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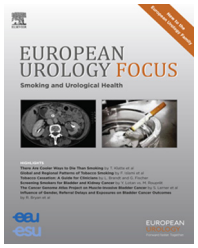

Review – Pediatric Urology

Lower Urinary Tract Terminology in Daytime Lower Urinary Tract Symptoms in Children: A View of the Pediatric Urologist

Marleen van den Heijkant, Guy Bogaert *

UZLeuven KU Leuven Department of Urology, Vlaams Brabant, Leuven, Belgium

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Abstract

Context: Epidemiological studies have demonstrated rates of lower urinary tract (LUT) symptoms in school-aged children as high as 20%. Symptoms of LUT may have significant social consequences. The diagnosis of LUT symptoms in children is mainly based on the subjective impression, and it is therefore important to translate the clinical impression into a structured LUT terminology.
Objective: To have a view, as a pediatric urologist and a urologist, of the LUT terminology proposed by the Standardization Committee of the International Children Continence Society.
Evidence acquisition: In addition to the known LUT terminology conditions that are mainly functional, we propose to add specific urological malformations due to congenital or acquired urological conditions, leading to LUT symptoms.
Evidence synthesis: In addition to the opinion-based statements and practical clinical suggestions, we have added recent literature to support the statements and suggestions.
Conclusions: LUT symptoms in children can be from a functional or an anatomical origin. As the diagnosis is often made on the basis of subjective and variable information, experience of the medical caretaker is also important to allow categorization of the condition of the child into a well-structured LUT terminology. Medical caretakers should be aware of possible evidence-based diagnostic tools and be able to follow guidelines and algorithms to come to the correct diagnosis and condition of the child to allow one to distinguish functional from congenital or acquired anatomical LUT conditions.
Patient summary: Up to 20% of school-aged children can have wetting problems. Some wetting problems can be temporary, due to the young age, stress, psychological problems, or other associated problems such as bowel dysfunction. However, some wetting problems in children are due to a condition of the kidneys, bladder, or elsewhere in the urinary tract since they were born, and should be well investigated, as in most such situations the LUT problems could be treated surgically.

* Corresponding author. UZLeuven Urologie, Herestraat 49 UZLeuven Urologie, Vlaams-Brabant, Leuven 3000, Belgium. Tel.: +32 16 34 6930; Fax: +32 16 34 6931.
E-mail address: guy.bogaert@uzleuven.be (G. Bogaert).

1. Introduction

According to the European pediatric urology guidelines and the International Children's Continence Society (ICCS), the lower urinary tract (LUT) terminology in children currently consists of four themes: daytime LUT conditions, monosymptomatic enuresis, nonmonosymptomatic enuresis, and neurogenic bladder [1,2]. We will provide a pediatric urological view on the proposed present LUT terminology in daytime LUT conditions and give an update of the latest treatment options.

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It is interesting when we look at the fact that the conditions of LUT problems in children are mainly based on the history of the child, the history of the parents, a voiding diary, and questionnaires. All these are a subjective impression of the situation and can be variable in time; however, the treatment is based on the diagnosis of the condition. Additional examinations such as uroflowmetry, ultrasound, voiding cystourethrogram (VCUG), urodynamic investigations, and cystoscopy are the typical tools that a (pediatric) urologist can use to attempt to make a correct diagnosis of the condition. However, it is known that uroflowmetry and urodynamic investigations can also vary and are influenced by circumstantial situations.

In addition to the known conditions, mostly functional problems, there are specific anatomical urological malformations due to congenital or acquired urological conditions, leading to LUT symptoms. For example, children with bladder exstrophy/epispadias will require surgery to improve urinary continence, or should we call it "dryness," in which they can void spontaneously or they require chronic clean intermittent catheterization, with and without chronic medication. There is a need for a clear definition for what is "dry" or "not dry" because this is different from being continent or incontinent. The need and proposal for a good definition of dryness in congenital malformations, such as bladder exstrophy–epispadias complex, have been proposed by several authors [3,4]. Another specific group of children with a status after posterior urethral valve (PUV) treatment, also known as the so-called "valve–bladder syndrome," requires specific definitions and terminology. Children with a congenital renal duplication and ectopic ureter will present with continuous dribbling, another condition that does not fit the known existing classification. In addition, other congenital or acquired pediatric urological malformations such as urethral pathology, meatus malformations, and even tumors of the bladder or prostate can cause LUT symptoms.

In addition, children with psychological and psychiatric comorbidity show a higher prevalence of daytime LUT conditions [5]. Their concurrent behavioral disorders will affect 30–40% of children with daytime incontinence. It is, therefore, important to include a psychological assessment in children with daytime LUT conditions [6].

2. Evidence acquisition

In addition to the known LUT terminology conditions that are mainly functional, we propose to add specific urological malformations due to congenital or acquired urological conditions, leading to LUT symptoms.

3. Evidence synthesis

3.1. *Epidemiology, etiology, and pathophysiology*

There is an increasingly reported incidence of daytime LUT conditions in children as well as an increasing number of publications on this topic [1]. This may be due to the fact that there is an increasing demand of parents and our social environment that children are "continent," meaning in full control of storage of urine and emptying at an appropriate time and place.

