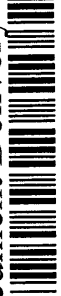


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CONSTIPATION: A CAUSE OF ENURESIS, URINARY TRACT INFECTION AND VESICO-URETERAL REFLUX IN CHILDREN

S. O'Regan and S. Yazbeck. Pediatrics and Surgery Department, Nephrology Division, Université de Montréal, Centre de Recherche Pédiatrique, Hôpital Sainte-Justine, 3175 Chemin Sainte-Catherine, Montreal, Quebec, Canada H3T 1C5. (reprint requests to SOR)

ABSTRACT

The observation that constipation alone may induce uninhibited bladder contractions in children and is associated with recurrent urinary tract infection in childhood suggests an etiologic association (1). Rectal distension due to faecal retention in chronic functional constipation causes bladder distortion (2) and may cause stimulation of detrusor stretch receptors resulting in detrusor peroneal dyssynergism. Distortion of the trigonal area may result in failure of ureteral valve competence and allow for vesico-ureteric reflux.

INTRODUCTION

The causes of recurrent urinary tract infection, enuresis and vesico-ureteric reflux in the absence of anatomic abnormality are unknown. Studies investigating recurrent urinary tract infection in children in the absence of radio-urologic abnormalities have concentrated on the identification of particular characteristics of infecting bacteria resulting in urinary tract infection such as pill formation and host bladder wall receptors (3). The latter postulate infers that urinary tract infection is caused by infecting organism characteristics suggesting that it may be an infectious disease. This is not so. Enuresis has been attributed to abnormalities of neural control of bladder function (4) and has been treated with alarm systems (5) or with systemically acting drugs such as Imipramine and Vasopressin to decrease urinary output (7), none with a satisfactory result. Vesico-ureteric reflux in children has been attributed to abnormalities of ureteric insertion of the ureter into the bladder wall (8). However, the observations that reflux spontaneously resolves suggests that previous congenital anatomic abnormalities spontaneously resolve, an unlikely proposition (9).

Recurrent urinary tract infection in children

Recurrent urinary tract infection in children as shown by epidemiologic studies has an incidence of up to 3% in North American children (10).

Treatment usually consists of antibiotic therapy of infectious episodes or chronic prophylactic therapy. Urinary tract infection usually resolves at the end of the first decade or beginning of the second decade of life. In 1967, Shofpner et al. studying bladder and ureteral distortion due to constipation in 36 children noted that 3 of them had recurrent urinary tract infection (2). Neumann et al. noted the frequency of abnormal bowel habits, specifically constipation, in association with urinary tract infection in children and noted a high incidence of resolution of recurrent urinary tract infection with treatment of the constipation (11).

In a study of 47 children (1) it was noted, utilizing urodynamic and rectal manometric studies, that constipation was a constant associated condition. Constipation was measured not subjectively but objectively by measuring rectal ampulla capacity and rectal sphincter response to air balloon insufflation thus providing a measurement of constipation not subject to observer bias. Fifty percent of the mothers denied constipation as a symptom though questioning the individual children indicated defecation episodes of 2 to 3 times per week in the majority of cases. Aggressive treatment of the constipation resulted in resolution of all the recurrent urinary tract infections and also of associated enuresis in 67% of those who had it. These studies indicated the association of constipation with urinary tract infection.

A retrospective study of the incidence of urinary tract infection in Hirschsprung's disease (12), a constipating congenital abnormality of the large bowel, indicated an incidence greater than that normally observed in infancy. The study suggests that constipation may contribute to the development of recurrent urinary tract infection in children. The fact that the rectum may be abnormal in these children, substantiates the studies of Bailey et al. (13) who demonstrated abnormal anal electromyography in 57% of children with urinary tract infection.

