

Dysfunctional voiding in children

Dysfunctional voiding is a problem of the emptying phase of the bladder.

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The bladder is a storage organ, implicating that there is always urine in the bladder. The rectum, in comparison, is a transit organ, meaning that there is not continuously stool in the rectum but only in transit.

Definitions

- **Incontinence of urine** – involuntary wetting at an inappropriate time and place in a child over the age of 5 years
- **Enuresis** – incontinence while asleep
- **Normal frequency of urination** – not more than 4 - 7 times during the day and more than once at night
- **Normal bladder volume** – the normal voided volume in a child can be estimated using the formula $\text{kg} \times 7$ under the age of 2 years and $\text{age} \times 30 + 30$ ml over the age of 2 years.

Abnormalities may occur in both the storage and voiding phase of bladder emptying.

Because the bladder is a storage organ, its main function is to store urine until an appropriate time and place to empty it. Abnormalities may occur in both the storage and voiding phase of bladder emptying.

Dysfunctional voiding

According to the current International Children's Continence Society (ICCS) terminology guidelines, dysfunctional voiding is a problem of the emptying phase of the bladder and a condition where the urethral sphincter habitually contracts during voiding. This term can not be used unless uroflow measurements show curves

with a staccato pattern or unless it is verified by invasive urodynamic investigation. Dysfunctional voiding describes malfunction of the voiding phase only – not of the storage phase.¹

As it is possible for a child to have lower urinary tract symptoms (LUTS) with both storage and voiding problems, it is important to note this description.

Aetiology

The true causes of dysfunctional voiding are unknown. It is probable that the causes are multifactorial and include learned behaviour, perpetuation of infantile patterns, maturational delay and, possibly, to a lesser extent, genetic or congenital factors.² Bowel dysfunction is an inherent and indispensably important part of voiding dysfunction in children, as the genito-urinary and gastrointestinal tracts are interdependent. They share the same embryological beginnings, pelvic location, aspects of innervation and passage through the levator ani. Stool retention, with or without faecal incontinence, is therefore an important coexisting condition with dysfunctional voiding as a result of the non-relaxation of the pelvic floor musculature.

Assessment and diagnosis

Dysfunctional voiding results when an overcompensating external urethral sphincter responds to inhibit the detrusor reflex. This results in the development of a staccato flow pattern as the urine flow, caused by a detrusor contraction, decreases during a urethral sphincter or pelvic floor contraction. It can lead to incomplete emptying of the bladder,

but not in all instances. It can also lead to compensatory detrusor hypertrophy and hyperplasia, which in turn can cause a functionally small bladder capacity, increased bladder pressures and vesico-ureteric reflux.³ In some patients it can lead to detrusor decompensation and hypocontractility with an increased bladder residual.

The bladder is a storage organ, implicating that there is always urine in the bladder.

It is essential to understand that there is a relationship between bladder and bowel dysfunction.⁴ The gastrointestinal and genito-urinary tracts share the same embryological development, pelvic location, innervation and passage through the levator ani. The anal and urethral sphincters' action is also intimately interlinked. Constipation, faecal impaction and disturbances of the bowel function are directly linked to dysfunctional voiding. The management thereof is essential in the management of these children.

Assessment

A careful history is essential in assessing these children. A history of enuresis, daytime frequency and behavioural patterns, reactions to a full bladder and symptoms of constipation and urinary tract infections must be obtained. The clinical examination must include an abdominal examination, scrutiny of the external genitalia, the back, sacrum and anal area and the patient's gait and neurological status.

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Investigations include:

- A urine dipstick test/urine microscopy, culture and sensitivity (MCS)
- An ultrasound study, specifically of the bladder, to determine the bladder wall thickness, the residual urine, and the upper tract can be helpful. An accepted limit for bladder thickness is 3 mm with a full bladder and 6 mm with an empty or partially empty bladder.
- Urine flowmetry is the ideal method of assessing dysfunctional voiding as it is a non-invasive test that can easily be done in children. It assesses the voiding phase of urination, where the essential problem with dysfunctional voiding lies. The key to diagnosis is a staccato flow pattern, which can easily be seen if compared with the standard or normal bell shape urine flow (Fig. 1). Normal urination, typified by a bell flow urine pattern, is more important than a maximum flow in children. Internal sphincter electromyography (EMG) is helpful in assessing sphincter contraction during the staccato interruptions of the flow study.

