ABSTRACT

Urinary incontinence is a disease that limits life activity and occurs more often in women than in men.

The study aimed to present methods of the diagnosis and assessment of stress urinary incontinence such as interviews, assessment of body posture, and breathing mechanism, mobility tests, external examination with visual assessment, and additional diagnostic tools in the form of tests and questionnaires.

Modern diagnostic methods and the cooperation of doctors and physiotherapists allow the implementation of effective therapeutic and educational activities in the field of urinary incontinence.

Keywords: stress urinary incontinence, urogynecology, physiotherapy, diagnostics, pelvic floor muscles

INTRODUCTION

The World Health Organization classifies urinary incontinence (UI) as one of the basic health problems of the 21st century. Urinary incontinence is a disorder that leads to a significant limitation of life activity. Moreover, it affects women twice as often as men [1].

UI is an important social problem, not only due to its significant scale but also its specificity. It is still such an embarrassing issue that people affected by this disease avoid contact with a doctor. The epidemiological data shows that around 200 million people worldwide suffer from this disorder [2], whereas in Poland it may occur in up to five million people [3]. The scale of the problem is huge and often underestimated, however, it is a social and civilization disease. Among the methods of UI treatment, physiotherapy supported by modern methods of diagnosis and monitoring progress in therapy is gaining more and more recognition. According to global organizations associating therapists specialized in stress urinary incontinence (SUI), it is the first therapeutic method of choice preceding surgical treatment and can be used together with pharmacotherapy [4]. The effects of physiotherapy largely depend on the individual approach and relationship between the therapist and the patient.
gives an opportunity not only to fully justify the necessity and explain the performance of individual exercises but also to monitor and correct errors that may occur. Individual and intensive work with a physiotherapist also gives the patient the opportunity to effectively continue the exercise program and perform them independently at home.

**TYPES OF INCONTINENCE**

The International Continence Society (ICS) has identified the following types and causes of UI:

- **stress urinary incontinence (SUI)** - excessive mobility of the bladder neck, and failure of the sphincter mechanism;
- **overactive bladder (OAB)** - overactivity of the detrusor muscle, low compliance of the bladder walls, including the neurogenic bladder;
- **urinary incontinence (UI)** – from overflow: detrusor muscle insufficiency, outflow obstruction;
- **extra-sphincteric incontinence (NM)** - fistulas, developmental defects [5].

SUI is the most common form affecting women and its incidence increases significantly with age. According to various studies, about 24% of women aged 18-48 suffer from SUI, 37% in the age group 35-54, and as much as 39% after reaching the age of 55 [6]. In addition to age, the following are the risk factors for SUI:

- weakness of the pelvic floor muscles (MDM), which is most often generated by pregnancies, natural childbirth, puerperium, certain types of gynecological and obstetric surgeries, or obesity;
- menopause and estrogen deficiency related to it, which adversely affects the condition of the epithelium of the bladder and urethra;
- total and radical hysterectomy and related MDM damage [7].

**STRESS INCONTINENCE**

SUI is an involuntary, uncontrolled leakage of urine that occurs during exertion, coughing, or sneezing, i.e. during activities that increase intra-abdominal pressure. The characteristic feature is that before and during the leakage of urine, the person does not feel the urge to urinate. Stamey distinguished three stages of SUI:

- **I degree** – leakage of urine only during a rapid and significant increase in intra-abdominal pressure;
- **II degree** - involuntary urination during a moderate increase in intra-abdominal pressure - when walking up the stairs, jumping up, and light physical work;
- **III degree** – leakage of urine while lying down, standing, or walking [8].