The ICCS updated their report on the standardization of terminology of LUT function in children and adolescents in 2016, and "daytime LUT conditions" is currently the term that should be applied to functional urinary incontinence problems in children [1]. In the update of the terminology, there is also increasing importance and a close relationship of bowel emptying issues with bladder function, and the term "bladder and bowel dysfunction" is introduced. The previously known term "dysfunctional elimination syndrome" was used for children with associated voiding and bowel dysfunction, and is connoted a particular abnormality or condition and therefore abandoned.

From a population-based survey in a cohort of Swedish twins, there is clear evidence that there is a genetic influence for susceptibility for urinary incontinence and a rather environmental influence to develop an overactive bladder (OAB) [7]. These findings have been confirmed in another large prospective study where daytime urinary incontinence as well as nocturnal enuresis were investigated [8].

In a Swedish observational study, the occurrence of bladder sensation is found from the age of 1.5 yr; however, the median age for attaining day- and nighttime "dryness" was 2,5 and 4 yr, respectively [9]. An earlier study in the USA has observed a "toilet training age" for daytime urinary control at 2.4 ± 0.6 yr [10]. In a recent PRISMA literature review on voiding pattern in healthy preterm and term infants and toddlers, it was found that when evaluating the voiding pattern in infants, normal evaluation of micturition parameters in healthy normal developing infants must be taken into consideration [11].

3.2. *Classification*

Classification of daytime LUT conditions is based on a framework, described and defined by the ICCS standardization document and dependent on the information obtained from history and diaries, therefore emphasizing on the importance of those diaries [1]:

1. Incontinence (presence or absence, and symptom frequency)
2. Voiding frequency
3. Voiding urgency
4. Voided volumes
5. Fluid intake

The possible conditions are as follows:

1. Bladder and bowel dysfunction
2. OAB
3. Voiding postponement
4. Underactive bladder
5. Dysfunctional voiding
6. Bladder outlet obstruction
7. Stress incontinence

8. Vaginal reflux
9. Giggle incontinence
10. Extraordinary daytime-only urinary frequency
11. Bladder neck dysfunction

We propose to add the following conditions based on congenital LUT malformations (Fig. 1):

1. Exstrophy–epispadias complex
2. Valve–bladder syndrome for children with congenital posterior valves
3. Meatal urethral obstruction
4. Congenital or acquired urethral stricture
5. Renal duplication with an ectopic ureter and continuous dribbling
6. Bladder or prostate tumor
7. Vesicoureteral reflux

Patients with exstrophy–epispadias complex cannot achieve normal urinary continence; however, they can acquire "dryness" by voiding or performing intermittent catheterization. The wording "dryness" requires a definition. From a literature review, it is most commonly used and therefore accepted that dryness in bladder exstrophy–epispadias complex is dryness with voiding or catheterization at 3-h intervals [3].

3.3. *Clinical presentation*

On the basis of history taking of the child and the parents, voiding diaries, and questionnaires, daytime LUT conditions can be subdivided into functional filling-phase (storage) and functional micturition-phase (emptying phase) disorders. One can imagine that the classification of a medical condition based on history taking and voiding diaries, filled out by the children or their parents, can vary based on several circumstantial situations and therefore there may be an overlap between the conditions. In addition, certain symptoms may evolve over time and be circumstantial specifically when the problems are functional. If the problem has a urological anatomical cause, the symptoms will be rather consistent.

Regarding voiding diaries, it has been studied and accepted that a 48 h (or 2 d) diary is representing the voiding and drinking habits of the child [12]. In adults, a 3-d voiding diary is still recommended by the International Consultation on Incontinence Questionnaire (ICIQ) [13].

However, analysis of daily practice has demonstrated that only a minority of patients who present with daytime LUT are routinely investigated with a voiding diary [14]. In addition, children and their parents will not always fill out such a 2-d voiding diary in a correct way so that interpretation is often difficult. The reason why paper-based voiding diaries are not filled out correctly is unknown, and several studies are now investigating if electronic data capturing by smartphones could improve the content of the voiding diaries [15].

In addition to history taking and voiding diaries, several questionnaires have emerged in the attempt to allow correct diagnosis and the eventual optimal treatment. In the recent standardization document of the ICCS, two questionnaires are recommended: the Dysfunctional Voiding Symptom Score and the pediatric Urinary Incontinence Quality of Life score [16,17]. A recent comparative study between the ICIQ-LUTS score and the Akbal questionnaire has found that both scores were consistent with the clinical impression, with a small favorable outcome for the Akbal score in consistency of the scoring [18]. In another study, the authors have investigated three validated survey instruments for measuring LUT symptoms in children, the Dysfunctional Voiding Symptom Score, the Akbal survey, and the Nelson survey [19]. All three surveys correlated with the physician impression of severity for lower urinary tract

