

# Urinary incontinence treatment algorithm

## Algotem zdravljenja urinske inkontinence

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### Abstract

Uncontrolled leakage of urine or urinary incontinence is a pelvic floor dysfunction and defined as any involuntary urination. The aetiology of incontinence is multifactorial, but with respect to the basic pathophysiological mechanisms that cause its onset, it can be roughly divided into stress, urge, mixed and overflow incontinence. The basic treatment for a patient is complex because the symptoms and signs of these disorders can result from gynaecological as well as internal, urological and neurological diseases. This article uses relevant literature and European guidelines to present a urinary incontinence treatment algorithm that emphasises the application of stepwise treatment and the importance of conservative treatment. Surgery is recommended only after all the conservative treatment options have been exhausted.

### Izvleček

Nenadzorovano uhajanje urina ali urinska inkontinenca je disfunkcija medeničnega dna in se opredeljuje kot vsako nehoteno uhajanje urina. Na vzrok inkontinence vpliva več dejavnikov. Po osnovnih patofizioloških mehanizmih nastanka se v grobem deli na stresno, urgentno, mešano in t.i. »overflow« urinsko inkontinenco. Osnovna obravnava bolnice je kompleksna, saj lahko na simptome in znake teh motenj vplivajo ginekološke, internistične, urološke in nevrološke bolezni. V članku na osnovi literature in evropskih smernic prikazujemo algoritem zdravljenja urinske inkontinence s poudarkom na stopenjskem zdravljenju in na pomenu konservativnega zdravljenja. Šele po izčrpanih možnostih konservativnega zdravljenja svetujemo bolnici kirurški poseg.

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## 1 Introduction

Uncontrolled leakage of urine or urinary incontinence (UI) is a pelvic floor dysfunction found in all age groups (1). UI as a term has been used since 2002 for any involuntary urination, as per the definition by the International Continence

Society (ICS) (2). Patients have varied symptoms and signs and cite a wide range of problems, from mild to disabling (2,3).

The aetiology of UI is multifactorial, as risk factors include age, pregnancy and childbirth (multiparous women), pelvic

floor injury during vaginal delivery, pelvic surgery, menopause (due to decreased oestrogen secretion), hysterectomy, increased body weight, lack of physical activity, urinary tract infections, chronic cough, prolonged heavy lifting, congenital weakness of connective tissue and chronic constipation (2,4).

According to anatomical criteria, UI is divided into urethral and extra-urethral. Clinically, it is divided into absolute and relative UI. Absolute UI in women occurs because of congenital (epispadias, ectopic ureter, bladder exstrophy) or acquired abnormalities (obstetric fistula, following surgery, due to malignancy or following radiation therapy). Several types of relative UI are known, and they are divided by basic pathophysiological mechanisms that cause their onset. They are roughly divided into stress UI (urinary incontinence due to pressure or upon exertion), urge UI (urgent urinary incontinence), mixed UI (with characteristics of stress and urge UI) and overflow UI (involuntary release of urine due to an overfull bladder). In practice, however, the borders between different UI types are often blurred due to mixed aetiology (2,4,5).

Results of epidemiological studies on the prevalence of UI in women differ significantly. The cause can most probably be found in different sample sizes, UI definitions and methodology (6). The UI problem is becoming more common due to the rising elderly population and the trend of rising prevalence of UI with ageing. Based on available data, the prevalence of UI in young women (18–44 years) is 20–30%, in middle-aged women (45–59 years) 30–40% and in older women (older than 60 years) 30–50% (6,7). For example, the Norwegian EPINCONT longitudinal study (8,9), which was underway between 1995–1997 and again between 2006–2008, showed a rise in UI prevalence of 16%

between the two periods. The incidence increased by 18.7%, and remission was achieved in 34.1%. Stress incontinence is more common than urge or mixed incontinence (8,10,11). The prevalence of stress incontinence reaches its peak in the 5th decade of life, but the prevalence of mixed and urge incontinence keeps increasing. Studies predict that the prevalence of UI and other pelvic floor disorders, such as pelvic organ prolapse (POP) and anal incontinence, will keep increasing with the overall ageing of the world's population (8,12).

