

## Dysfunctional voiding: Challenges of disease transition from childhood to adulthood

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### Case

A 14-year-old female presents with complaints of primary diurnal and nocturnal incontinence. Her past medical history is non-contributory apart from two afebrile urinary tract infections (UTIs) in the prior three years. Her father had primary nocturnal enuresis until 12 years of age. She reports little impact on daily activities, but confesses decreased self-esteem and embarrassment in relationships. Following medical history, focused physical exam, and voiding diary review, primary enuresis associated with overactive bladder (OAB) and mild bowel-bladder dysfunction (BBD) secondary to constipation were diagnosed. Her pediatric urologist initiated behavioural modification with aggressive constipation management. On followup, incontinence was only slightly improved with regular bowel movements and, thus, she was provided with an anticholinergic medication. After two years on anticholinergic medication, her symptoms resolved and her bladder capacity increased. The medication was then discontinued and she remained asymptomatic the following year and declined further followup.

### Introduction

Enuresis and voiding dysfunction are common referral conditions in the pediatric urology clinic.<sup>1,2</sup> According to the International Continence Society, incontinence refers to any type of involuntary leakage of urine, and dysfunctional voiding

is involuntary intermittent contractions of the striated sphincter during voiding in neurologically normal individuals.<sup>1</sup> These frequent problems in the pediatric setting have known propensity to persist, evolve, and change during adulthood.<sup>3,4</sup> Obstructive symptoms are the most frequent presentations later in life.<sup>1</sup> Little interest has been put on the transition of these patients from childhood to adult life. Recognizing the association between pediatric and adult symptoms is the first step in this difficult transitioning process.

### Background

Lower urinary tract dysfunction (LUTD) is commonly encountered in daily urological practice and represents a broad spectrum of symptoms that encompass abnormalities of both the filling and the emptying phases.<sup>5</sup> Daytime and nocturnal incontinence and recurrent urinary tract infection (UTI) are among the most challenging presentations for children of school age and their families. The clinical presentation described is more prevalent in girls than boys, with substantial improvement with time and aging.<sup>6,7</sup> There is a clear association between LUTD and syndromes such as recurrent UTI, overactive bladder (OAB), vesicoureteral reflux (VUR), detrusor-sphincter dyssynergia, and bladder and bowel dysfunction (BBD).<sup>8-10</sup> Controversy remains as to the exact nature of the association and the possible causal relationship. Strong associations exist between psychiatric comorbidity and LUTD.<sup>11</sup> LUTD symptoms are stressors that can have negative impact on the child or adult daily life and self-esteem. Conversely, psychosocial stressors can also have an impact on severity and presentation of LUTD symptoms. For example, a previously dry child can wet his bed after parental divorce, and primary enuresis persisting through teenage years can increase stress on the patient and family members.

There is no precise estimation of dysfunctional voiding prevalence in the general population; however, according to reported data, 2% of patients in general urology clinics are afflicted by dysfunctional voiding.<sup>12</sup> There are two types of adult dysfunctional voiding: primary adult dysfunction-

al voiding refers to persistent bothersome symptoms that have been present since childhood and are attributed to mal-behaviour inherited from childhood;<sup>13</sup> and secondary adult dysfunctional voiding refers to adult-onset bothersome symptoms that occur due to occult neurologic disease,<sup>14</sup> unrecognized symptoms during childhood,<sup>13</sup> hormonal etiologies (such as polycystic ovarian disease),<sup>15</sup> or sphincter spasm during voiding because of pelvic or bladder pain.<sup>16</sup>

The most common complaints associated with dysfunctional voiding include urinary hesitancy, straining, intermittent urinary flow, and weak urinary stream.<sup>1</sup> However, chronicity of disease and severity of obstruction can produce storage symptoms, including urinary frequency, urgency, and urge incontinence.<sup>3,4</sup> Interestingly, there are reports with higher prominence of irritative symptoms, such as frequency and urgency, in a subset of patients with dysfunctional voiding than obstructive symptoms.<sup>17</sup> Recurrent UTI and severe response to psychological prompts that promote urinary urgency (running water, etc.) are other symptoms that have been reported.<sup>13,18</sup> Although childhood dysfunctional voiding might improve into adolescence, frequency, nocturia, urgency, stress, and urge incontinence may increase in adulthood with or without any dysfunctional voiding.<sup>19</sup>

Urinary tract complications in long-standing dysfunctional voiding are similar to those associated with neurogenic bladder. Severe morbidity is rare, although upper urinary tract deterioration, chronic renal failure, and even suicide have been reported.<sup>13</sup> Upper urinary tract deterioration is most commonly encountered in childhood and is less likely to develop in adolescence.