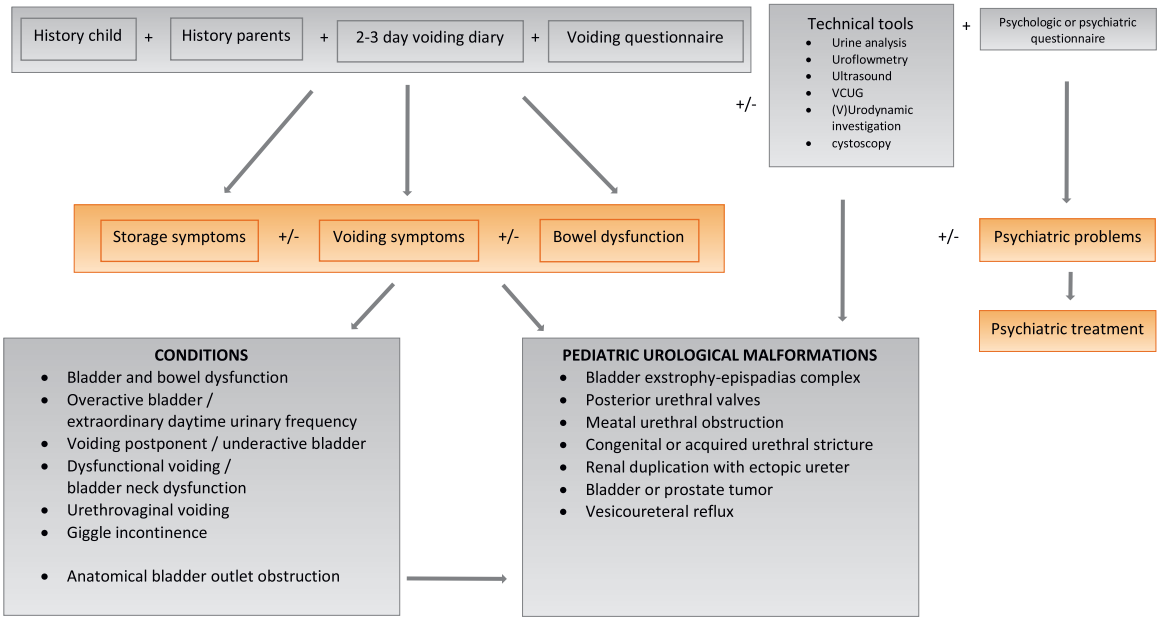

Fig. 1 – Proposed algorithm for collecting information to allow categorization of LUT in children, to address LUT associated problems and to eventual discover congenital or acquired urological malformations. VCUG = voiding cystourethrogram.

symptoms, with the Nelson survey being most accurate. The variation of the results of these comparative studies and the existence of different questionnaires demonstrate how difficult it is "to measure" LUT symptoms in children in an objective and reliable way.

Owing to the high rate of comorbidity with bowel dysfunction and possible behavioral, psychological, or psychiatric disorders, again the standardization document of the ICCS recommends the use of a brief psychological screening using the Short Screening Instrument for Psychological Problems in Enuresis [20].

Based on this information, symptoms of the child can be categorized into storage and voiding symptoms or a combination of both.

Storage symptoms can be expressed as an increased or decreased voiding frequency (<3 or >8 times a day), urinary incontinence, urgency, and nocturia [1].

Voiding symptoms can be expressed as hesitancy, straining, a weak stream, an intermittent stream, and dysuria [1].

Conditions of congenital malformations of the urinary tract, such as the bladder exstrophy–epispadias complex, renal duplication with the ectopic ureter (continuous incontinence), and the valve–bladder syndrome, can well be described using these storage and voiding symptoms.

Of course, a clinical examination of the child with specific attention to the external genitalia, and also to the clothing looking for wet spots or soiling, is extremely important. In boys, inspection of the penis should be performed to exclude meatal stenosis after circumcision or hypospadias. In girls, inspection of the introitus can reveal labial synechia [21], and the position of the urethral meatus can be assessed [22]. In addition, inspection of the presence of urine in the vagina must alert if the symptoms are those of postvoid dribbling in prepubertal obese girls or in children with continuous urine dribbling with the possibility of an ectopic ureter. Further inspection of the gluteal and anal region as well as the palpation of the sacrum is important. The grasping function of the toes is a simple tool to test an intact sacral nerve 1–3 function (Fig. 2).

3.4. *Additional technical investigations*

Urine analysis can rule out a urinary tract infection (UTI), proteinuria, calciuria, diabetes mellitus, or diabetes insipidus.

Fig. 2 – Grasping function of the toes require intact function of S1-S2-S3 and is therefore an excellent non-invasive tool for checking nerve function.

Uroflowmetry with or without electromyography (EMG) recordings "can" be useful. In daily practice, uroflowmetry without EMG is performed as it is closer to a normal situation. The parameters measured during uroflowmetry are maximal flow rate, average flow rate, flow curve shape, and voiding time. In addition, residual urine should be measured using ultrasound. Reliable information from the uroflowmetry is obtained if the voided volume is at least 50% of the average voided volume during the day and not necessarily of the bladder volume calculated for age, as a number of these children will not be able to retain such a volume. As a rule of thumb, the voiding time should be ≤20 s as this is observed in all mammals as normal [23]. It is also recommended to perform at least two measurements to assure consistency [24].

Nowadays, renal and bladder ultrasound is an extension of the clinical examination in most urological practices, as ultrasound has become a noninvasive, affordable, and easily accessible tool. Specific attention should be given to the upper urinary tract for detection of renal duplication, and possible hydronephrosis with full and empty bladder with the possibility of vesicoureteral reflux. In the LUT, measurement of postvoid residual, exclusion of an intravesical or prostatic tumor, inspection for a possible keyhole sign, measurement of bladder wall thickness, and measurement of the rectum diameter should be performed [25]. Regarding bladder wall thickness, it is somehow useful. However, there are no reliable normal or abnormal values; the bladder wall thickness varies with the bladder filling status [26].