### 1.1 Stress urinary incontinence

The ICS defines stress urinary incontinence (SUI) as the complaint of any involuntary loss of urine on effort or physical exertion (e.g. sporting activities) or on sneezing or coughing (2). When leakage of urine through the urethra, concurrent with an increase in intra-abdominal pressure (e.g. on coughing, sneezing or the Valsalva manoeuvre) in the absence of bladder contraction is found with urodynamic investigations, we speak of urodynamically diagnosed SUI (2,13).

The main theory explaining the mechanism of SUI proposes that urine begins to leak uncontrollably through the urethra as intra-abdominal pressure (IAP) rises (5,14). The moment IAP rises, the pressure in the bladder rises and becomes higher than the pressure in the urethra, as the rise in IAP is unevenly distributed between the bladder and the urethra in favour of the former. In SUI, this occurs without contraction of the detrusor muscle in the bladder (14,15).

The factors that affect the pathologic deviation in urethral pressure are numerous. The most important are the changed position of the bladder neck due to weakness and the loss of the supportive role of

the vagina (upon which the urethra and the bladder neck lie), the pelvic floor muscles (PFM) and the posterior pubourethral ligament. Contractility of the urethral sphincter and urethral compliance also affect the pressure (14). Numerous studies have confirmed that pregnancy and/or childbirth increase the possibility of SUI occurrence, especially in younger women. In most, this is a temporary occurrence, which becomes chronic in some of them (11). The reason can be found in changes in the female body, which occur during pregnancy and after delivery, the most important among them being the weakening of the levator ani muscle, bladder neck descent and partial loss of pelvic muscles innervation due to injury of the pudendal nerve or its branches (14,16,17,18). Constant physical exertion and obesity are also important factors for SUI occurrence due to chronic elevations in IAP (5).

## 1.2 Urge urinary incontinence

The ICS defines urge urinary incontinence (UUI) as the observation of involuntary leakage from the urethral orifice associated with the individual reporting the sensation of a sudden, compelling desire to void (urgency) (2). It most often occurs on the way to the bathroom, when listening to running water or during contact with cold water. It is caused by uncontrolled bladder contractions, causing urgency which can lead to UUI (19).

UUI is only a part of the syndrome known as overactive bladder (OAB). It is defined by the presence of urgency, often accompanied by frequent urination and nocturia (one-time or multiple interruptions of sleep per night due to the need for urination) in the absence of urinary tract infection or other obvious pathology (2). The dry type without urinary

incontinence, but with urgency and frequent urination, and wet type with UUI are known (19). Pathophysiologically, there are two types of OAB. If the cause of an overactive bladder is a proven disorder of the central nervous system, we talk of detrusor hyperreflexia. This type of OAB can be present in patients with multiple sclerosis, stroke or Parkinson's disease. The other type of OAB with an unstable detrusor has no known cause. With this type, central disorders of micturition control due to delayed maturation of the central nervous system can be found, or it can occur due to peripheral causes, such as excessive cholinergic stimulation or decreased peripheral adrenergic inhibition (5,19).

Risk factors for the occurrence and worsening of UUI are numerous. Recurrent urinary tract infections are connected to UUI and are a curable cause of incontinence. A high body mass index (BMI), ageing and caffeine use (due to its diuretic effect and increasing the feeling of urgency) are also connected with UUI occurrence. Risk factors also include dementia, loss of higher cognitive functions and depression (20).