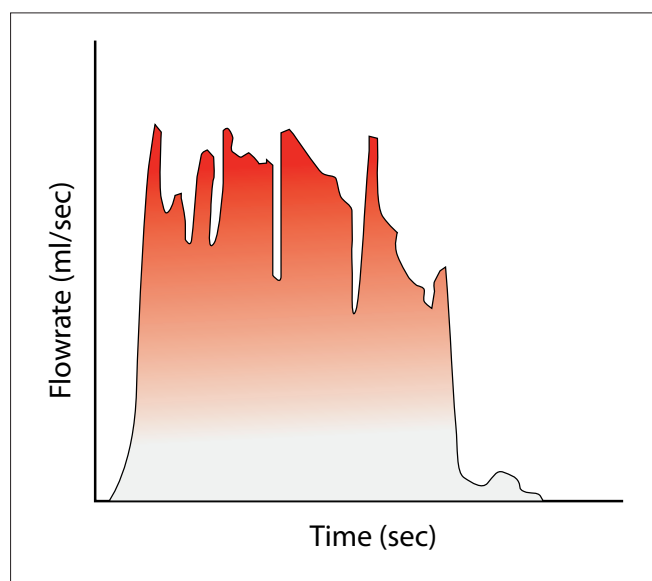


Fig. 1. Staccato flow pattern.

A formal, invasive urodynamic study is rarely necessary but may be helpful in refractory cases. A urinary cystogram is not performed routinely. It is only indicated when vesico-ureteric reflux is suspected.

Therapy for dysfunctional voiding

Non-pharmacological therapy

Urotherapy is a non-standardised term referring to non-surgical and non-pharmacological treatment of lower urinary tract dysfunction. It includes education of the child and the family about normal urinary patterns, hydration, regular optimal voiding regimens and bowel programmes and may include pelvic floor muscle awareness, biofeedback training and neuromodulation.¹ This type of treatment is done by individuals and units that are dedicated to the assessment

and treatment of children with incontinence. These include general practitioners with a special interest in this condition, paediatricians, urologists, physiotherapists, biofeedback specialists and nurses. Co-operation and participation by the whole family is essential to long-term success.

It is essential to understand that there is a relationship between bladder and bowel dysfunction.

Correction of the bowel pattern is most important. Stool frequency is determined and positioning on the toilet and guidance to assist the defecation process are carried out. Correct toilet posture and foot support, with comfortable hip abduction and a good sitting posture that enables the abdominal muscles to activate properly and undergo co-ordinated relaxation of the pelvic muscles, are necessary. Initial disimpaction and oral laxatives are often part of the long-term management.¹

Animated biofeedback is an ideal and proven way of management for these children. There are centres in South Africa that specialise in this form of management. Behavioural or psychiatric comorbidities, such as attention deficit hyperactivity disorder (ADHD), are compromising factors that may need separate attention and management by specialists in this field.⁵

Clean intermittent catheterisation (CIC) is a form of management that is essential in the child with dysfunctional voiding with a large bladder residual from an underactive bladder muscle. Detrusor underactivity shows an interrupted flow pattern on uroflow measurement with a low maximum flow rate, large voided volumes and a prolonged voiding time (Fig. 2). CIC may be used

