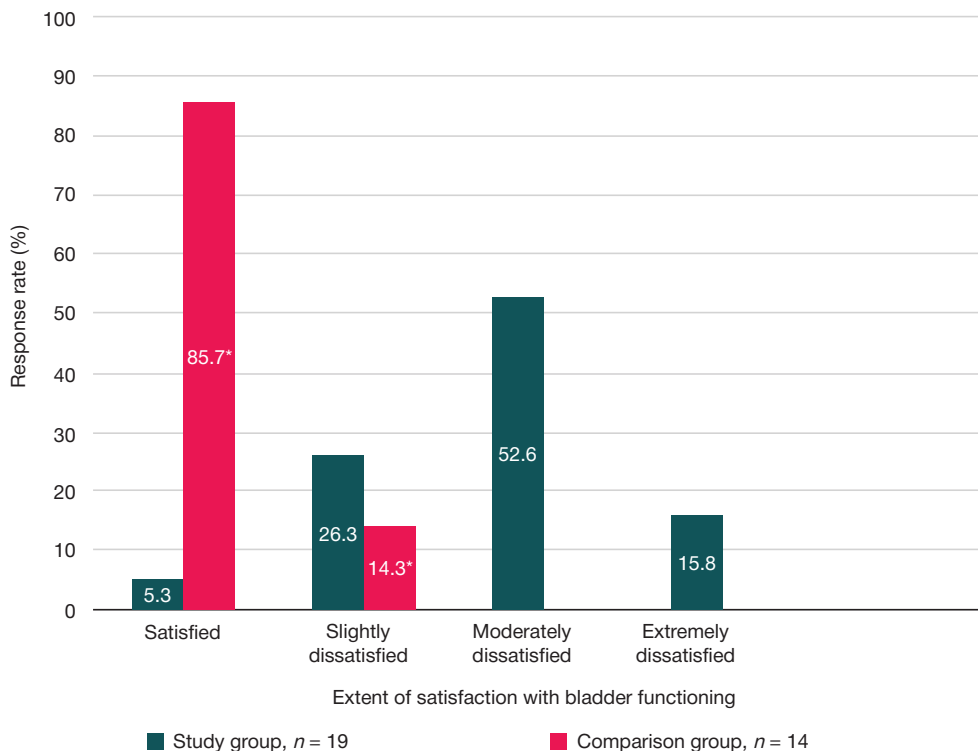


Fig. 3. Frequency of satisfaction with bladder functioning (QOL index) based on the Pelvic Organ Function Questionnaire. * — $p < 0.05$, χ^2 test

Table. Bladder disorder severity in women with remittent MS based on the Neurogenic Bladder Symptom Score (NBSS)

Women with MS and NLUTD <i>n</i> = 19	Average scores by domains				Total score
	Incontinence (0–29)	Storage and voiding	Complications	Quality of life	
	6.05 ± 5.43	10.08 ± 2.93	4.95 ± 4.36	2.1 ± 1.07	

severity. The severity of this or that MS symptom is determined by localization of demyelination lesion, exacerbation severity, and the quality of functional recovery after relapse. The bladder disorder associated with MS contributes greatly to the patients' disadaptation, increasing the disability score [12]. Women with MS and LUTD were more disabled compared to women with normal voiding. At the same time, they had mild-to-moderate bladder dysfunction, and no correlation between the EDSS and NBSS scores was found. This is consistent with the features of using the bladder and gut functional system scale and the algorithm to determine the total EDSS score.

It is important that a large share of women (39.4%) had bladder disorders, in which the symptoms associated with both urine retention and bladder voiding occur. Such variant of neurogenic bladder disorder develops in case of focal spinal cord lesion below the pons (or medulla oblongata) and above the sacral region [14]. It should be noted that about 80% of patients with MS have lesion in the spinal cord, mostly in the cervical region, which are more often symptomatic compared to brain lesions and can cause considerable disadaptation in the form of the gait, coordination, bladder and gut function disturbances [3, 15, 16]. The patients having a combination of the storage and voiding symptoms usually pay attention to the increase in urinary frequency and episodes of urge incontinence, while voiding symptoms remain out of sight, and the conditions for the upper urinary tract injury are preserved. Impossibility of adequate severity estimation based on the patient's subjective complaints represents one of the major challenges of the diagnosis of urinary hesitancy. In this regard, it is feasible to regularly conduct screening aimed to identify the voiding disturbances, ensure timely referral for urological counseling, perform uroflowmetry to quantify urine flow rate and bladder ultrasound to determine residual urine volume [5, 6].

In turn, the storage symptoms that usually reflect neurogenic detrusor overactivity can also lead to the upper urinary tract injury, as well as to the development of nonreflux pyelonephritis. This is associated with the detrusor tissue fibrosis, impaired bladder dynamics [7, 17].

The increase in the rate of urination at night in individuals with MS is one more manifestation of the urine storage and voiding dysfunction. Nocturia disturbs night sleep, leads to fatigue, daytime drowsiness, decreases the QOL [18, 19]. The prevalence of nocturia in individuals with MS is higher, than in general population, it varies between 20.9% and 48.8% [18]. We noted that 18.2% of women with MS woke up more than once a night and went to the bathroom for voiding. Currently, three various mechanisms underlying the development of nocturia (reduced bladder capacity, general polyuria and nocturnal polyuria) are discussed [20, 21]. The range of causes underlying these three pathogenetic variants of nocturia is well-known; the MS-associated specific factors not observed in patients having no neurological disorders have been reported [20, 21].

