

Wake Forest University School of Medicine

Document Delivery



ILLiad TN: 504296

Journal Title: Clinical nephrology

Volume: 23

Issue: 3

Month/Year: 1985

Pages: 152-154

Article Author: O'Regan, S

Article Title: Constipation, bladder instability,
urinary tract infection syndrome

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Constipation, bladder instability, urinary tract infection syndrome

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Abstract. Forty-seven children with recurrent urinary tract infection were noted to have large fecal reservoirs by rectal examination and rectal manometry. Constipation was accompanied in the majority by enuresis and/or encopresis. Urodynamic studies indicated uninhibited bladder contractions. Aggressive treatment of the constipation resulted in cessation of infection in 44 patients, enuresis in 22 of 32 patients and encopresis in 20 of 21 patients and an improvement in bladder function with cessation of all other forms of treatment.

Key words: urinary tract infection - constipation - bladder contractions

Introduction

Recent studies have indicated that some children may have urodynamic abnormalities associated with recurrent urinary tract infections in the absence of radiologic abnormalities of the urinary tract [Allen and Bright 1978, Firlit et al. 1978, Smey et al. 1978]. It has been indicated in one study that abnormal bowel habits as determined by parental response to questioning may be observed in some patients with urinary tract infection [Neumann et al. 1973]. Distortion of the urinary tract system associated with constipation, though in the absence of urinary tract infection has also been reported [Shopfner 1968]. Also anal electromyography has been reported as abnormal in 57% of children with urinary tract infection [Bailey et al. 1970]. We describe the association of constipation, commonly unrecognized, with uninhibited bladder contractions as determined by urodynamic studies in children with symptomatic urinary tract infection without radiologic evidence of anatomic abnormality.

Patients and methods

The identification of several children investigated for recurrent urinary tract infection who had uninhibited bladder contractions and functional constipation, all of whom had large fecal reservoirs as determined by rectal examination and rectal manometry,

led to the investigation of 47 patients who had no evidence of radiologic abnormality but had a similar pattern of abnormal bladder contractility and recurrent urinary tract infection. All were girls, with a mean age of 8.2 ± 2.53 years (1 SD) and a mean duration of symptoms of 3.7 ± 2.28 years (1 SD). Mean age of onset of first urinary tract infection was 4.6 ± 2.26 years. Close questioning of the parents of several children did disclose elements suggesting the presence of chronic constipation. However, in 21 cases, constipation was denied as a symptom. All patients had been referred for assessment because of culture proven recurrent urinary tract infection with (32 patients) or without (15 patients) enuresis. Twenty one patients had mild encopresis. Radiologic investigation in all had been negative. Three patients had an anterior anus as determined by a decreased distance between the anal orifice and the vestibule. Because of the identification of the typical urodynamic tracings of an unstable bladder, later patients underwent directly rectal manometry in the absence of a history of constipation or encopresis. All patients had normal renal function as determined by normal plasma creatinine levels.

Urodynamic studies were performed using a DISA 2100 Urosystem

The patient was placed in a lithotomy position. After disinfection and draping, a 7-F single microtip transducer catheter was passed into the bladder per urethram and the bladder was filled. A balloon filled with water was placed in the rectum to register intra-abdominal pressure variations. Circular surface electrodes were placed on each side of the anus, and were used for perineal electromyography.

Received September 2, 1984, in revised form October 11, 1984.

Reprint requests to Dr. Sean O'Regan.

This paper was supported by a grant from the Hospital for Sick Children Foundation.

The child was seated on a flowmeter chair and data were recorded on a six channel recorder. The recorder noted simultaneously the total bladder pressure, the intra-abdominal (rectal) pressure and the intrinsic bladder pressure, obtained by the subtraction of the rectal pressure from the total bladder pressure. The bladder was filled with NaCl 0.9% at room temperature and 2 to 3 complete voiding cycles were registered on each child.

Bladder instability was considered present if at least one of these elements was identified:

1. The presence of uninhibited contractions of the detrusor during the filling phase of the bladder with an amplitude equal or greater than 15 cm H₂O.
2. The occurrence of detrusor contraction at the end of or after urinary flow.

Rectal manometry performed as follows

Rectal manometric studies were done using a Beckman 710 recorder with a Shuster air filled balloon system [Menuier et al. 1967]. We noted the smallest inflation volume perceived by the patient, the volume at which relaxation of the internal sphincter occurred and the maximal inflation volume that was tolerated by the patient without pain or discomfort.

Functional constipation was deemed present when the following elements were noted:

1. Decreased perception and increased tolerance in response to large volume stimulation by the rectal balloon.
2. The presence of a normal rectal-anal reflux.

Twelve patients had been treated with oxybutyryn chloride (Ditropan) to inhibit abnormal bladder contractions without satisfactory response. All these patients with functional constipation were treated with a phosphate-soda enema (Fleets) once a day for one month and once every other day for the 2nd month to maintain the dilated rectum empty and prevent re-accumulation while awaiting the return to a normal rectal tone. All other forms of treatment were stopped [oxybutyryn chloride (Ditropan, antibiotics)] when the enema treatment was initiated.

Results

A consistent pattern of uninhibited bladder contractions was observed in all patients studied, consisting of detrusor contraction during the filling phase of the bladder with an amplitude equal or greater than 15 cm H₂O or the presence of detrusor contraction at the end of or after urinary flow [Allen and Bright 1978, Firlit et al. 1978].