## 2 Initial assessment of patients with urinary incontinence

The initial management of patients with disorders of the pelvic floor function consists of a urogynaecological history with analysis of a bladder diary, urine analysis and clinical examination. The goal of the focused urogynaecological history is to identify the patient's main symptoms and signs and their duration, characteristics and effect on their quality of life. The patient should be asked about the severity of these symptoms, their onset and triggering factors. The amount and the type of fluid consumed during the day should be

established. Complete gynaecological history and information regarding concomitant medical issues, previous surgery and any allergies should also be obtained. The bladder diary can also be analyzed, as it provides valuable information regarding the patient's frequency, incontinence episodes, pad use, fluid intake, and degree of urgency and incontinence (21). By taking a history, we try to identify problems, enabling us to choose further diagnostic investigations. Standardized questionnaires are sometimes used, especially to quantify symptoms. One of them, the International Consultation on Incontinence Modular Questionnaire – Urinary Incontinence Short Form (ICIQ-UI SF), has been translated, modified and validated for the Slovenian language (22,23). History is followed by a clinical examination, which consists of a general physical examination, abdominal examination and vaginal examination with POP and PFM assessment. We recommend using the Pelvic Organ Prolapse quantification score (POP-Q) for POP assessment, which is recognized and organized by the ICS (22). PFM strength is assessed by digital palpation, with contraction strength assessed either according to the six-level Oxford scale or four levels of PFM strength. Because of the high prevalence of urinary tract infections in women with lower urinary tract symptoms, urine analysis, urinary culture and post-void residual evaluation represent an indispensable part of the initial assessment of these patients. The algorithm of the initial assessment of patients with UI is shown in [Figure 1](#).

Urodynamic measurements are an important part of the diagnostic process in patients with complicated UI. These enable us to see the functional capabilities of the lower urinary tract – evaluation of urethral sphincter power and bladder wall activity. We can measure urethral pressure

at rest and during physical activity and intravesical pressure during bladder filling with normal saline.

The ICS specifies standard and additional urodynamic measurements (24). Standard measurements include uroflowmetry, post-void residual evaluation, cystometry and pressure-flow study. An EMG can be added to urodynamic measurements with certain indications, along with imaging and urethral pressure profile. Cystometry can also be performed via the suprapubic catheter (13,21,22,23,24).

Deciding on conservative or surgical treatment approach depends predominantly on the severity of UI and on comorbidities. Before surgery is recommended, we need to be certain which type of UI the patient has and if surgery is even required. It is important to know whether UI is primary or secondary. Conservative treatment should be exhausted, and before surgery is proposed, certain factors must be taken into account – the patient's age, general condition and health, prior surgeries, and especially the gynaecological and lower urinary tract status (19).

