

## VOIDING DYSFUNCTION IN CHILDHOOD

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### ABSTRACT

**Objectives:** Voiding dysfunction (VD) in children with no neurological disease can be related to the delayed maturation of the voiding reflex. The purpose of this work was to assess the clinical and radiological finds and the impact of the treatment on the VD in childhood.

**Design:** Fifty-seven children (aged 5 to 12 years) with VD were submitted to urinalysis, urine culture, creatinine, plain film (lumbosacral spine), renal ultrasonography, voiding cystourethrogram (VCUG) and urodynamic study (UD). Oxybutynin chloride (OC) or dicyclomine hydrochloride (DHCl) were used if indicated.

**Results:** Symptoms such as nocturnal enuresis (88%), urgency with urinary incontinence (84%), daytime urinary incontinence (61%) and intestinal constipation (51%) were common. Twenty-eight patients (49%) had recurrent urinary tract infection (UTI). Detrusor instability occurred in 62% of the 21 patients who performed UD. Thirty-six children underwent pharmacological treatment, 24 (67%) used OC and 12 (33%) used DHCl. Improvement or resolution of symptoms were obtained in 94% of those taking OC and in 67% of those with DHCl ( $p < 0.05$ ).

**Conclusion:** In cases of VD we can establish pharmacological treatment based on clinical and laboratorial findings. However, when this was not successful or in those with recurrent UTI, the performance of UD, VCUG and ultrasonography (US) are imperative.

**Key words:** bladder, unstable bladder, oxybutynin, enuresis, infancy

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### INTRODUCTION

Voiding dysfunction occurs in children neurologically normal (1,2) and can be related to the delayed maturation of the voiding reflex (1,3) Yeung et al. (4) studied newborn babies through continuous urodynamic examination and found detrusor instability in 5% of cases while 50% presented with vesico-sphincteric dyssynergia. This called in question a phase denominated as autonomic bladder, which characterizes normal neurological maturation of the voiding control in a child (3,5). The etiology of the voiding dysfunction is still unknown and its incidence may vary from 2 to 25% of children in toilet training (6-8). Frequency, urgency and enuresis (3,9-11) are the main symptoms of the voiding

dysfunction. Approximately 50% of urinary infection cases are related to detrusor instability (11) and 34% to vesicoureteral reflux (VUR) (11). Occult spina bifida (7) may occur in 38% of cases of voiding dysfunction. The value of this finding, though, is still controversial (12). VUR and urinary infection may cease successfully after voiding dysfunction treatment.

The aim of this study is to analyze clinical, radiological and treatment aspects of voiding dysfunction in childhood.

### METHODS

Fifty-seven patients with voiding dysfunction were studied between June 1992 and De-

ember 1996. There were 36 girls (63%) and 21 boys (37%), ranging in age from 5 to 12 years old (average 8 years old).

The evaluation included clinical history, physical and laboratory examination (urinalysis, urine culture, serum urea and creatinine), lumbosacral spine radiography, VCUG, abdominal US and urodynamic examination. Either oxybutynin chloride (dose of 0.3 to 0.7 mg/kg taken orally, every 12 hours) or dicyclomine hydrochloride (dose of 0.5 mg/kg/ taken orally, once a day) were used in pharmacological treatment of vesical dysfunction. The results were considered good for resolution of the symptoms and moderate for cases of improvement. The results of the pharmacological treatment were analyzed by means of the  $X^2$  (chi-square) test.

## RESULTS

Symptoms such as nocturnal enuresis (88%), urgency with urinary incontinence (84%), daytime urinary incontinence (61%) and intestinal constipation (51%) were common. Neurological examination was normal in all patients.

Of the 28 patients (49%) with recurrent UTI, 17 (26%) presented signs of pyelonephritis. The urinary tract was evaluated by means of ultrasonography in 38 children (67%) whereas 50 children (87%) underwent VCUG. The main radiological findings were "spinning top" deformity in 22% (11 out of 50), vesicoureteral reflux in 28% (14 out of 50), bladder trabeculation in 16% (8 out of 50). Occult spina bifida was found in 9 cases (16%). Uninhibited contractions were found in 13 (62%) of the 21 patients (37%) who performed urodynamic study. Of the 36 (63%) children who underwent pharmacological treatment, 24 (67%) used OC and 12 (33%) used DHCl during 26 months (5-60 months) on average. Either considerable improvement or resolution of symptoms were observed in 23 children (94%) taking OC, in contrast with 67% of the cases treated with DHCl, with statistically significant difference ( $p < 0.05$ ).

## DISCUSSION

Detrusor instability is a benign condition, which occurs, in neurologically normal children. It is mainly characterized by the presence of nocturnal enuresis and urgency with incontinence, in addition to frequency and daytime urinary incontinence. Some cases may be asymptomatic (9).