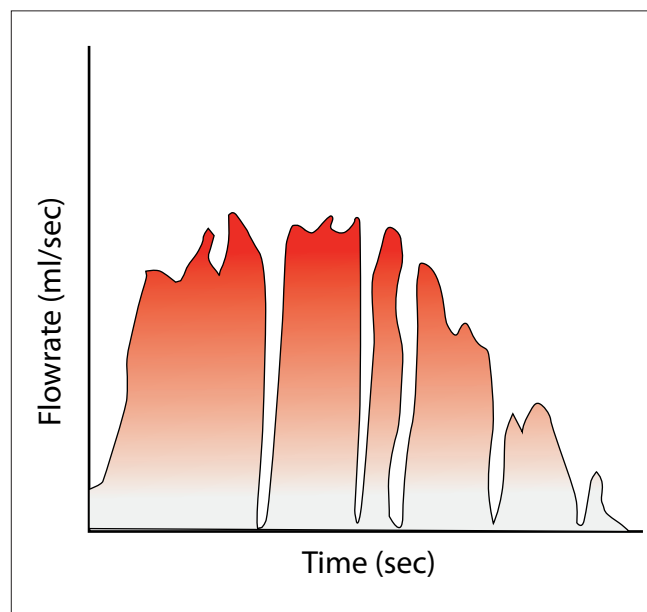


Fig. 2. Interrupted flow pattern.

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if all conservative forms of management such as double voiding, regular urination, frequency with the help of a buzzer watch and bowel regulation education have been unsuccessful. CIC is used for a minority of patients.

A urinary cystogram is not performed routinely. It is only indicated when vesico-ureteric reflux is suspected.

Pharmacological therapy

Pharmacological therapy of the bladder is aimed at two essential parts of bladder function, i.e. the detrusor muscle and the bladder outlet.

Anticholinergics, e.g. oxybutynin, are the mainstay of treatment for the overactive bladder component of the detrusor muscle and its use in children has been validated. There are ongoing phase 3 trials with new drugs.

The bladder outlet is rich in α -adrenergic receptors and stimulation of these receptors leads to bladder neck contraction and closure.

α -blockers relax the muscle outflow and are extensively used in adults. The use in children is off-label, but there are several reports of successful improvement of dysfunctional voiding and a decreased staccato pattern of urination in children. Evidence-based therapy is not available, but results with these medications are promising.⁶

Pharmacological therapy for dysfunctional voiding is an ancillary measure to improve bladder emptying, but the mainstay of therapy is non-pharmacological intervention in the form of urotherapy.

NOTE BY THE AUTHOR

The first international meeting of the International Children's Continence Society (ICCS) in South Africa was held in Cape Town on 12 - 14 February 2012. I wish to give credit to the excellent faculty present, and encourage people interested in the care of the incontinent child to join the ICCS. Information on this society can be found on www.i-c-c-s.org

References available at www.cmej.org.za

IN A NUTSHELL

- Dysfunctional voiding is an abnormality of the voiding phase of bladder function.
- Bowel and bladder function are intimately connected and both should be addressed in evaluation and management.
- Uroflowmetry is the essential diagnostic test in dysfunctional voiding, and a staccato urine flow pattern is the mainstay of diagnosis. The emphasis is on non-invasive forms of evaluation and management. Formal urodynamic study is seldom needed. It is important to realise that there can be both high and low intra-vesical pressures in children with dysfunctional voiding.
- Urotherapy, i.e. behavioural modification, is the basis of treatment, and medication is only ancillary. A team effort between medical caregivers, the family and the patient is fundamental in achieving long-term success.

SINGLE SUTURE

Autism rates surge

Claims that autism is caused by vaccines containing thiomersal have been floored by increasing rates of autism in children not exposed to the chemical.

No link has been found between autism spectrum disorder (ASD) and a mercury-containing compound known as thiomersal that is used in some vaccines. Nevertheless, since 2000, thiomersal has been phased out of most paediatric vaccines in the USA. Now a report published by the USA Centers for Disease Control and Prevention shows that, despite this, the prevalence of ASD has continued to grow.

The data, from 13 areas in the USA, reveal that in 2008, 11.4 8-year-old kids per 1 000 had an ASD compared with 6.4 per 1 000 – a 78% increase. 'Since the [latest data] came from kids who had vaccines [largely] without thiomersal, this factor plays no apparent role in the increased rates of this disorder,' says Emanuel DiCicco-Bloom of the Robert Wood Johnson Medical School in Piscataway, New Jersey, who was not involved in the study.

'Increases are likely to reflect better awareness of the condition,' says Simon Baron-Cohen, director of the Autism Research Centre in Cambridge, UK.

New Scientist, 7 April 2012:5.