



# Slow transit constipation and lower urinary tract dysfunction

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Bladder and bowel dysfunction; Children; Slow transit constipation; Detrusor overactivity; Urinary incontinence; Cajal cells

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## Summary

### Introduction

Many theories have been proposed for the coexistence of constipation and lower urinary tract dysfunction (LUTD), such as bladder compression from a distended rectum and stimulation of sacral reflexes from a full rectum. In these cases, successful treatment of constipation should result in resolution of bladder symptoms. Some children have refractory constipation and others respond well to treatment, but once treatment is discontinued most children relapse back into their constipation. This may indicate the existence of a defect in colon motility, with a persistent peristalsis problem. The existence of a common neuromuscular disorder should be the base for both bladder and bowel dysfunction (BBD).

### Objective

To study colonic transit time (CTT) in children and adolescents with refractory constipation and lower urinary tract symptoms (LUTS).

### Materials and methods

A total of 15 children (mean age 9.7 years) with refractory constipation and LUTS were evaluated with: standardized medical history; physical examination; bladder and bowel diaries; Bristol stool scale; Rome III criteria; Dysfunctional Voiding Scoring System (DVSS); ultrasound examination of the kidneys and urinary tract, and measurement of rectal diameter; urodynamic evaluation; and a CTT study using radiopaque markers.

## Results

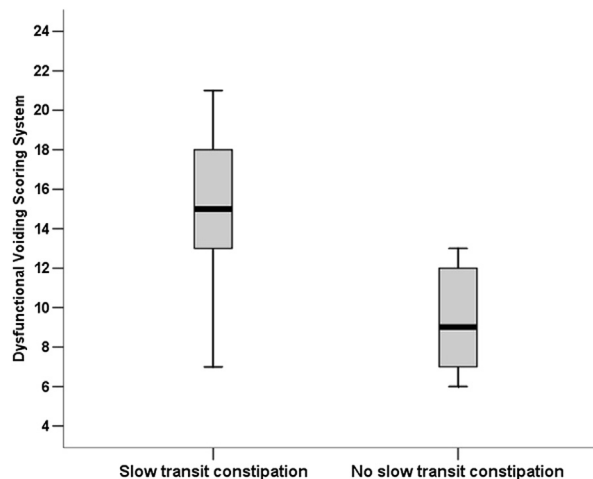
Urodynamic features were abnormal in 13 out of 15 children: 10 (66.7%) presented with detrusor overactivity (DO) and voiding dysfunction (VD), two (16.7%) had isolated DO, and one (8.3%) had a VD. The CTT study was abnormal in 12 out of 15 children: nine (60%) presented with slow transit constipation, three (20%) had outlet obstruction, and three (20%) had a normal CTT study. When comparing CTT and LUTD, nine (100%) children with slow transit constipation (STC) and three (50%) with no STC had DO ( $P = 0.04$ ). Seven (77.8%) children with STC and three (50%) with no STC had VD ( $P = 0.29$ ). The DVSS scores ranged from 6 to 21. The subgroup with STC had a DVSS score that was significantly higher than that of the subgroup with no STC (Figure).

## Discussion

The present study showed a high prevalence of STC in children and adolescents with refractory constipation and LUTS. This was in accordance with previous studies that have demonstrated a rate of 50–60% of STC in children with refractory constipation. In addition, DO was found to be associated with STC, which raises the chance for the existence of a common neuromuscular disorder to be the base for both bladder and bowel dysmotility. The limitation of this study was the number of participants.

## Conclusions

The present study demonstrated an association between DO and STC.



**Figure** Children and adolescents with slow transit constipation had higher DVSS scores than those without slow transit constipation.