Specific questionnaires determining the QOL index have been developed to assess QOL in individuals with neurogenic bladder dysfunction. The majority of MS researchers agree that the symptoms of bladder dysfunction have a significant impact on the patients' QOL, regardless of the assessment tool used [2, 12]. In the Russian population of individuals with

MS the issue of the impact of bladder dysfunction on the QOL is still poorly understood, which is likely to be due to the fact that specific questionnaires have been translated into Russian and validated not so long ago [9, 11]. According to the data of the Russian study focused on validation of the short QOL questionnaire for patients with neurogenic bladder dysfunction (SF-Qualiveen), patients with MS and neurogenic LUTD had much worse QOL scores [22]. In our study, every third woman with MS having bladder dysfunction reported that the issue was very important for her. The QOL index from the Pelvic Organ Function Questionnaire also reflected low satisfaction with the urination quality in women with LUTD compared to patients having no such disorder.

Not only primary disease, but also comorbidities and lifestyle factors affect the QOL and mortality in individuals with MS. A large share of such factors is constituted by infections, especially pneumonia, influenza, and UTIs [2]. UTIs in patients with MS are strongly associated with bladder dysfunction. UTIs are among three major causes of hospital admission in patients with MS and reach 30–50% of all indications for hospitalization [2, 8]. According to the data of epidemiological study of MS comorbidity, among 815 patients 3.5% had UTIs [23]. In our patients, the reported rate of the history of UTIs was 36.4%. In the large-scale retrospective study of the causes of death in people with MS conducted in Canada in 1986–2013, UTIs were noted in 8% of 2153 death cases as one of the major causes of death, while in general population UTIs constituted only 2% of the causes of death [24].

Testing of the MS patients' urine by culture-based microbiological diagnosis methods showed that *Escherichia coli*, *Streptococcus beta-hemolytic B*, *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Staphylococcus coagulase-negative* were the most common causative agents of UTIs [8, 25]. We have found no scientific literature data obtained by modern methods that would allow one to determine nonculturable bacteria in urine of patients with MS and neurogenic dysfunction. In this study we performed molecular genetic identification of OM in women with MS using the BacScreen OM test system. Asymptomatic bacteriuria was observed in 24.2% of cases. The following representatives were found: *Enterobacter cloacae*, *Escherichia coli*; *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Acinetobacter spp.*, as well as *Staphylococcus spp.*, and *Streptococcus spp.* All these microorganisms can cause UTIs [25, 26]. Moreover, *Enterobacter spp.*, *Klebsiella pneumoniae*, *Staphylococcus spp.* found in the urine of women with MS belong to the group of most important bacteria referred to as ESKAPE: *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter spp.* [27]. These bacteria that often cause severe infections show multidrug resistance to various classes of antibiotics [28, 29]. ESKAPE pathogens were included in the WHO priority list of pathogens for the development of new antibacterial drugs or alternative treatment methods [27–29]. The range of the quantity of OM revealed was $10^{2.5}$ – $10^{5.7}$ GE/sample. The microbiological pattern associated with NLUTD changed depending on the urine drainage method [30]. All the women we examined urinated unaided. Despite the limited number of patients with the OM detected, we performed in-depth

analysis of bladder dysfunction symptoms in this group. This approach turned out to be relevant in the context of understanding the relationship between UTIs and various LUT dysfunction types. In our study, all women with MS and bacteriuria detected had urination disturbances with obstructive symptoms, as well as the history of UTI episodes. These symptoms can indicate disturbances of the mechanism underlying urination, which, according to modern studies can be associated with detrusor sphincter dyssynergia. Such a bladder disorder form combines the storage symptoms and the signs of obstruction, including residual urine volume. While urinary retention and weak urine stream can attract the patient's attention, post-void residual volume often remains unnoticed. That is why it is important to timely detect the signs of voiding disturbances. To estimate the severity of such disturbances more accurately, it is necessary to conduct comprehensive urodynamic assessment allowing one to obtain detailed information about the LUT functional state, including the dynamics of intra-bladder pressure and bladder volume [2]. It is impossible to draw definitive conclusion about the disease severity and nature without such assessment. In one of the studied cases, significant residual urine volume (160 mL) and pseudodiverticula were revealed in patient with bacteriuria based on ultrasound data. These findings can suggest a prolonged course of chronic urinary retention, which, in turn, can negatively affect the patient's health and ensure susceptibility to infectious complications. Joint monitoring of patients with NLUTD by neurologist and urologist is important for preservation of renal function and prevention of severe, often fatal, urological complications [2, 8].

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CONCLUSIONS

Bladder disorders were found in 57.6% of women with relapsing-remitting MS. Clinical assessment of this category of patients involved the use of specific Pelvic Organ Function Questionnaire allowing the neurologist to thoroughly assess the system functioning quality and perform diagnostic screening. The storage and voiding symptoms were equally frequent, and the majority of patients had a combination of those. Moderate LUTD significantly affecting the QOL prevailed. The use of the diagnostic kit enabling comprehensive qualitative assessment and quantification of microflora composition with the emphasis on detection of the broad spectrum of OM of three classes (*Bacilli*, *Betaproteobacteria*, and *Gammaproteobacteria*) most often causing community-acquired and hospital-acquired infections was the feature of the study. Preliminary results of urinary microflora assessment suggest the presence of not only well-known *Escherichia coli*, but also other OM representatives, including those belonging to the ESKAPE group of most important bacteria that are often resistant to antibacterial drugs. Symptoms of obstruction prevailed in women with the OM detected. This emphasizes the importance of timely detection and adjustment of functional LUT disorders aimed at preventing infectious inflammatory diseases. Bladder voiding disturbances are likely to be one of the causes of intense bacterial growth. Further research is required to determine additional risk factors of infectious complications affecting LUT in individuals with MS.

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