The ICS Standardization Committee recommends a different typology (according to Blaivas) taking into account the position of the bladder neck:

- **type 0** - the closed bladder neck is located above the pubic symphysis. It is inefficient when coughing, but there is no leakage of urine;
- **type I** – the bladder neck is lowered by 2 cm in relation to the pubic symphysis. Inefficient when coughing, there is the uncontrolled leakage of urine during exertion;
- **type II A** – the bladder neck is lowered more than 2 cm in relation to the pubic symphysis. Ineffective coughing, a sign of urinary incontinence, is observed in the diverticulum of the bladder with accompanying lowering of the anterior vaginal wall (cystocele);
- **type II B** – at rest, the bladder neck is lower than the pubic symphysis. When coughing, it lowers even more and is accompanied by urinary incontinence;
- **type III** – insufficiency of the external sphincter [9].

**DIAGNOSTICS AND ASSESSMENT METHODS**

UI, regardless of the type, is often not an independent disease entity but is a symptom of many possible abnormalities occurring in the human body with hormonal, functional, and structural backgrounds. Risk factors also include hard physical work, competitive sport, or significant weakening of the connective tissue.

The complexity of possible causes has a significant impact on the selection of UI treatment methods and therapeutic progress. Therefore, the first essential element starting the therapeutic process is a general interview. It gives basic information such as age, body mass index (BMI), comorbidities (thyroid, diabetes, asthma, neurological diseases), surgeries, professional work and resulting possible burdens, pregnancies and childbirth, sex life, medications used, sports, and others. A detailed interview allows for providing information like the duration of the problem, severity, and in what kind of situations the symptoms appear. The detailedness of the questions and their variety allows for a precise assessment of symptoms and their severity. The interview should be attentive, including objective questionnaires/tests, analysis of medical records, and possibly additional tests [10].

**Evaluation of body posture, breathing mechanism, and mobility tests**

Body posture, joint mobility, and gait pattern have a big impact on the proper functioning of the pelvic floor. In people with problems with the pelvic floor, there is a smaller plane of support and a shift of the center of gravity forward. This posture reduces the activity of the postural muscles, including the pelvic floor muscles [11]. Posture defects that predispose to overloads in the pelvic floor area include: shoulders and head in protraction [12, 13], deepened kyphosis of the thoracic segment, and shallow lordosis of the lumbar segment [14, 15]. Limitation of mobility in the hip and intervertebral joints of the lumbar section have a direct impact on the mobility of
the pelvis, which in turn affects muscle atrophy, myofascial contractures, and muscle tone, which then changes the reactive and reflex capacity of the pelvic floor muscles. Limited mobility of the foot joints affects the gait pattern, e.g. incorrect foot rolling leads to uneconomical locomotion, faster fatigue, and abnormal muscle tension in the lower limbs, spine and pelvis [10].

Mobility tests should include:
- a short gait test with its assessment,
- assessment of the mobility of the hip, knee, and ankle joints,
- foot arches,
- finger joints,
- limited mobility of the intervertebral joints of the entire spine [10].

Another diagnostic element is the assessment of breathing and diaphragm function. There is a strong relationship between the work of the diaphragm and the work of the pelvic floor muscles. What is more, studies show that activation of the pelvic floor muscles enables more effective breathing (spirometry), which emphasizes the correlation between the work of the diaphragm and perineal muscles [16]. Factors affecting the work of the diaphragm leading to respiratory dysfunction include:
- posture defects (scoliosis, deepening of thoracic kyphosis),
- setting the pelvis in excessive anterior and posterior tilt,
- limitations in the mobility of the spine joints, resulting from increased tension of myofascial structures, e.g. iliopsoas muscle, hamstring muscles, spinal rectifier muscle, thoracolumbar fascia,
- work of other structures including mm. pelvic floor, upper thoracic opening (structures between the cervical and clavicle) [17-19].