Urodynamic or video-urodynamic investigation of a child with LUT symptoms is an invasive technical tool and should be reserved for children with classic treatment-resistant OAB voiding dysfunction [27]. In addition, a recent Cochrane analysis has concluded that urodynamic investigations in children with LUT symptoms will change clinical decision making; however, there was not enough evidence to suggest whether this would result in better clinical outcome [28].

A VCUG is also an invasive tool and stressful for the children and their families. However, it can deliver excellent images of the LUT, including the behavior of the bladder outlet, allowing further suspicion of anatomical or functional subvesical causes for the LUT symptoms of the child. We believe that, if the child and the parents are well prepared, the VCUG can be performed as an acceptable low stressful event [29].

Cystoscopy under general anesthesia is reserved for boys with the suspicion of the anatomical bladder outlet obstruction with eventual simultaneous treatment of possible PUVs, a syringocele, a congenital obstructive posterior urethral membrane (COPUM), or Moormann's ring, or for girls with continuous dribbling and the suspicion of an ectopic ureter.

In case of a suspicion of a neurogenic bladder, magnetic resonance imaging of the lumbosacral spine and medulla can exclude or demonstrate an occult neurological lesion such as tethered cord, lipoma, or other rare conditions, which can result in a neurogenic bladder.

3.5. Bladder and bowel dysfunction

Diagnosis of bowel dysfunction is another challenge in the terminology and definition of LUT problems in children. On the one hand, we know that rectal distension has its effect on bladder sensation and function [30], and on the other hand, diagnosis and awareness of bowel dysfunction are not easy to measure. The Bristol stool chart is a valuable tool for the diagnosis of and for following children during treatment [31]. The Rome III classification has the most acceptable criteria for the definition of functional constipation in children, but is not easy to use in the daily practice. Transabdominal ultrasound and measuring the rectal diameter constitute an excellent method to avoid digital rectal examination in children; however, it is an image of a moment and does not reflect the daily habits of the child [32].

3.6. Overactive bladder

The OAB condition in a child is suspected in the event of storage symptoms such as increased voiding frequency and possible nocturia, or enuresis with or without urinary incontinence. Another main symptom is urgency to void. UTIs should of course be excluded, and it can be also a symptom for an anatomical congenital pathology, such as PUVs. Children with OAB usually have detrusor overactivity and abnormal detrusor (bladder) contractions during filling, which can only be confirmed by cystometry by means of an invasive urodynamic investigation, which is not a natural situation. Children with OAB often have urgency incontinence, which is involuntary loss of urine associated with urgency and is often seen in children becoming dry during toilet training [9]. Children often show holding maneuvers to prevent micturition or leaking [5].

Owing to the a high incidence and prevalence of OAB in children, a trial with oral anticholinergic medication while registering voiding diaries is the initial step and sort of an exclusion tool in the diagnosis. In children with the suspicion of an OAB and persistent urinary incontinence and those clinically not responding to oral anticholinergic therapy, an urodynamic study can sometimes demonstrate detrusor overactivity. Specifically in boys, a bladder outlet obstruction or infravesical urethral problem should be considered and excluded [33].

3.7. Voiding postponement

Voiding postponement can be intentional, for example, children refusing to use the bathroom in an unfamiliar or a not-clean environment, or unintentional, because they prefer to continue their play or activity when they feel a voiding sensation. In addition, this can either be visual for their environment, such as standing on tiptoe, forcefully crossing the legs, or squatting with a hand or heel pressed into the perineum (Vincent's curtsy) [34], or pinching their glans to induce a bulbocavernosus reflex in boys, or be not visual.

Voiding postponement can be associated with or without incontinence, and the condition will and can be suspected from the history and representative voiding diaries. The voiding diary shows a low voiding frequency during the day, most frequently less than three times a day.

This condition is more often seen in children with psychological comorbidity or behavioral disturbances [34]. In a chronic phase, the condition can further deteriorate and cause upper urinary tract deterioration and even renal failure; this is known as the Hinman syndrome, also called the non-neurogenic neurogenic bladder dysfunction condition [35].

3.8. Underactive bladder

In this condition, children void with an increased abdominal pressure to start, maintain, or complete voiding (straining). The bladder diary may show a low frequency of voiding with a normal fluid intake, but can also show frequency in case of incomplete emptying of the bladder. Uroflowmetry usually shows an interrupted or plateau-shaped flow pattern. An invasive urodynamic study can sometimes demonstrate detrusor underactivity, but not always. In addition, a recent study has shown clearly that this patient group can have the same condition as the group of children with postponement behavior. In this study, patients, thought to have the underactive bladder condition, seemed to have their bladder "recovered" after timed voiding [36].