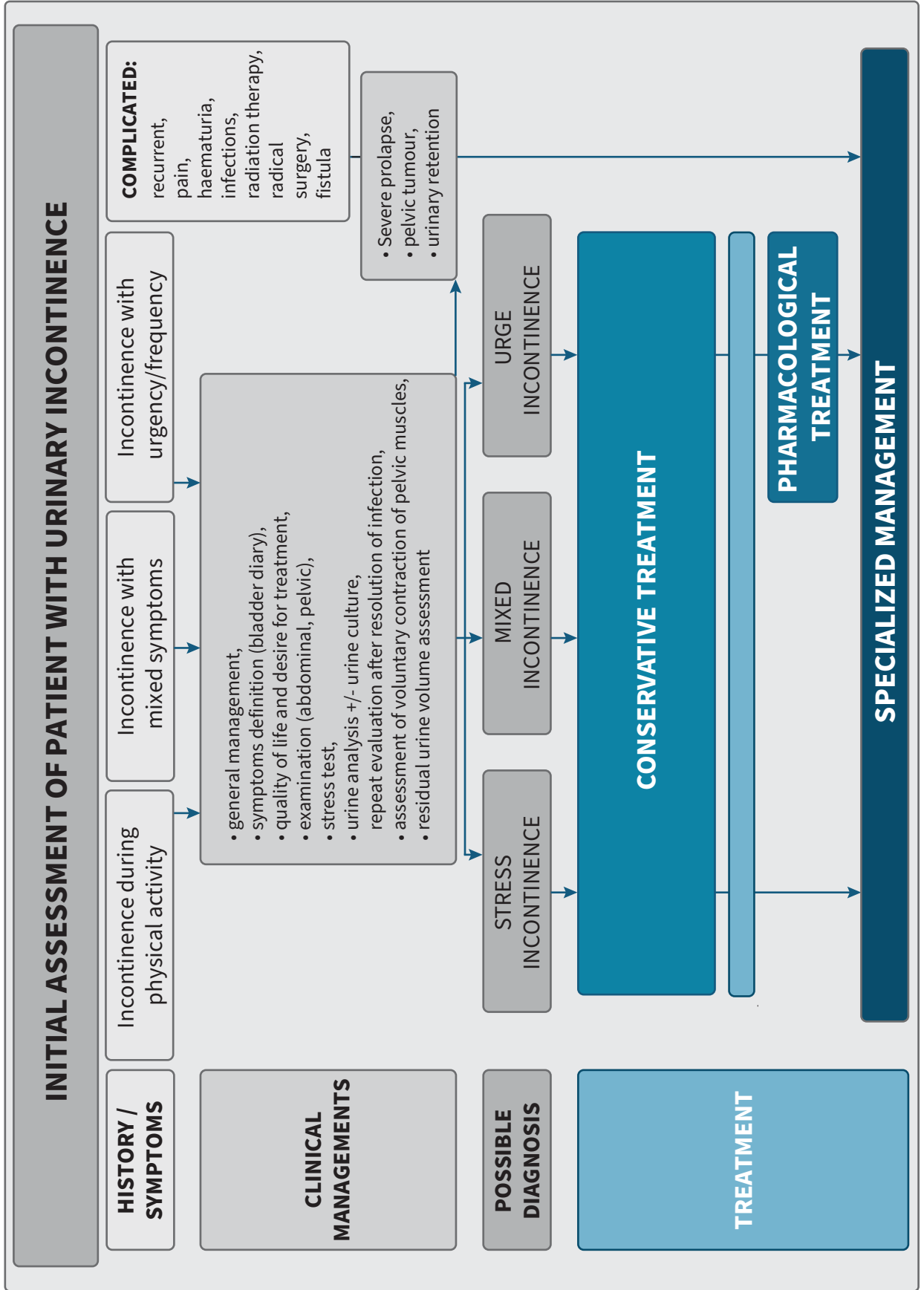
## 2.1 Treatment of stress urinary incontinence

### 2.1.1 Conservative treatment

Indications for treatment include mild and moderate SUI, treatment before and after surgery, severe SUI with an absolute contraindication for surgery and mixed forms of UI. Conservative treatment includes lifestyle changes, PFM strengthening exercises, pharmacological treatment with alpha agonists and oestrogens, functional electrostimulation, magnetic stimulation and pessaries. We do not use the latter for treatment, only for symptomatic relief (2,13,19,26).

PFM strengthening exercises are the oldest form of treatment of UI in women.

**Figure 1:** Initial assessment of patient with urinary incontinence. Summarized from Blaganje M (25).



In 1948, the American gynaecologist Arnold Kegel published instructions on how to strengthen the detrusor muscle with PFM strengthening exercises. The idea was not novel, as similar exercises are found in several traditional and East Asian cultures. Kegel recommended the exercises for the prevention and treatment of SUI (after childbirth, in menopause). With the development of modern physical therapy, these exercises differ from the ones described by Kegel, although the term “Kegel exercises” is still in use for PFM strengthening exercises. They consist of voluntary contraction and relaxation of PFM, including of the detrusor muscle. Active exercising increases their strength and endurance. In turn, this increases the power of the urethral sphincter if the intra-abdominal pressure suddenly rises (13). Adequate PFM exercises provide good structural support to the pelvis. Despite detailed and exhaustive individual instructions, a third of women do not perform the exercises correctly after their first appointment; therefore, before starting the exercises, it should be confirmed that the patient knows how to perform them correctly. PFM exercises can be performed independently or in combination with other methods and techniques (26).