Though sensation under normal circumstances can be determined when the balloon of the rectal

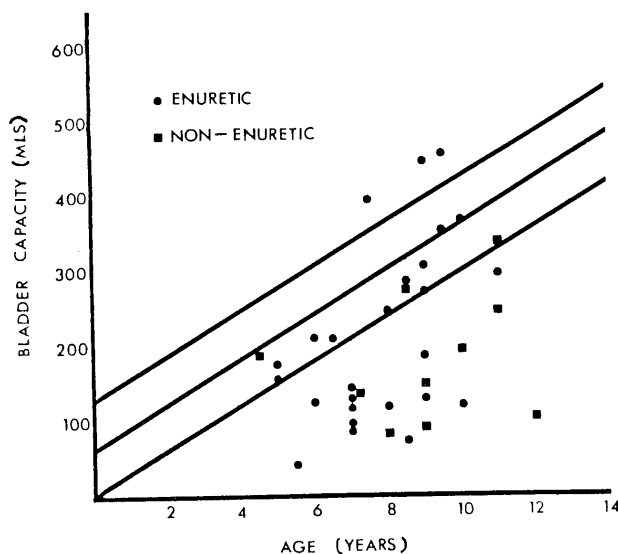


Fig. 1 Bladder capacity in 36 children with urinary tract infection and constipation. Upper and lower lines indicate 95% confidence limits [Berger et al. 1983].

manometer is inflated with 5 ml to 10 ml of air the majority of these children had poor perception of rectal distension until at least 40 ml had been instilled into the balloon. All patients could tolerate balloon distension of 80 to 110 ml (maximal balloon insufflation volume; 110 ml, 6.7 cm diameter) without experiencing any discomfort. A majority of patients had a decrease in urinary bladder capacity. Three patients were noted to have an anterior anus.

Dramatic improvement was evident in all patients who followed the enema regimen. At follow-up clinic visits during which cultures were done only 3 patients had further episodes of urinary tract infection after initiation of treatment. At follow-up, constipation persisted in 2 patients. Enuresis ceased in 22 patients and improved (1 night/wk to month) in 7. Encopresis resolved in 20 patients. Two of 3 patients who did not respond completely were noted to have refused to follow the enema regimen appropriately. At follow-up of 17 to 9 months (mean 12 ± 2), elimination of constipation resulted in dramatic symptomatic and psychologic improvement in 44 patients. In 12 patients in whom follow-up urodynamic studies were done, normal bladder function as determined by urodynamic studies has been attained. Control rectal manometry was performed in some patients and showed perception to lower volumes of balloon insufflation.

Discussion

Functional constipation has been associated with radiologic distortion of the urinary system in the presence and absence of urinary tract infection

[Neumann et al. 1973, Shopfner 1968]. We describe the association of rectal reservoirs of feces and uninhibited bladder contractions with enuresis, encopresis and recurrent urinary tract infection. In many of the patients studied there was no prior history or a history of constipation was denied. Normal bowel habits were perceived by patients and parents even in the presence of proven rectal reservoirs of feces by rectal examination and rectal manometry and on occasion even with encopresis. Close questioning however, indicated that patients had been toilet-trained very early in childhood and either had large infrequent stools or incomplete evacuation as determined by rectal examination after defecation. Elimination of constipation resulted in dramatic symptomatic improvement with cessation of urinary tract infection and enuresis even in the presence of some continuing abnormal bladder contractility.

Uninhibited bladder contraction is typical of that seen in infancy before full maturation of cortico-spinal control of bladder activity is achieved [Smey et al. 1978]. It is possible that the presence of abnormal contractions is indicative of arrest in the development of normal detrusor peroneal synergism, possibly due to chronic constipation.

Another possibility is that day wetting might induce voluntary peroneal contraction resulting in functional constipation. However, the elimination of enuresis and urinary tract infection after the treatment for constipation, as well as the fact that constipation and secondary encopresis preceded urinary symptomatology in several patients, militates against this possibility.

It is possible that the compression of the bladder due to pressure from a rectal fecal reservoir might serve to trigger such uninhibited bladder contractions. However, such contractions are not observed in pregnancy when the bladder is compressed by the gravid uterus. Since the innervation of the rectum and bladder are both from S2-4, it is possible that the development of constipation might precipitate, due to stimulation of the detrusor and consequent incoordination between detrusor contraction and external bladder sphincter relaxation.

One can surmise that in chronically severe constipated patients the rectum is never empty. In this case, the external sphincter of the anus remains the main if not the only means of rectal continence. It then is contracted continuously by the normal reflex mechanism and by voluntary action. Anal electromyography has been reported to be abnormal in children with urinary tract infection [Bailey et al. 1970]. Since concomitant contraction of the external sphincter of the bladder and the anus normally occurs, the presence of a continuous contraction of the anal

sphincter would induce the continuous contraction of the bladder sphincter resulting in urinary symptoms. This may explain the observation of Bailey et al. [1970] who noted a 57% incidence of abnormal anal electromyography in children with recurrent urinary tract infection. Elimination of constipation would result in cessation of voluntary anal and consequent urethral sphincter contraction, thus allowing for attainment of a more normal voiding pattern. This theory best explains the dramatic success of elimination of constipation in our patient series and is substantiated by the observation of an extremely high incidence of urinary tract infection in children with Hirschsprung's disease [O'Regan and Yazbeck 1984].

Pharmacologic manipulation has been utilized in the management of children with dysfunctional voiding problems with some success [Firlit et al. 1978, Smey et al. 1978]. However, pharmacologic manipulation based on urodynamic studies may result in variable symptomatic improvement without elimination of a possible primary cause i.e., functional constipation. Our experience indicates that the association of constipation and recurrent urinary tract infection is a frequent uncommonly recognized symptom complex. Rectal examination should be performed on all patients with recurrent urinary tract infection.

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