3.9. Dysfunctional voiding

Children with the dysfunctional voiding condition are children with a normal neurological examination of the lower limbs and symptoms of simultaneous contraction of the urethral sphincter or their pelvic floor during their detrusor contraction while voiding. The term should, therefore, be used only in neurologically normal children with this specific situation of simultaneous contraction [31]. Dysfunctional voiding is commonly associated with bowel dysfunction, and it should, therefore, be one of the key approaches to treat these patients. In girls, dysfunctional voiding is common and can be accompanied by recurrent UTIs. The first step should, therefore, be to prevent the eventual UTIs and treat the bowel dysfunction, most frequently constipation and empathic bladder training, also called urotherapy. This will most likely resolve the simultaneous contraction of the urethral sphincter or pelvic floor and detrusor within 3 mo. Only if conservative treatment fails, it is recommended to add further technical investigations such as uroflowmetry, urodynamic studies, and a VCUG. Uroflowmetry eventually combined or not combined with simultaneous EMG recording will demonstrate a staccato flow pattern, with or without interruption.

In a VCUG, a spinning top sign [37] or an arrowhead sign [38] can suspect a dysfunctional voiding condition in girls (Fig. 3A). However, it can be seen in a voiding dysfunction caused by the irritation of the indwelling transurethral catheter. If the spinning top sign or arrowhead sign is seen in boys, it can be due to either a functional dysfunction or a true anatomical bladder outlet obstruction such as PUVs (Fig. 3B).

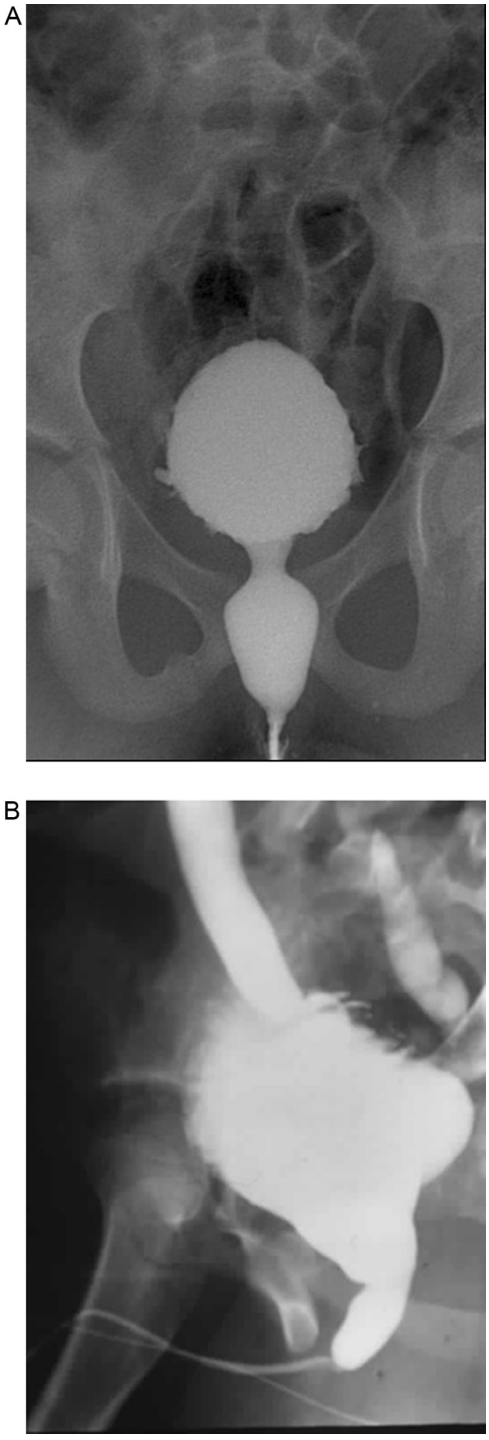

Fig. 3 – Voiding cystourethrogram showing a spinning top urethra as result of a dysfunctional voiding condition in (A) a girl and (B) urethral valves in the urethra and vesicoureteral reflux as the result of a congenital urological malformation in a boy.

3.10. Bladder outlet obstruction

The term of bladder outlet obstruction condition proposed by the ICCS Standardization Committee seems to be dual: it can be functional, such as in the dysfunctional voiding condition, or it can be a "real" anatomical obstruction. From a urological point of view, we would rather reserve the term bladder outlet obstruction condition to an anatomical subvesical obstruction. Auroflowmetry or uroflowmetry with EMG will not be able to differentiate the dysfunctional voiding condition from the real bladder outlet obstruction. Even a VCUG will not always be able to differentiate a functional from an anatomical subvesical obstruction, so in those situations, a cystoscopy under general anesthesia can reveal the exact source and level of obstruction. The possible anatomical subvesical obstruction causes can be PUVs, COPUM, Moormann's ring, a syringocele, or a congenital or acquired urethral stricture. In rare cases, meatal stenosis or urethral diverticulum can also be a cause of subvesical obstruction, but should be picked up during a thorough clinical examination.

Also extremely rare is sudden urinary retention in the event of a bladder or prostate rhabdomyosarcoma as the cause of a bladder outlet obstruction.

However, the general subjective clinical symptom in children with a bladder outlet obstruction can be a feeling of incomplete emptying; however, children with congenital anomalies can also have no subjective complaints as they have always experienced the subvesical bladder obstruction, which for them is a "normal" situation.