In our study, nocturnal enuresis (88%), followed by urge incontinence (84%), was observed as the main symptoms. According to the literature, the incidence of enuresis is around 40% whereas urgency with incontinence varies from 17% to 40% (20,23). Persson-Jünemann et al. (18) observed detrusor instability in 68% of cases of nocturnal enuresis. Sixty-two percent of children showed uninhibited contractions (detrusor pressure  $> 15$  cm of  $H_2O$ ) in the urodynamic study. The literature, though, reports a variation from 31% to 52% of cases (20,21,23). Therefore, if one takes into consideration the urodynamic examination alone in order to confirm the diagnosis of instability, 38% to 69% of patients would not present such diagnosis as they did not show uninhibited contractions. We believe that the introduction of pharmacological treatment to the vesical dysfunction may be based on clinical symptomatology and laboratorial findings, reserving the urodynamic study either to those cases on which the treatment was not successful or to those with functional alteration of the urinary tract.

The incidence of UTI observed in our cohort of patients (49%) is similar to the one presented in the literature, varying from 36% to 50% of cases with voiding dysfunction (20,23).

The VCUG performed in 87% of patients detected VUR in 28%, "spinning top" deformity (radiographic image of dyssynergic contraction of the external sphincter in a girl with an unstable bladder) (9) in 22%, and bladder trabeculation in 16%. Aubert (3) considers the irregularity of the vesical wall as radiological lesion specific to the voiding dysfunction. The probable cause for this vesical alteration could be the increase of intravesical pressure produced by the vesico-sphincteric dyssynergia (3,20), which is one of the possible etiological

factors, responsible for the manifestation of VUR (13). The vesical hyperpressure regime could cause wall bladder ischaemia, decreasing the protective factor of the vesical mucosa. This factor along with the urine flow inversion in the urethra could perpetuate urinary infection (4).

The literature reports that the incidence of “spinning top” deformity is 68% in cases of vesical immaturity, which is a higher percentage when compared to our series. VUR could be associated with detrusor instability in 30% to 47% of the cases (6,20). Surgical treatment in patients with vesicoureteral reflux and detrusor instability shows poor results (9). An effective clinical treatment of detrusor instability might lead to the resolution of 20% to 30% of cases of VUR (9,11).

Intestinal constipation is often associated with vesical dysfunction and UTI. Since it seems that fecal accumulation induces uninhibited detrusor contractions, the treatment of constipation by dietary manipulation, stool softeners and laxatives are indicated (10).

Occult spina bifida was radiologically detected in 16% of cases. These results are lower than those reported in the literature (38%) (19). However, the meaning of this finding is not clear. Ritchey et al. (19) proclaim a conventional treatment for such cases and only recommend surgery when a neurological lesion and occult spina bifida occur simultaneously to tethered cord.

The urodynamic study was performed in 37% (21/57); only 62% (13/21) presented with detrusor instability and none of the cases presented with vesico-sphincteric dyssynergia. Szabó and Borbás (20) observed expressive indication of detrusor instability in 40% of urodynamic studies. These data suggest that urodynamic studies should be reserved to the cases resistant to clinical treatment or to those presenting alterations in the lower urinary tract (bladder trabeculation and VUR). Significant loss of compliance (17) may occur in severe vesico-sphincteric dyssynergia, causing VUR and renal scarring, which characterizes Hinman’s syndrome (10,14). Prolonged sphincteric hypertony may cause vesical atony, “lazy bladder” (10,14).

In our series we observed that significantly better results were obtained when OC (94%) was used instead of DHCl (67%). In the literature, different authors describe similar results varying from 78 to 90% success (3,23) when using OC. Malone-Lee et al. (15) suggest the use of OC, regardless of age, beginning with 2.5 mg twice a day, despite the fact that the half life of the drug lasts 3 hours, which would suggest the necessity of a larger fractionation and therefore its disadvantages. In our experience, satisfactory results were obtained, beginning with 0.3 mg/kg/day, twice a day and increasing them gradually, if necessary, until the effective dose was reached. Side effects of the drug (constipation, dry mouth, mood change, heat intolerance) might occur but can be reversed when the medication is discontinued or the dosage is decreased. In cases resistant to the pharmacological treatment, Mauroy et al. (16) suggest the use of electrical therapy and reports 90% of efficacy. The use of intravesical oxybutynin is limited to cases of vesical neurogenic dysfunction in intermittent catheterization regime, either because oxybutynin is orally ineffective or because of its side effects (2).

In cases where the obstruction may cause detrusor instability in boys, infravesical obstruction should be ruled out. Maximum flow rate and ultrasound may be used (postvoid residual urine volume and bladder wall thickness). Amaro et al. (1), studying 167 normal male children, observed that maximum flow rate is 15 ml/s until the pre-adolescence on average, and after that it is similar to the urinary flow of an adult (20 ml/s). In this way, having established a parameter of normality of the urinary stream, one can, together with the information from the ultrasound, avoid the manipulation of these children with urodynamics, ruling out a possible infravesical obstruction (1).

Therefore, in cases of voiding dysfunction with no complicating factors, we can establish the pharmacological treatment based on clinical symptoms and laboratorial findings. However, in cases on which the pharmacological treatment was not successful, or in those presenting with recurrent urinary tract infection, the performance of urodynamic

study, cystourethrography and ultrasound are imperative.

Vesical dysfunction is a condition that can lead to serious psychological damage. Also, its association with recurrent urinary infections and vesicoureteral reflux may be harmful to the urinary tract. Thus, its early recognition and treatment may promote resolution of symptoms and will prevent long term complications.

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