External examination and visual assessment
The physical examination includes the abdomen, vagina, perineum, and anus, as well as a neurological examination assessing sensation, reflexes from the limbs, as well as muscle tone and strength. The first element of the assessment is the indirect MDM examination, visual assessment, and direct examination at rest and in activity [20]. The visual assessment of the perineum can be divided into two parts: the first is at rest - which allows for assessing the length of the vaginal entrance and observing scars, tissue damage or skin lesions, or venereal diseases affecting the perineal area. The second is in activity - during contraction, pushing, and cough test, i.e. activation of pelvic floor muscle contraction. The proper contraction was described by A. Kegel as early as 1948 as squeezing of the urethra, vagina, and anus, combined with the movement of retraction of the perineal area [10].

The direct examination is palpation of the pelvic floor - static and dynamic per vaginum according to the Oxford scale with the PERFECT scale test (Table 1). It is the duty of the urogynecological physiotherapist to explain the essence of the examination, present its course step by step, and the possibility of interrupting the procedure at any time, as well as to ensure appropriate conditions for the examination and maximum comfort for the patient. The examination always takes place in intimacy, but its course is slightly different from a traditional gynecological examination. At the urogynecological physiotherapist, the patient lies freely on the couch, and her legs do not have to be spread far apart. In some cases (e.g. in the patient’s static disorders) it is even recommended that the patient assumes a standing position, leaning her buttocks on the edge of the couch. The PERFECT scale assesses: the patient’s ability to properly contract and relax the pelvic floor, muscle strength through the closing force and retraction movement, maximal voluntary contraction (MVC), endurance (maintenance of contraction and its efficiency), symmetry of contraction within the crotch, coordination with other muscles and possible compensations [21].

<table>
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<tr>
<th>Table 1 PERFECT pelvic floor function test</th>
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<td><strong>PERFECT scale</strong></td>
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<td>P – Power</td>
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Source: [10]

The Oxford scale includes 6 grades, depending on the strength of contraction of the pelvic floor muscles:
- 0 - no muscle tone, no contractions
- 1 - muscle tremors, not visible outside the perineum
- 2 - weak muscle tone, impossible to maintain
- 3 - moderate muscle contraction, medium muscle strength
- 4 - pronounced muscle contraction, good muscle strength
- 5 - strong muscle contraction, very good muscle strength, possible contraction against clear resistance [21].
Additional diagnostic tools

• A voiding diary
  The standardized voiding diary contains complete medical history, includes time-based parameters, and is a simple test that can be performed using a standard measuring cup to evaluate fluid excretion measured in milliliters. It can be carried out over a day or more (preferably including one weekend day). The following parameters are documented: the volume of fluids drunk and their type, the occurrence of urgency (yes/no) and its intensity, the volume of urine excreted, involuntary loss of urine (amount, cause), pad change, pad weight (g=ml), special events during the day and medications [10].

• Pad test
  The Standardization Committee of the ICS in its 5th report of May 1988 provides a detailed description of the test performance and its interpretation. In the test, the patient, after emptying their bladder, receives a weighted pad and drinks 500 ml of fluids for the first 15 minutes, or the same amount of fluid is introduced using a catheter. For the next 30 minutes, they walk, as well as climb the stairs, and in the last 15 minutes: 10 times they stand up and sit down, 10 times they cough strongly, run in place for 1 minute, pick up objects from the floor 5 times, wash their hands in running water for 1 minute. After the test is completed, the insert is weighed. The patient can empty their bladder. UI is indicated by the weight of the insert greater by at least 2 g. If the result is unreliable, the test is repeated a second time, with the difference that the patient does not empty their bladder before starting the test.
  Grades of incontinence based on one-hour pad test:
  • < 2 g: no incontinence
  • 2-10 g: medium degree
  • 10-50 g: severe degree of incontinence
  • 50 g: very severe incontinence [22].

• Stick test (Q-tip test)
  It is one of the tests used for diagnosing SUI. According to Bręborowicz, the examination involves inserting a cotton bud into the urethra and observing its angle during the so-called Valsalva maneuver (e.g. raising intra-abdominal pressure by pushing) [23].