### 2.1.2 Surgical treatment

When conservative treatment fails, we opt for surgical treatment. Indications are severe SUI, failure of conservative treatment and MUI with a predominance of SUI signs. When choosing a surgical approach, it should be noted that two thirds of patients with SUI have to a certain extent altered statics of the pelvic organs and pelvic floor. As quality of life is in question, we decide on the surgical approach that will eliminate the most pronounced symptoms and signs to the greatest extent. Depending on the approach, we

distinguish between vaginal, retropubic, combined (vaginal and abdominal approach) and endoscopic (laparoscopic and needle suspension) surgery (5).

Tension-free vaginal tape (TVT) surgery for treating SUI was first described by Ulmsten in 1996 (1). Since then, it has become a gold standard for the surgical treatment of SUI worldwide (4). The success rate is 84–95%, but the procedure is connected with possible complications, such as damage to the bladder, urethra, intestine or large vessels. After the procedure, 8–17 % of patients experience temporary urinary retention and 5–15% (27%) urgency. To avoid complications connected with the retropubic approach, Delorme introduced the transobturator approach. By inserting the tape through the obturator muscle, we compensate for the weakness of the endopelvic fascia and at the same time avoid intrapelvic and retropubic blind punctures, thus reducing the risk of damage to the bladder, intestine and large vessels (5,27).

In recent years, physicians, national supervisory institutions, the media and various internet pages with information for patients have been warning of complications following the use of synthetic meshes used in the surgical treatment of SUI and POP. They warn of possible complications that additionally worsen the patient's quality of life – including mesh exposure, chronic pain, dyspareunia and infections. In March 2017, a report was published on the results of an independent Scottish study on the use, safety and efficacy of surgical meshes in the transvaginal treatment of SUI and POP, revealing that the use of tension-free vaginal tape is a suitable solution only for SUI treatment (28). Morlin et al. (29) conducted a cohort study in 16,000 women who underwent their first surgery to treat UI or POP with a mesh or colposuspension.

Surgical procedures involving a mesh had less risk for immediate postoperative complications (relative risk: 0.44) and also for subsequent surgery for the treatment of POP. Due to inconsistent reports that affect media opinion and the position of lawyers and patients, multiple national organizations have recommended that patients be thoroughly informed of all risks connected to these procedures and consistently informed of conservative treatment options and other available surgical approaches. They stressed that surgical approaches which use a mesh are successful if they are used in appropriate patients and with suitably qualified surgeons (28,29,30).

Despite this, due to numerous patient lawsuits due to complications, TVT surgery for treatment of SUI and POP was banned in Great Britain, Australia and New Zealand. In these countries, laparoscopic Burch colposuspension is now the main form of surgical treatment. The surgery was first described in the literature by John Christopher Burch (1900–1977) in 1961 and was the most common surgical approach for the treatment of SUI until the 1990s due to its high success rate of up to 86%. Surgical correction of the position of the bladder neck achieved by Burch colposuspension returns the proximal urethra to its original position behind the symphysis. It is an indirect suspension of the bladder neck as the paravaginal fascia is lifted, that is the part of the endopelvic fascia of the paraurethral part of the vagina, leaving the urethra free and mobile (5,29).

According to the European Association of Urology (EAU), treatment of SUI with colposuspension (open or laparoscopic) is only recommended if TVT surgery is banned. The British National Institute for Health and Clinical Excellence (NICE) guidelines state that treatment of SUI

with colposuspension, TVT or autologous fascial sling is the first choice among the surgical approaches, but that laparoscopic colposuspension should only be performed by an experienced laparoscopic surgeon working with a multidisciplinary team (28,29,31,32).

SUI can also be treated by injecting various substances under the proximal urethra mucosa or into the bladder neck. The bulking agent can be injected via the transurethral approach or under the paraurethral mucosa to lift it and thus achieve better regulation and higher urethral closing pressure. The ideal bulking agent should be easy to inject, biologically compatible and not leak into its surroundings or cause local inflammation (28,33).

