CURRENT TOPIC

Detrusor instability; day and night time wetting, urinary tract infections

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Normal bladder function is the product of the complex interaction between storage and emptying. It requires a compliant bladder of adequate volume, and effective sphincter and detrusor muscles with appropriately coordinated contraction and relaxation.

Storage is facilitated by release of noradrenaline from the branches of the sympathetic nervous system stimulating contraction of the sphincters in the bladder neck and posterior urethra accompanied by relaxation of the detrusor. Bladder emptying is effected by the parasympathetic nervous system. Acetylcholine, released from the preganglionic nerves (S2–S4), stimulates contraction of the detrusor. In infancy, this is accompanied by simultaneous sphincter relaxation. Toilet training superimposes supraspinal polysynaptic reflexes on this system such that inhibition and initiation of detrusor contractions as well as sphincteric relaxation are essentially under voluntary control.

A bladder is defined as unstable if urodynamic investigation shows detrusor contractions during the filling phase while the patient is attempting to inhibit voiding. Contractions occurring as a result of a diagnosed neurological disease are ascribed to detrusor hyperreflexia; those unrelated to proven disease are caused by detrusor instability.[1]

History

The clinical presentation of a child with detrusor instability will depend on the reaction (conscious or otherwise) to the bladder attempting to empty. The characteristic history includes urinary frequency, urgency, and wetting and is seen in up 70% of patients with documented detrusor hyperactivity.[2]

Daytime wetting is the hallmark of detrusor instability and the most common reason for referral. Urinary incontinence has a strong social stigma recognised by children as the third most stressful situation in life after death of a parent and going blind.[3]

In urge syndrome, the volume of urine lost is usually very small, causing only dampness on the underwear. There may be a nocturnal component but again the volumes involved cause only moistening of the nightclothes rather than the soaking from complete bladder emptying of enuresis. The majority of children with detrusor instability display notable urgency that may be either primary, a result of the repeated contractions, or a secondary attempt to avoid incontinence by frequent emptying of the bladder. Some children report perineal or suprapubic pain.[4] In attempting to augment the sphincter function against an uncontrolled detrusor contraction young girls may adopt a characteristic posture; the Vincent's curtsey sign where they drop into a crouch/low curtsey pressing their heel into the perineum.[5] The additional length of the male sphincter affords a degree of additional protection against this problem.

The voiding patterns associated with detrusor instability are frequently abnormal. The flow may be described as staccato with periodic bursts of pelvic floor muscle contraction interrupting urine flow. Bladder emptying may not be complete. The lazy bladder syndrome is the long term result of fractionated voiding.[6] It leads to a large capacity bladder in which urge is more easily inhibited. Wetting in such children is most often caused by overflow incontinence where urine continually leaks. These children void infrequently, never report urgency, and strain using the increased abdominal pressure of a Valsalva manoeuvre to decrease urinary flow time.

In contradistinction to the patients described above, pure diurnal enuresis is a clinical entity where patients, usually boys, simply delay emptying their bladder until it becomes too late. They rarely report urgency and when wet often have complete bladder emptying. The voiding in such patients is infrequent but otherwise normal. The "laziness" is of the patient rather than the bladder.

True stress incontinence caused by incompetence of the sphincter is rare in children although patients with urge syndrome may leak when increased abdominal pressure stimulates a detrusor contraction. In giggle incontinence complete, involuntary, and uncontrollable bladder emptying occurs whilst giggling in otherwise normal children.[7]

It is essential in all patients with problems of bladder control to assess the effects of associated constipation. Faecal masses themselves may provoke the uninhibited detrusor contractions that lead to the symptoms of bladder hyperactivity.[8]

Some patients with detrusor instability are asymptomatic in terms of urgency, frequency, or incontinence. However, the ability to overcome the forceful bladder contractions by

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constriction of the sphincter is at the expense of grossly raised intravesical pressure. The relation between such abnormal voiding and urinary tract infection is now well established.[9 10] The incidence of the problem is reported as 8.4% in girls and 1.7% in boys.[11]

Recent work using natural fill cystometry has further brought into question the understanding of primary vesicoureteric reflux. Rather than relating the disorder to primary abnormalities of the vesicoureteric junction, reflux may be caused by abnormalities of detrusor contraction and secondary effects on the junction.[12 13] If this were the case management should be directed to the bladder rather than the vesicoureteric junction.[14]

The most extreme and pathologically severe form of dysfunctional voiding is Hinman syndrome (non-neurogenic, neurogenic bladder).[15] In children who are neurologically normal a clinical picture develops of gross detrusor overactivity which leads to bladder–sphincter dyssynergia and finally detrusor decompensation. If untreated this may lead to severe renal damage and even renal failure.