## Evaluation

The basic evaluation of childhood incontinence or recurrent afebrile UTI includes complete history of symptoms and past medical history. Questioning the parents' history of diurnal and nocturnal incontinence is as important as evaluating developmental milestones of the child and his/her psychosocial history. Physical examination includes abdominal palpation for stool impaction and constipation, lumbosacral examination for dysraphism, genital examination, and screening neurological examination of the pelvis and lower extremity. Post-void residual measurement can evaluate bladder emptying. A voiding diary is often helpful with comparison to reference bladder capacity in childhood calculated using  $(\text{age} + 2) \times 30 = \text{bladder capacity in millilitres}$ .<sup>20</sup> Validated questionnaires add valuable information on severity of symptoms (Dysfunctional Voiding Score Symptom [DVSS]<sup>21</sup>), quality of life (Pediatric Urinary Incontinence Quality of Life [PIN-Q]),<sup>22</sup> and psychological health (Child Behavior Checklist [CBCL]<sup>23</sup>, Short Screening Instrument for Psychological Problems in Enuresis [SSIPPE]<sup>24</sup>), but are most often used in a research setting. Laboratory evaluation typ-

ically requires only urinalysis. Urine culture, uroflowmetry with or without urodynamic study (UDS), abdominal/pelvic ultrasound, voiding cystourethrogram (VCUG), and spinal magnetic resonance imaging (MRI) may be used, depending on clinical circumstances.

The American Urological Association (AUA) symptom score has been used to assess the severity of patients' symptoms.<sup>17</sup> Renal and bladder ultrasonography is a standard assessment in adult patients suspected of having long-lasting dysfunctional voiding.<sup>25,26</sup> Other imaging modalities, such as VCUG, are not recommended routinely in adult patients unless other conditions, such as VUR or urethral stricture are suspected.

UDS are quite invasive in childhood and are poorly predictive based on anxiety incurred during the testing process.<sup>27</sup> They are usually reserved for cases unresponsive to standard management. There is no general agreement regarding necessity of performing UDS in adults when it has been previously performed in childhood. In severe complicated cases and long-term bothersome symptoms, it seems logical to repeat the UDS, as symptoms may have evolved. Adult dysfunctional voiding can be challenging to diagnose based on clinical presentation alone, so UDS is often a useful evaluation.<sup>17</sup> The most consistent UDS findings in adults are failure of relaxation and intermittent recruitment of pelvic floor. Although classically intermittent voiding pattern is the main expected finding in dysfunctional voiding, most adult cases present with low or lower-limit normal flow, with normal or obstructive pattern of voiding.<sup>4,18</sup> Video-urodynamics is a useful evaluation to differentiate between bladder neck spasm, pelvic floor, and striated sphincter spasm, as these conditions can have the same presentation.<sup>4,18</sup>

Cystoscopy is rarely performed in childhood, as general anaesthesia is generally required. However, because of potential for missed posterior urethral valves and urethral stricture<sup>28</sup> in childhood assessment, cystoscopy is recommended in some patients with symptoms extending into adulthood. In addition, there are surgical modalities, such as bladder neck incision, that are not used during childhood that can be recommended to adults after diagnostic cystoscopy.

## Treatment

The first and most important step in both adult and childhood treatment, regardless of symptoms or age at presentation, is behavioural modification. Appropriate quantity and timing of fluid intake, voiding schedule and positioning, constipation recognition and management can improve diurnal and nocturnal symptoms without need for further treatment.<sup>17</sup> Wetting alarms for monosymptomatic nocturnal enuresis in children have been shown to be the most effective long-term therapeutic modality.<sup>29</sup> Physical therapy with biofeedback has demonstrated efficacy to improve detrusor-

sphincter dyssynergia and OAB symptoms.<sup>26</sup> Different pharmacological interventions are available for children; among them, anticholinergics are most commonly used, with alpha-adrenergic receptor antagonists and desmopressin as possible adjuncts, depending on symptoms.<sup>30</sup> B3-adrenergic agonists are new options for the treatment of OAB, with use reported in the pediatric population.<sup>31</sup> Preliminary studies on neuromodulation, tibial nerve stimulation, and sphincter or detrusor injection of botulinum toxin for children suggest efficacy and safety.<sup>30</sup> Paediatric treatment approaches commonly follow the adult strategies; however, definitive surgical interventions are rarely performed, as symptoms may improve with puberty and growth. Surgical intervention in adult treatment is rarely used and reserved for refractory cases. Interventions including sphincterotomy with or without bladder neck incision have been used historically.<sup>32</sup> In more severe cases with upper tract involvement, urinary diversion is recommended.<sup>13</sup>

An integrated approach to an adult patient with dysfunctional voiding is mandatory. Symptom alleviation and patient satisfaction are related to many coexisting issues. Succeeding in aforementioned factors depends on proper assessment of depression and anxiety, painful bladder syndromes (interstitial cystitis), pelvic floor spasm, and sexual dysfunction.<sup>3</sup> More global management, including psychological issues, is less common in the pediatric population, but psychological evaluation should be more often offered to the child and his family. Constipation and low back pain are two other common comorbidities for which treatments have been shown to be effective in decreasing voiding dissatisfaction.<sup>17</sup>

### Association of pediatric and adult symptoms

An interesting association exists between urological symptoms in childhood and presentation in adult life, suggesting possible common physiopathology and continuing process through the lifetime of an individual. This opens new perspectives on management of both children and adults and highlights the importance of aggressive treatment in childhood before chronicity develops.