## Introduction

Coexistent bowel and bladder dysfunction have previously been noted in children [1,2]. In 1998, Koff et al. introduced the term Dysfunctional Elimination Syndrome (DES) in order to describe the association of lower urinary tract and bowel functional disorders. The spectrum of urinary disorders included urge syndrome, dysfunctional voiding, and enuresis [2]. The International Children Continence Society (ICCS) recently proposed the term 'bladder and bowel dysfunction' (BBD) to describe the combination of functional bladder and bowel disturbances and to replace the term DES. Despite various publications regarding constipation and lower urinary dysfunction, the exact pathophysiological mechanisms are still not fully understood. Many theories have been proposed for the coexistence of constipation and lower urinary tract dysfunction, which include mechanical causes such as bladder compression from a distended rectum and stimulation of sacral reflexes from a full rectum [3]. In these cases, a successful treatment of constipation should result in immediate resolution of bladder symptoms. But some of these children have refractory constipation and others respond to treatment, but once treatment for their bowel issues is discontinued, most children will relapse back into their constipation. This indicates the existence of a defect in colon motility, with a persistent peristalsis problem, which leads to reaccumulation of stools. The existence of a common neuromuscular disorder should be the base for both bladder and bowel dysmotility [3]. The hypothesis of the present study was the association between slow transit constipation and lower urinary tract dysfunction (LUTD). The aims were: to analyze colonic transit time in children and adolescents with refractory constipation and lower urinary tract symptoms; to compare the subgroups of functional constipation with the subgroups of lower urinary tract dysfunction; and to evaluate the severity of LUTS among children with or without slow transit constipation.

## Methods

The present study was a prospective, descriptive study. Eighteen children with chronic constipation, who were refractory to conventional medical and behavioral treatment, were recruited from pediatric gastroenterology outpatient clinics from March 2013 to January 2014. The children were eligible if they had lower urinary tract symptoms and had been treated for constipation for at least 6 months. The exclusion criteria were: endocrine, metabolic or neurologic diseases; Hirschsprung disease; anorectal, spinal, urological or lower limbs orthopedic malformation. Three out of eighteen children were excluded due to the diagnosis of hypothyroidism, spinal malformation and renal malformation.

Ethical committee approval (project ID CAAE: 12673013.2.0000.5259) and written informed consent from all parents were obtained for the present study.

## Protocol

The study was based on the following protocol: during the first visit, a standardized medical history, which included

the initial diagnosis and previous treatment of constipation, fecal incontinence and LUTS, general health, growth and development, nutrition and family history, was carried out. A physical examination was performed with focus on the neurological system, back, lower limbs, abdomen, genitalia and digital rectal examination. The children were categorized as fitting into normal weight, being overweight, or obese, in accordance with the age-related body mass index (BMI) by WHO recommendations [4]. Constipation was defined by Rome III criteria [5]. The LUTS were classified in accordance with the ICCS terminology [6]. A validated version of the Brazilian Portuguese of Dysfunctional Voiding Scoring System (DVSS) was used to assess the severity of LUTS [7,8]. At the end of the first visit, parents were instructed to fill out a 3-day bladder diary with the frequency, voided volume, urgency and incontinence episodes recorded. In addition, they were asked to complete a 2-week bowel diary with the frequency of bowel movements, abdominal pain, evacuation difficulty and stool consistency. Stool consistency was assessed by the Bristol Scale [9]. All children underwent an ultrasound exam of kidney, bladder and rectum, as well as a urodynamic evaluation and a colonic transit time study. A follow-up was performed every month.

## Ultrasound

The ultrasound (Toshiba Xario XL, SSA660A – Japan) was performed to evaluate the kidneys and urinary tract, and measure both post void residual (PVR) urine and rectal diameter. The PVR was measured less than 5 min after voiding and was considered to be abnormally elevated if a single PVR was  $>20$  ml or 15% of bladder capacity (BC), or a repetitive PVR was  $>10$  ml or 6% of BC [6]. A rectal diameter  $>3$  cm was considered to be indicative of rectal impaction [10,11].

## Colonic transit time

The assessment of total and segmental colonic transit time (CTT) was using radiopaque markers, as described by Metcalf et al. [12]. The children were instructed to maintain their usual diet, and discontinue the use of any medication that acts upon intestinal motility 5 days before the exam. They ingested a small capsule containing 24 radiopaque markers for 3 consecutive days. On the fourth day of the study, the children underwent plain abdominal radiograph in the supine position. One additional X-ray was performed on the seventh day of the study in case  $>80\%$  of the markers had not been eliminated. The radiographs were performed with high kilovoltage, a high-sensitivity film and a high-luminosity screen in order to reduce radiation exposure. Localization of markers was based on the identification of body landmarks and gaseous outlines, as described by Arhan et al. [13]. Markers were counted in the right, left, and rectosigmoid regions, and mean segmental transit times were calculated according to a previously described formula [11,13]. Two medical radiologists independently counted the markers. Normal ranges for total and segmental transit time were based on the upper limits (means + 2 SD) previously described in healthy children:

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