According to EUA guidelines, bulking agents should not be offered to patients who expect a long-term cure; as they only improve SUI symptoms for short periods, retreatments are necessary. NICE guidelines recommend treatment with bulking agents, but they warn of short-term treatment success and the need for repeat injections (28,31,32).

### 2.1.3 Other treatment approaches

Recently, laser treatment of SUI and its therapeutic role have been at the forefront of research. In 2019, the Canadian agency responsible for national health policy (Health Canada), as the first in the world to do so, confirmed the use of laser for SUI treatment, vulvovaginal atrophy and genitourinary syndrome of menopause (34). Despite studies (35,36,37,38) that have confirmed subjective and objective improvement of the symptoms of patients with SUI, the International Urogynaecological Association (IUGA) warns against the use of this method in everyday clinical practice due to the lack of quality evidence in the form of multicentric, randomized and

placebo-controlled studies. The therapeutic advantages of laser photothermal non-ablative treatment in urogynaecology should only be recommended when additional clinical studies show long-term success, safety and efficacy (39).

## 2.2 Treatment of urge urinary incontinence

### 2.2.1 Conservative treatment

While in many cases, treatment of SUI is surgical, the treatment of UUI is mostly conservative. Every woman with UI should first be educated about the nature of the disease, the possibilities of self-help and procedures to promote a healthy lifestyle as part of conservative management. We can partially affect the pathogenesis and symptoms of UI with lifestyle changes and advice on reducing body mass index, eliminating constipation, lowering intake of carbonated beverages and caffeine, and with advice on quitting smoking, the correct position for micturition and defecation, the correct techniques for lifting heavy weights, and recreational and sports activities (1,3,19,20,22).

As an addition to conservative approaches, treatment with magnetic stimulation could be offered to patients. Current EUA recommendations advise against treating UI or OAB with magnetic stimulation (strength of recommendation – strong). Despite this, the recent meta-analysis by Qing He et al. (40) concluded that magnetic treatment is an effective therapeutic method for patients with UI. Numerous studies (41,42,43,44,45) show improvement in UI symptoms and improvement in quality of life for individual patients. With this method, patients with UI who are perhaps not motivated to perform regular PFM strengthening

exercises can be conservatively treated. Still, Qing He concludes that further large, randomized control studies are necessary to define consistent protocols and standardize outcome measurements to generate comparable data. Longer observation periods and cost-benefit analysis are needed to confirm treatment efficacy with magnetic stimulation (40).

### 2.2.2 Pharmacological treatment

Pharmacological treatment is usually combined with bladder training and functional electrostimulation. Medication doses can be determined based on treatment success and possible side effects. These drugs are characterized by affecting the entire nervous system, and, as such, they have numerous side effects, including negative ones (46,47). For symptomatic treatment of UUI and/or OAB, antimuscarinic agents (solifenacin, oxybutynin and tolterodine) and mirabegron are used. Antimuscarinic agents work as competitive and specific antagonists of cholinergic receptors, as the bladder is innervated by parasympathetic cholinergic nerves. Acetylcholine contracts the detrusor muscle by activating the M3 muscarinic receptors, and antimuscarinic agents work as their competitive inhibitors. Mirabegron relaxes the smooth muscle of the bladder, increases the concentration of cyclic adenosine monophosphate (cAMP) in the bladder tissue and relaxes the detrusor muscle. Mirabegron improves the storage of urine by stimulating the beta-3 adrenergic receptors in the bladder (47). We can also treat UUI pharmacologically with oestrogens (because of urethral and vaginal mucosa changes due to hypoestrogenaemia in menopause), prostaglandin inhibitors and tricyclic antidepressants (5,31).