Strong association has been described between adult OAB symptoms and dysfunctional voiding in children. Women with detrusor instability have commonly reported late improvement of nocturnal enuresis.<sup>33-35</sup> Similarly, a significant association between childhood urge symptoms and nocturia was found in adults with OAB symptoms.<sup>36,37</sup> The reverse association has also been described: OAB symptoms in children with adult nocturnal enuresis, urge, and urge incontinence.<sup>36,38</sup> In most of these studies, not only the presence of symptoms in childhood, but also their severity, was associated with adult presentation.

Nocturnal polyuria in children is associated with nocturia in adults.<sup>38</sup> Interestingly, late improvement of nocturnal enur-

esis was strongly associated with development of nocturia in adulthood and more often associated with OAB symptoms. Resolution of nocturnal enuresis later than 10 years old was associated with worse prognosis of adult symptoms.<sup>37</sup> Infrequent voiding and postponement of urination in childhood has been associated with adult nocturnal enuresis and female lower urinary tract symptoms (LUTS).<sup>19,36</sup> The only pediatric urinary syndrome associated with UTI in adults was the presence of UTI in childhood.<sup>38</sup>

It has long been recognized that a close relationship exists between bladder and bowel functions. This association extends from childhood to adult life. BBD in childhood is associated with adult nocturnal enuresis.<sup>36</sup> Most importantly, relatively benign conditions like constipation in childhood can evolve through time and become chronic symptoms more difficult to treat. Another proof of association in time was recently reported in patients with bladder pain syndrome (BPS).<sup>39</sup> Among adults with BPS, a subset of patients also have irritable bowel syndrome (IBS). Among those patients, association with childhood constipation, infrequent voiding, and painful voiding is significantly higher, demonstrating the constant association between those organs through life.<sup>39</sup> Although BPS is rare in kids, it can be hypothesized that long-term detrusor-sphincter dyssynergia can evolve to painful symptoms over time. Dyssynergia can also be the result of postponement manoeuvres in severe OAB to prevent incontinence. An association between childhood LUTD and adult BPS was suggested by Peters et al. Compared to asymptomatic controls, BPS patients reported significantly more dysfunctional urinary and bowel elimination symptoms in both childhood and adolescence.<sup>40</sup>

### Challenges in transitioning

Transition has been defined as the purposeful, planned movement of adolescents and young adults with chronic physical and medical conditions from child-centred to adult-oriented healthcare systems.<sup>41</sup> Transition from pediatric to adult urology presents multiple technical and disease-specific challenges.

The transfer of information is a significant problem in the context of the Canadian geographical reality. This presents a challenge of communication and file transmission. Most patients will move from an academic centre with only pediatric orientation to community centres with different realities and a wide range of pathologies treated. Moreover, family physicians are not comfortable and not well-trained to follow and treat the complex cases that need continuity of care through adulthood.

The long-term care relationship with the feeling of attachment between the patient and his/her practitioner can sometimes cause a break in transition care if not well-presented to the patient. The consequences of failed transition can be

the loss of confidence in the practitioners, decreased compliance to treatment, and lost followup.

The primary challenges to transitional care associated with enuresis and voiding dysfunction include: 1) avoidance of repeat invasive studies when transitioning from pediatric to adult care; 2) continued focus on conservative strategies to manage bowel-bladder dysfunction and chronic constipation; 3) adjustment of treatment strategy, including anticholinergic, beta-3 agonist, or bowel protocol to standardized adult dosing; 4) introduction and acceptance of physiotherapy in adult treatment, which may be less commonly used in pediatric patients; and 5) management of concomitant problems, such as voiding dysfunction (stress and urge incontinence, frequency), pelvic pain syndrome, and dyspareunia.

## Recommendations

### Psychological

In order to facilitate continuity of care, transition should be seen more as a process than a discrete event. Practitioners must introduce transition early in the long-term management, starting with explanation to the patients of the natural history of their condition. Treatment plans must include not only short-view actions, but also long-term objectives. Depending on the age of the pediatric patient, promotion of patient independence and autonomy in the treatment plan is crucial. The patient should be included in the decision process and seen as an active partner as early as his/her cognitive maturity allows. The patients should not feel that he/she is starting from the beginning with the new practitioner, as frustration may add to the fragile state of balance already obtained.