Girls with symptoms of dysfunctional voiding, possibly associated with recurrent UTIs or symptoms of an underactive bladder, can have an anatomic variation of the meatus. These girls will have an anteriorly deflected urinary stream, and will therefore be unable to void in a normal toilet position and present with true meatus stenosis. In a normal sitting position on the toilet, these girls will void over the rim of the toilet or wet their buttocks and legs during micturition. Surgical correction of these meatus deformities in girls is claimed to add to success rates in their dysfunctional voiding symptoms due to this bladder outlet obstruction condition [22,39].

3.11. Stress urinary incontinence

Stress incontinence is the unintentional loss of urine, most frequently during a physical activity, without a bladder muscle contraction. Stress incontinence is not related to psychological stress. Compared with the previously described conditions, it is best described as a bladder outlet insufficiency, caused by an insufficient activity of the pelvic floor or urinary sphincter. In adults, the causes for stress incontinence are clear—in women with progressive reduction of pelvic floor muscle or urinary sphincter strength, and in men after surgery of the prostate [40,41]. It is, therefore, debated if the stress incontinence condition exists in neurologically normal children. Stress-induced urge incontinence can be seen after coughing or sneezing, because coughing or sneezing can cause a sudden detrusor contraction resulting in an opening of the bladder neck, with or without urinary incontinence [40]. An interesting theory has been proposed that children with "general hypermobility of the joints" would have a lack of supportive tissue in their pelvic floor caused by an abnormal collagen composition, as in that study, the authors have found that girls with general hypermobility of the joints would have more symptoms of urinary incontinence [42].

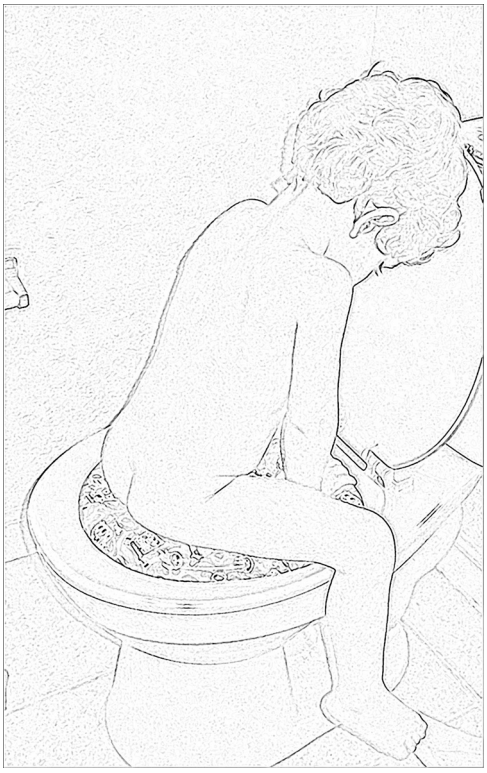

Fig. 4 – Reverse sitting on the toilet will allow girls to have their bony pelvis tilted into a correct position, their labia spread and their urethra aiming straight down, so that they will avoid "urethro-vaginal voiding".

3.12. Urethrovaginal reflux

Postvoiding involuntary urine leakage without any other voiding symptoms or urinary incontinence is often the result of urethrovaginal voiding [43,44]. Urethrovaginal voiding occurs typically in prepubertal obese girls during voiding while "hanging" in the toilet; therefore, their upper legs are squeezed together, resulting in vaginal voiding. However, it can also occur in girls with labial synechia, and this becomes obvious after a normal clinical examination of the external genitalia.

Labial synechia should be preferentially treated surgically under anesthesia because local application of estrogen or cortisone cream have insufficient success or a high recurrence rate [21].

Prepubertal obese girls should be taught to sit reverse on the toilet so that their upper legs are separated and their pelvis is tilted so that the urethral meatus is in a downward position to be able to void straight into the toilet (Fig. 4).

3.13. Giggle incontinence

Giggle incontinence is a condition where urinary incontinence occurs during laughter or a jumping activity. There is disagreement about the pathophysiology of giggle incontinence with two different hypotheses [45]. According to the first hypothesis, a detrusor contraction occurs with inappropriate bladder outlet function resulting in urinary incontinence, and this theory is based on the successful outcome after anticholinergic drug treatment or pelvic floor muscle training [46]. The second hypothesis emphasizes on the neurological cause of the cascade effect of laughter, comparing the situation with cataplexy and other central nervous system disorders, and this is mainly based on some successful treatment with methylphenidate.

Giggle incontinence is seen most frequently, but not exclusively, in girls. Giggle incontinence seems to be more frequent than thought, as it was reported to have happened in up to 25% otherwise normal women without any other voiding symptoms [47]; however, in some situations, the incontinence can become a significant social embarrassing situation resulting in impaired quality of life. Typically, some children with giggle incontinence report the occurrence of the same symptom of incontinence while performing jumping activities such as trampoline jumping. The giggle incontinence condition tends to improve or disappear during puberty; however, it can persist into adulthood.

3.14. Extraordinary daytime-only urinary frequency

This condition is proposed by the Standardization Committee of the ICCS and is defined for a toilet-trained child who has urinary frequency of small volumes of $<$50% of the expected bladder capacity according to age during the day without urinary incontinence or nocturia [1]. If this condition is suspected, based on the voiding diary, comorbidity-like polydipsia, diabetes mellitus, nephrogenic diabetes insipidus, daytime polyuria, UTI, viral syndrome, and hypercalciuria should be excluded. It seems that this condition is a problem of sensory awareness of bladder filling during the day and it can be suspected that an OAB can also play a role in the condition as the symptoms are quite comparable. In any case, the treatment will be the same as that for the OAB condition.