### 2.2.3 Percutaneous stimulation of the posterior tibial nerve

Percutaneous electrical stimulation of the posterior tibial nerve (PTNS) affects the inhibition of the parasympathetic nervous pathway and stimulation of the sympathetic pathway (48). This increases the bladder capacity at the first involuntary contraction of the detrusor muscle (49,50). The treatment protocol includes the percutaneous insertion of electrodes in the immediate vicinity of the nerve. Treatment consists of 30-minute weekly sessions for a total of 12 weeks. Despite promising results described in the literature, there are still insufficient clinical studies evaluating long-term treatment success. According to NICE and EUA guidelines, PTNS is used as one of the possibilities of invasive management of UUI in patients in whom conservative treatment has failed and who do not opt for treatment with botulinum toxin injections or sacral neuromodulation or have contraindications to both treatment methods (28,31,32,50).

### 2.2.4 Botulinum toxin A injections

Injection of botulinum toxin A, a powerful neurotoxin, into the bladder wall is currently recommended for patients with OAB with or without UUI and who have not responded well to conservative or pharmacological treatment. The toxin is injected into the detrusor muscle using a flexible or rigid cystoscope with local or general anaesthesia. The main side effects include urinary tract infections, incomplete bladder emptying and temporary urinary retention (28,51,52).

Due to the availability of high-quality data, most guidelines recommend the use of onabotulinum A toxin for the treatment of resistant OAB symptoms. NICE guidelines recommend a starting dose of 200 units in patients with a proven

overactive detrusor, while the EUA guidelines recommend a starting dose of 100 units. Patients should be made aware that there is a 5% risk of urinary retention following the procedure that would require occasional clean self-catheterization and repeated injections every 6–9 months, and that there is an increased risk of urinary tract infections (28,31,32).

### 2.2.5 Other forms of treatment

Surgery in patients with UUI is very rarely indicated when conservative treatment is exhausted and the UUI is very severe. Due to the intertwining of aetiological-pathogenetic factors in the formation of UUI and the lack of efficacy of surgical treatment, other forms of treatment are being tested, such as sacral neuromodulation and alternative methods of treatment (acupuncture, hypnotherapy, homeopathy) (28).

NICE guidelines currently recommend the use of sacral neuromodulation in patients who do not respond to conservative treatment, including pharmacological treatment, and are not capable of occasional clean self-catheterization (and are thus not suitable for botulinum A toxin injections). The EAU guidelines recommend the use of sacral neuromodulation as an alternative equivalent to botulinum A toxin injections in patients with UUI who do not respond to pharmacological treatment (28,31,32).

## 3 Mixed urinary incontinence

MUI is defined as the complaint of involuntary leakage of urine associated with urgency and exertion, effort, sneezing, or coughing. A different ratio of UUI and SUI is seen in every patient with MUI. We thus differentiate between urge-predominant MUI and stress-predominant MUI (5,19).

MUI is the second most common type of UI. As with other types of UI, the data on prevalence differ between studies. Its prevalence is estimated at 20–36%, and the trend is increased prevalence with age (8,9). Diagnostic investigations are similar to those for other types of UI. Treatment is adjusted according to the leading and most bothersome symptoms, either urge- or stress-related. In any case, treatment is conservative at first and surgical if the former fails (20,28,31,32).

#### 4 Conclusion

Basic management of patients with pelvic floor dysfunction is complicated as various gynaecological, medical, urological and neurological diseases affect the symptoms and signs of these disorders. A detailed urogynaecological history

together with a clinical examination is the cornerstone of our diagnostic procedure. Due to the high prevalence of these disorders in the general female population, it is crucial that all gynaecologists learn the basics of urogynaecological management during their training. Treatment should start with simple general advice –“healthy habits for a healthy bladder”. Only after conservative treatment has been exhausted do we offer the patient surgery. The goal of treatment is to improve quality of life. Therefore, when choosing treatment, especially surgical, the patient’s cooperation is important, especially a good understanding of possible failure and complications. The physician’s duty is to explain the proposed treatment to the patient and explain to the patient what MUI means.

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