### Investigative

Although the invasiveness of cystoscopy and UDS in the adult period is much less than in childhood, these studies are not routinely completed unless clinically indicated.

### Management

The mainstay of therapy remains behavioural and medical interventions. Although physiotherapy is recommended more frequently for adults than children, biofeedback has also been reported beneficial in the pediatric population.<sup>42</sup> Surgical options are available, however, reserved for specific refractory cases, considering their possible complications (retrograde ejaculation, retention, and stress incontinence).

Specific issues need to be discussed in the transition perspective. Sexuality is a subject that many patients will feel

uncomfortable to discuss with the practitioner, especially if their parents are present, but this topic needs to be seen as a natural step in their development. In fact, girls and boys suffering from LUTD need to know about the impact of their symptoms on sexual activities and the impact of sexual activities on their symptoms. Fear may delay intimate relationships in incontinent patients, who have a much higher prevalence of sexual dysfunction than those who are continent.<sup>43</sup> Sexual relations in women are associated with recurrent UTIs that can further exacerbate or contribute to LUTS symptoms. Patients may be counselled to void before or after coitus; this easy action is unlikely to be harmful, although there is no evidence for this practice.<sup>44</sup> Sexually transmitted diseases (STDs) must be addressed not only as a public health issue, but also because they can exacerbate urinary symptoms. The appropriate methods for safe sex need to be discussed.

Fertility is less of an issue in voiding dysfunction compared to some other pediatric urology pathologies. In fact, fertility is not expected to be affected by the syndromes. However, pregnancy can cause or increase urinary tract symptoms and use of medications (such as anticholinergics) during pregnancy must be discussed. Caffeine, energy drinks, alcohol, and drug consumption may be experienced by teenagers. Patients should be informed of possible impact of those substances on bladder function. The physiologic impact of alcohol on vasopressin can lead to increased urine output, which again could exacerbate symptoms like urge, frequent urination, and incontinence. Altered cognitive functions can impact an already fragile balance of bladder control in patients with LUTD.

### Cues for proper transition process

Appropriate transition occurs when the receiving physician and the patient are well-informed. Chart summary of a long-standing caring relationship is mandatory even if it necessitates long and laborious efforts for the referring physician. The pediatric urologist should know the surrounding adult colleagues with proper training or interest in functional urology to provide proper followup of these patients. The summary, also sent to the family physician, should include initial presentation, evolution through time, investigation, previous treatments, and response of management modalities. The actual management should be well-detailed and any future steps discussed with the patients should be mentioned. This may help the patient to see transition as continuity of care and not as a frustrating new beginning.

As a primary member of the treatment team, the patient should leave the pediatric clinic with a clear plan in mind for the future and be aware of the possible resources and management available. Dialogue with the pediatric urologist should be opened for further questions during the transition

## Case followup

Our patient returns at 24 years of age with similar complaints of urinary frequency, mixed urinary incontinence, and long-standing mild dyspareunia. She is concerned that her childhood voiding symptoms have recurred. The patient is reviewed with a complete history and physical examination. A review of dietary triggers, fluid consumption, and constipation is completed. Conservative lifestyle modification is suggested, including regular stool softeners and increased dietary fiber. She is evaluated with renal and bladder ultrasound that demonstrates a persistent post-void residual elevation. Subsequent video-urodynamics demonstrates pelvic floor recruitment during the voiding cycle suggestive of dysfunctional voiding. She is referred to a pelvic floor physiotherapist for biofeedback. She returns six months later with diligent dietary change and adherence to physical therapy. Her symptoms are improved and her bothersome incontinence is eliminated.

process. If possible, the patient should be informed of the possible evolution with time and specific lifetime situations (pregnancy, alcohol use, etc.). Patients should be informed of the risks of inappropriate followup and necessity of long-term monitoring of certain treatments. Finally the patient should understand that his/her condition could be a chronic problem with ups and downs.

## Conclusion

Prevention of upper urinary tract deterioration is the main responsibility of both adult and pediatric urologists. As pediatric urologists should not hesitate in performing urodynamic evaluation and cystoscopy in refractory and progressive cases, adult urologists should not conduct them in newly transferred patient from pediatric services simply because he or she has become an adult. Behavioural, physiotherapy, and medical treatments are preferred management strategies in both adult and pediatric cases, and invasive surgical interventions are reserved only for rare, complicated situations.

Transition of care is a process that needs to be planned. Incontinence and dysfunctional voiding are included in a spectrum of presentations without straight boundaries. The symptoms usually evolve with time and aging. Urological literature shows that untreated or ignored symptoms will

likely become chronic and individuals can be affected with this bothersome condition for their entire life.

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