• Bonney test
  A popular method that also applies to SUI and facilitates the prognosis of surgical treatment. Urodynamic testing is a combination of cystometry and urethral profilometry at rest and during exercise, as well as uroflowmetry. This method accurately shows the function of the lower urinary tract [24].

Ultrasonography

Ultrasonography is the basic diagnostic test in SUI. The most common and main ultrasound method used by physiotherapists in clinical work is a two-dimensional (2D) ultrasound examination: transperineal (TP) and transabdominal (TA). Transperineal ultrasonography is a reliable method for the diagnosis of UI in women. It allows visualization of the bladder neck, urethra, vagina, and measurement of bladder neck mobility during contraction, with conscious activation of the pelvic floor muscles (PFM) and the Valsalva maneuver against the pubic symphysis. The technological development of ultrasonography is constantly progressing. Three-dimensional and four-dimensional ultrasound allows for a very detailed assessment of the levator ani muscles and dimensions of the urogenital hiatus, as well as detailed pelvic floor morphology and diagnosis of postpartum levator ani muscle injury, as well as differential assessment of genital prolapse. Transabdominal ultrasonography is a completely non-invasive method of assessing the conscious activation of MDM. It is also becoming more and more popular and used by physiotherapists around the world [25]. The above-mentioned ultrasound examinations are very promising as techniques for evaluating the results and effects of physiotherapy therapeutic programs in the future.

Electromyography

Surface electromyography (sEMG) is one of the objective tools for assessing pelvic floor tone. It is a study of the electrical potentials of muscles at rest or during exercise tests. Using vaginal or rectal electrodes, the basal MDM voltage or that generated during contraction can be measured. This method enables a very accurate way of visualizing the resting activity of MDM, examining their function (contraction parameters), and educating the patient in the field of conscious activation of the pelvic floor muscles using biofeedback. EMG devices also perfectly illustrate the progress of therapy over several weeks or months [10].

Dynamometry

Several forms of MDM dynamometers have been invented in the last 20 years. They differ in shape, size, the force of the acting vector (anterior-posterior, lateral-lateral, multi-directional force), or other technical details. During the work of the pelvic floor muscles, their lengthening or shortening causes the transfer of information about the strength of contraction to the voltage indicator glued to the speculum, which affects the change in electrical resistance. The voltage value expressed in volts is then amplified, expressed digitally, and converted into units of force. The dynamometers documented good linearity, repeatability, and the ability to measure force regardless of the point of application on the speculum paddles in calibration studies of tested subjects.
Perineometry

In 1948 Dr. Arnold Henry Kegel invented a vaginal device – a perineometer, used to assess the strength of women’s pelvic floor muscles. A probe measuring the pressure in the vagina was connected to a manometer showing it in millimeters of mercury (mm Hg). Since then, there have been many probes of various shapes and many technical parameters measuring the pressure in the vagina. These instruments expressed vaginal pressure in mm Hg or cm of water column [25].

Among other tests, there are also: magnetic resonance (NMR, nuclear magnetic resonance), laboratory and microbiological tests, which are performed when infections occur frequently in people with UI. Numerous scientific publications referring to the diagnostic methods used in urophysiotherapy describe the way of interpreting the results and the diagnostic effectiveness of the described tests.

SUMMARY

UI affects approximately 25% of the adult female population. Due to its embarrassing nature, it is often omitted in conversations with a doctor or physiotherapist. Patients report to a specialist most often with stage II or III of SUI according to Stamey. As in most chronic diseases, the success of therapy depends to a large extent on the correct diagnosis and appropriately selected therapy conducted by a team of doctors and physiotherapists. In order to diagnose a patient early enough and implement effective therapeutic action, special emphasis should be placed on the appropriate education of women. According to the author of this article, the question about UI should be included in the gynecological interview, so women. According to the author of this article, the question about UI should be included in the gynecological interview, so that the potential risk of this problem can be determined as early as possible. The next step should be to refer the patient to the appropriate facility dealing with urogynecological therapy.

REFERENCES / LITERATURA

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