3.15. Bladder neck dysfunction

This term is an additional condition proposed by the Standardization Committee of the ICCS [1]. However, from the description, we believe that the condition is comparable with the symptoms described as "dysfunctional voiding" or "bladder outlet obstruction." From a urological point of view, the bladder outlet problem can be either functional or anatomically impaired.

4. Conclusions

Children can present with a high incidence of LUT symptoms. Owing to the fact that the diagnosis of the suspected condition is based on subjective and variable information, experience of the medical caretaker is an important factor to determine the diagnosis of the LUT condition. In Fig. 1, we have given a urological view on the standardization of the terminology document of the ICCS.

Author contributions: Guy Bogaert had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Bogaert, van den Heijkant.
Acquisition of data: Bogaert, van den Heijkant.
Analysis and interpretation of data: Bogaert, van den Heijkant.
Drafting of the manuscript: Bogaert, van den Heijkant.
Critical revision of the manuscript for important intellectual content: Bogaert, van den Heijkant.
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References

[1] Austin PF, Bauer SB, Bower W, et al. The standardization of terminology of lower urinary tract function in children and adolescents: update report from the Standardization Committee of the International Children's Continence Society. Neurourol Urodyn 2016;35:471–81.
[2] Tekgül S, Riedmiller H, Gerharz E, et al. Guidelines on Paediatric Urology. European Society of Paediatric Urology. 2010.
[3] Lloyd JC, Spano SM, Ross SS, Wiener JS, Routh JC. How dry is dry? A review of definitions of continence in the contemporary exstrophy/epispadias literature. J Urol 2012;188:1900–4.
[4] Capolicchio G, McLorie GA, Farhat W, Merguerian PA, Bägli DJ, Khoury AE. A population based analysis of continence outcomes and bladder exstrophy. J Urol 2001;165:2418–21.
[5] von Gontard A, Baeyens D, Van Hoecke E, Warzak WJ, Bachmann C. Psychological and psychiatric issues in urinary and fecal incontinence. J Urol 2011;185:1432–7.
[6] MacNeily AE. Should psychological assessment be a part of incontinence management in children and adolescents? J Urol 2016;195:1327–8.
[7] Wennberg A-L, Altman D, Lundholm C, et al. Genetic influences are important for most but not all lower urinary tract symptoms: a population-based survey in a cohort of adult Swedish twins. Eur Urol 2011;59:1032–8.
[8] von Gontard A, Heron J, Joinson C. Family history of nocturnal enuresis and urinary incontinence: results from a large epidemiological study. J Urol 2011;185:2303–6.
[9] Jansson U, Hanson M, Sillen U, Hellstrom A. Voiding pattern and acquisition of bladder control from birth to age 6 years—a longitudinal study. J Urol 2005;174:289–93.
[10] Bloom DA, Seeley WW, Ritchey ML, McGuire EJ. Toilet habits and continence in children: an opportunity sampling in search of normal parameters. J Urol 1993;149:1087–90.
[11] Van der Cruyssen K, De Wachter S, Van Hal G, De Win G, Van Aggelpoel T, Vermandel A. The voiding pattern in healthy pre- and term infants and toddlers: a literature review. Eur J Pediatr 2015;174:1129–42.
[12] Lopes I, Veiga ML, Braga AANM, Brasil CA, Hoffmann A, Barroso U. A two-day bladder diary for children: Is it enough? J Pediatr Urol 2015;11, 348.e1–4.
[13] Bright E, Cotterill N, Drake M, Abrams P. Developing and validating the international consultation on incontinence questionnaire bladder diary. Eur Urol 2014;66:294–300.
[14] Chapple CR. Is a voiding diary really necessary in 2014? Eur Urol 2014;66:301–2.
[15] Johnson EK, Estrada CR, Johnson KL, Nguyen HT, Rosoklija I, Nelson CP. Evaluation of a mobile voiding diary for pediatric patients with voiding dysfunction: a prospective comparative study. J Urol 2014;192:908–13.
[16] Farhat W, Bägli DJ, Capolicchio G, et al. The dysfunctional voiding scoring system: quantitative standardization of dysfunctional voiding symptoms in children. J Urol 2000;164:1011–5.
[17] Bower WF, Sit FKY, Bluyssen N, Wong EMC, Yeung CK. PinQ: a valid, reliable and reproducible quality-of-life measure in children with bladder dysfunction. J Pediatr Urol 2006;2:185–9.
[18] Goknar N, Oktem F, Demir AD, Vehapoglu A, Silay MS. Comparison of two validated voiding questionnaires and clinical impression in children with lower urinary tract symptoms: ICIQ-CLUTS versus Akbal survey. Urology 2016;94:214–7.
[19] Schneider D, Yamamoto A, Barone JG. Evaluation of consistency between physician clinical impression and 3 validated survey instruments for measuring lower urinary tract symptoms in children. J Urol 2011;186:261–5.
[20] Van Hoecke E, Baeyens D, Vanden Bossche H, Hoebeke P, Vande Walle J. Early detection of psychological problems in a population of children with enuresis: construction and validation of the short screening instrument for psychological problems in enuresis. J Urol 2007;178:2611–5.
[21] Bussen S, Eckert A, Schmidt U, Sütterlin M. Comparison of conservative and surgical therapy concepts for synechia of the labia in prepubertal girls. Geburtshilfe Frauenheilkd 2016;76:390–5.
[22] Klijn AJ, Bochove-Overgaauw D, Winkler-Seinstra PL, Dik P, de Jong TPVM. Urethral meatus deformities in girls as a factor in dysfunctional voiding. Neurourol Urodyn 2012;31:1161–4.
[23] Yang PJ, Pham J, Choo J, Hu DL. Duration of urination does not change with body size. Proc Natl Acad Sci U S A 2014;1–6.
[24] Kanematsu A, Johnin K, Yoshimura K, et al. Objective patterning of uroflowmetry curves in children with daytime and nighttime wetting. J Urol 2010;184:1674–9.
[25] Burgers R, Liem O, Canon S, et al. Effect of rectal distention on lower urinary tract function in children. J Urol 2010;184:1680–5.
[26] Leung VY, Chu WC, Yeung C, et al. Nomograms of total renal volume, urinary bladder volume and bladder wall thickness index in 3,376 children with a normal urinary tract. Pediatr Radiol 2007;37:181–8.
[27] Bauer SB, Nijman RJM, Drzewiecki BA, Sillen U, Hoebeke P. International Children's Continence Society standardization report on urodynamic studies of the lower urinary tract in children. Neurourol Urodyn 2015;34:640–7.
[28] Glazener CM, Lapitan MC. Urodynamic studies for management of urinary incontinence in children and adults (review). Cochrane Database Syst Rev 2012;1:CD003195.
[29] Thacker PG, Collins HR, Hill J. Distress experienced during pediatric VCUGs—a granular, prospective assessment using the brief behavioral distress scale. Pediatr Radiol 2016;46:660–5.
[30] Panayi DC, Khullar V, Digesu GA, Spiteri M, Hendricken C, Fernando R. Rectal distension: the effect on bladder function. Neurourol Urodyn 2011;30:344–7.
[31] Santos J Dos, Lopes RI, Koyle MA. Bladder and bowel dysfunction in children: an update on the diagnosis and treatment of a common, but underdiagnosed pediatric problem. Can Urol Assoc J 2017;11(1–2 Suppl 1):S64–72.
[32] Burgers R, de Jong TPVM, Benninga MA. Rectal examination in children: digital versus transabdominal ultrasound. J Urol 2013;190:667–72.