Examination

There should be little abnormal to find in the examination of a child with detrusor instability but it is essential to rule out a neurogenic cause of the problem. A full bladder may be palpable. Examination of the patient's back should exclude sacral and spinal anomalies, both latent and occult, as indicated by hairy patches, vascular malformations, asymmetry, pits, and lipomata. Details should be assessed of tone, power, and sensation in the lower extremities. The genitalia must be closely examined to exclude epispadias in both male and female. Anal tone and sensation must be recorded.

Investigations

The diagnosis of detrusor instability should be possible in the majority of patients by taking an adequate history and performing a complete clinical examination. It is essential to avoid unnecessary invasive investigations. Ultrasound of the upper tracts with assessment of the post-void residual urine volume is all that is required in the vast majority of children. Urinary flow studies give additional information on the nature of micturition.

Urodynamic studies are described in the literature as the investigation of choice in detrusor instability[16] but are found unpleasant and distressing by most children. This investigation should be reserved for those children with evidence of an "unsafe" bladder with large post-void residuals, dilated upper tracts, and dysfunctional voiding patterns. Full investigation of the urinary system including voiding cystourethrography to assess anatomical abnormalities of the kidneys, ureter, and bladder should then be carried out.

In patients with instability the existence and extent of vesicoureteric reflux should be ascertained. It is important to remember that the grading of reflux observed during urodynamics may vary considerably from that observed during other investigations. During filling or voiding cycles in cystography, the "spinning top" configuration of the urethra may be identified as the child with urge syndrome who contracts the pelvic floor to overcome the effects of a detrusor contraction. The proximal urethra is then dilated above the external sphincter. Some departments may combine cystography with the urodynamic study.

Techniques of urodynamics vary widely and are the subject of scientific and clinical debate. Natural flow cystometry[12 17] has allowed investigation under conditions that are considered more natural than traditional methods. The literature would suggest that there are two principal patterns that may be identified on investigation, although in reality there is a spectrum of disorder through which an individual may move as the disease process matures.[18] The fractionated flow of the lazy bladder is characterised by an irregular rather than smooth flow curve with notable sphincter activity rather than relaxation during voiding. In the urge syndrome, the detrusor contractions are seen as electrical pulses and consequent pressure changes during filling.

Treatment

As there is a spectrum of disease, so there are various modalities for treatment of detrusor instability. It is important however to consider exactly who is being treated prior to instituting therapies that have recognised side effects. It is essential that the history be obtained from the child so that one is treating the child and not the anxious or over protective parent. The slightly damp underwear of some affected children is often only of significance to their carers rather than to the patient themselves. This is particularly important in view of the side effects of the various treatments.

The basis of therapy lies in the exclusion of neurological causes, treatment of intercurrent infection and (re-)institution of structured voiding patterns. It is essential that coexistent constipation be corrected.[19] The additional value of antibiotic prophylaxis is well supported,[20] particularly as it may be that urosepsis causes inflammation and hence irritability of the detrusor. Long term use of anticholinergic preparations such as oxybutynin has been shown to be of benefit, particularly in children with the urge syndrome.[21] It has also been shown to alter the urodynamics of vesicoureteric reflux.[22 23] Side effects such as blurring of vision, headaches, abdominal cramps, and diarrhoea have limited its use even after local instillation. The effect of placebo in this type of disorder is however recognised.[24] There are hopes that the antimuscarinic side effects will be reduced with the newer agent tolterodine that is at present undergoing phase II trials.[25 26]

Some good results have been reported with the use of biofeedback techniques incorporating pre- and post-micturition ultrasound, electromyography, and video-urodynamics.[18] These are limited by the age and ability of the child involved.[27 28] Children with urge syndrome are taught techniques to identify and suppress the initial detrusor contractions while

those with lazy bladder syndrome must learn to identify the contractions of the voiding detrusor and relax the pelvic floor.

Those children whose symptoms and complications of detrusor instability are not improved by conventional methods may benefit from clean intermittent catheterisation (CIC). This is required therapy in children with Hinman syndrome but must be accompanied by some form of behavioural modification, with or without psychotherapy.[29 30]

Summary

Detrusor instability is a pathological entity in which uninitiated contractions of the detrusor muscle occur. The principal symptoms are wetting and recurrent urinary tract infection. It is essential to exclude by examination and investigation any underlying neurological cause for the condition. Management is dictated by the severity of the condition but may include antibiotic chemoprophylaxis, structured voiding regimes, antimuscarinic agents, or intermittent catheterisation. There is recognised morbidity when the problem is severe and thus should not be dismissed lightly. The role of detrusor instability in vesicoureteric reflux remains to be fully elucidated.

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