Three possibilities exist as to how constipation may be associated with urinary tract infection:

- a) the presence of recurrent urinary tract infection may allow for the development of constipation;
- b) the presence of uninhabitable bladder contractions against a closed ureteral sphincter would lead to intermittent urinary wetting. Efforts to maintain continence would lead to ureteral and simultaneous anal sphincter contractions resulting in constipation;
- c) the presence of constipation with a faecal reservoir would compress the bladder causing stimulation of stretch receptors resulting in uninhibited bladder contractions. Detrusor contraction would force urine down into the urethra against the closed external sphincter resulting in reflux of urine contaminated with bacteria back up from the urethra resulting in bladder infection;
- d) chronic constipation is associated with external anal sphincter contractions (voluntary or reflex). This leads to simultaneous bladder external sphincter contraction leading to failure of normal development of detrusor contraction/peroneal relaxation synergism.

### Constipation and enuresis

Urodynamic studies in children with constipation in the absence of other symptomatology demonstrated uninhibited bladder contractions (1). Further studies in children with enuresis also demonstrated uninhibited bladder contractions with decreased bladder capacity as seen in children with recurrent urinary tract infection (1). Aggressive treatment of constipation in boys and girls with enuresis resulted in resolution of their enuresis. A decrease in bladder capacity is noted in enuretics (14) and may be due to bladder compression by the rectum. Shopfner (2) noted that 54% of 36 patients with constipation were enuretic. It was also noted by Bailey et al. (13) that 55% of the children with enuresis had abnormal anal electromyography substantiating the postulate indicating that constipation is an etiologic factor.

### Vesico-ureteric reflux and constipation

Several series of children with Hirschsprung's disease have shown mega-ureter with dilatation of the genito-urinary tract (15,16,17). Kottmeir et al. noted a similar incidence of this phenomenon in children with functional constipation (17). Also constipation has been observed to cause hydronephrosis (18,19). Surgical resolution of Hirschsprung's disease may result in return to normal of the uretero-calycial dilatation (20). Since innervation of the bladder in Hirschsprung's disease is normal (21), a similar neuro-etiology for bladder and ureteric dilatation is not tenable. Children with vesico-ureteric reflux in the absence of anatomic abnormalities have uninhibited bladder contractions with dysfunctional voiding patterns (22). Treatment with cholinergic drugs such as Oxybutyrin may result in a decrease in the degree or resolution of the reflux by depressing uninhibited bladder contractions (22). Our observation that children with vesico-ureteric reflux are commonly constipated suggested to us that a spectrum of abnormalities of recurrent urinary tract infection, enuresis and vesico-ureteric reflux all of which are associated with uninhibited bladder contractions in childhood may be secondary to bladder distortion by chronic functional constipation. Since aggressive treatment of constipation results in resolution of enuresis, and recurrent urinary tract infection, with resolution of non inhibited bladder contractions, we propose that vesico-ureteric reflux on which volumes have been written (20) may be caused by chronic constipation.

The constipation may be undetected because:

- a) physician does not inquire;
- b) the mother is unaware since she will not document bowel motions in children when it is not a primary complaint;
- c) because its presence may be over shadowed by symptomatology from recurrent urinary tract infection or psychologic trauma produced by enuresis;
- d) because of bowel preparation prior to radiologic investigation.

The cumulative evidence may be summarized as follows:

- 1) Uninhibited bladder contractions are common to enuresis, recurrent urinary tract infection and vesico-ureteral reflux.

- 2) Constipation is associated with recurrent urinary tract infection in children. Treatment of constipation results in resolution of infection.
- 3) Constipation is associated with obstructive uropathy and reflux in children with Hirschsprung's disease and functional megacolon. Urinary tract infection is increased in Hirschsprung's disease with or without obstructive uropathy. Treatment of the constipation results in resolution of urinary tract dilatation.
- 4) Enuresis and decreased bladder capacity is associated with constipation.
- 5) Posterior bladder wall distortion may be caused by constipation.
- 6) Constipation may be the common etiologic factor causing bladder distortion and uninhibited detrusor contraction resulting in enuresis, recurrent urinary tract infection and vesico-ureteral reflux.

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