[33] de Jong TPVM, Kuijper CF, Chrzan R, Dik P, Klijn AJ, Vijverberg MA. Efficacy and safety of urethral de-obstruction in boys with overactive bladder complaints. J Pediatr Urol 2013;9:1072–6.
[34] Vincent SA. Postural control of urinary incontinence. The curtsy sign. Lancet (London England) 1966;2:631–2.
[35] Hinman F. Nonneurogenic neurogenic bladder (the Hinman syndrome)—15 years later. J Urol 1986;136:769–77.
[36] Van Batavia JP, Fast AM, Combs AJ, Glassberg KI. The bladder of willful infrequent voiders: underactive or underutilized? J Pediatr Urol 2014;10:517–21.
[37] Fisher OD, Forsythe WI. Micturating cysto-urethrography in the investigation of enuresis. Arch Dis Child 1954;29:460–71.
[38] Lyon RP, Tanagho EA. Distal urethral stenosis in little girls. J Urol 1965;93:379–88.
[39] Hoebeke P, Van Laecke E, Raes A, Van Gool JD, Vande Walle J. Anomalies of the external urethral meatus in girls with non-neurogenic bladder sphincter dysfunction. BJU Int 1999;83:294–8.
[40] Nitti VW, Combs AJ. Correlation of Valsalva leak point pressure with subjective degree of stress urinary incontinence in women. J Urol 1996;155:281–5.
[41] Kretschmer A, Hübner W, Sandhu JS, Bauer RM. Evaluation and management of postprostatectomy incontinence: a systematic review of current literature. Eur Urol Focus 2016;2:245–59.
[42] de Kort LMO, Verhulst JAPM, Engelbert RHH, Uiterwaal CSPM, de Jong TPVM. Lower urinary tract dysfunction in children with generalized hypermobility of joints. J Urol 2003;170:1971–4.
[43] Bernasconi M, Borsari A, Garzoni L, Siegenthaler G, Bianchetti MG, Rizzi M. Vaginal voiding: a common cause of daytime urinary leakage in girls. J Pediatr Adolesc Gynecol 2009;22:347–50.
[44] Mattsson S, Gladh G. Urethrovaginal reflux—a common cause of daytime incontinence in girls. Pediatrics 2003;111:136–9.
[45] Logan BL, Blais S. Giggle incontinence: evolution of concept and treatment. J Pediatr Urol. In press. http://dx.doi.org/10.1016/j.jpurol.2017.04.021.
[46] Chandra M, Saharia R, Shi Q, Hill V. Giggle incontinence in children: a manifestation of detrusor instability. J Urol 2002;168:2184–7, discussion 2187.
[47] Glahn BE. Giggle incontinence (enuresis risoria). A study and an aetiological hypothesis. Br J Urol 1979;51:363–6.