

THE DIAMETER OF THE RECTUM ON ULTRASONOGRAPHY AS A DIAGNOSTIC TOOL FOR CONSTIPATION IN CHILDREN WITH DYSFUNCTIONAL VOIDING

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ABSTRACT

Purpose: We proved the accuracy of the transverse diameter of the rectum on ultrasonography as an additional parameter for diagnosing constipation in children with lower urinary tract dysfunction.

Materials and Methods: The diameter of the rectum on bladder ultrasonography in a constipated group of patients with dysfunctional voiding was compared to this diameter in a control group of patients with a normal defecation pattern. A total of 49 children were included. Group 1 consisted of 23 patients with a positive history of dysfunctional voiding and, according to pediatric gastroenterological practice, constipation. Control group 2 consisted of 26 patients without lower urinary tract dysfunction and a normal defecation pattern. In each group a defecation questionnaire was administered and physical examination of the abdomen was done. In all patients a 7.5 MHz probe was used to measure the transverse diameter of the rectum behind the bladder on ultrasonography. The probe was applied on the abdominal skin approximately 2 cm above the symphysis. Measurement was performed with a filled bladder at an angle of about 15 degrees downward from the transverse plane.

Results: In constipated group 1 the mean diameter of the rectum was 4.9 cm (95% CI 4.4 to 5.3). In the control group the mean diameter of the rectum was 2.1 cm (95% CI 1.8 to 2.4). In group 1 the diameter of the rectum was significantly larger than in group 2 ($p < 0.001$). None of the patients had a sensation to defecate during the investigation. There was no significant difference in age between the 2 groups ($p = 0.20$) and no significant difference between them in the period between the last time that stool was passed prior to the time of rectal measurement ($p = 0.16$).

Conclusions: The transverse diameter of the rectum measured by lower abdominal ultrasound provides an additional accurate parameter with which to diagnose constipation in patients with nonneurogenic bladder-sphincter dyssynergia.

KEY WORDS: urination disorders, bladder, rectum, ultrasonography, constipation

Voiding dysfunction in children based on nonneurogenic bladder-sphincter dyssynergia is common in children, especially girls, with an incidence of approximately 6% in 7-year-old children.¹ Pelvic floor dyscoordination in these children can lead to recurrent urinary tract infections, incontinence and fecal constipation. Therapy for symptoms is based on reeducation of the pelvic floor with cognitive behavioral training or biofeedback training combined with medication to prevent urinary tract infections and laxative therapy for constipation.^{2–4} In the past we have routinely used the transverse diameter of the rectum on bladder ultrasonography as a parameter with which to diagnose constipation and evaluate treatment for constipation. This study was designed to prove whether our clinical practice is correct.

PATIENTS AND METHODS

Patients. A total of 49 patients between ages 5 and 13 years were included in this study. Group 1 consisted of 23 patients with a positive history of voiding dysfunction and constipation. Group 2 consisted of 26 urological patients without lower urinary tract dysfunction and a normal defecation pat-

tern. The diagnoses in this group were undescended testicle, periodic control for upper urinary tract dilatation, etc.

A positive diagnosis of constipation was made by patient history and physical examination when the patient had at least 2 positive signs, including 1) 2 or fewer bowel movements weekly without laxative therapy, 2) 2 or more episodes of fecal soiling weekly, 3) periodic passage of a large amount of stool once every 7 to 30 days and 4) a palpable abdominal and/or rectal mass on physical examination. Exclusion criteria were laxative therapy, constipation due to neurological disease, diseases of the gastrointestinal tract based on endocrinological, metabolic, genetic or toxic disease, or connective tissue diseases. In all patients the micturition history was taken, uroflowmetry was performed, and ultrasound of the kidneys and bladder was done.

Evaluation. Ultrasound was done with the patient supine. The 7.5 MHz probe was applied on the abdominal skin approximately 2 cm above the symphysis. Measurement was performed with a moderately (30% to 70% of capacity for age) filled bladder at an angle of about 15 degrees downward from the transverse plane (fig. 1). The diameter of the rectum behind the bladder was measured twice.

All patients were asked whether they had any urge to defecate during the investigation and how many hours ago stool had been passed prior to the investigation. If stools had been passed in the last 2 hours or patients had an urge to

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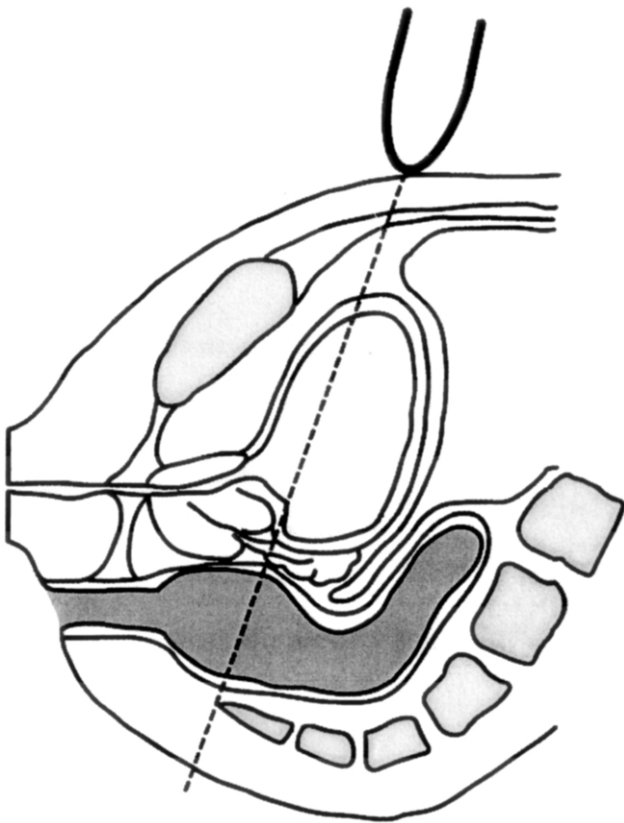


FIG. 1. Transverse (broken line) lower abdominal ultrasonography of rectum.

defecate during the investigation, they were not included in the study.

Statistical analysis. The *t* test was applied to compare continuous variables with normal distribution. All data were analyzed with SPSS, version 9.0 (SPSS, Inc., Chicago, Illinois).

RESULTS

In all patients it was possible to obtain a reliable and repeatable measurement of the rectum if at least some bladder filling was present. Maximal bladder filling limits the possibility of obtaining reliable measurements of the rectum. There was no significant difference in age between the 2 groups ($p = 0.20$) and no significant difference between the groups in the period between the last time that stool was passed prior to rectal measurement ($p = 0.16$). There was a significant difference in the diameter of the rectum between the constipated group and the control group ($p < 0.001$). In all patients with voiding dysfunction and fecal constipation (group 1) rectal examination confirmed stool in the rectum. Average diameter in the constipated vs control group was 4.9 vs. 2.1 cm (fig. 2). None of the patients had an urge to defecate during the investigation.

DISCUSSION

No evidence based guidelines currently exist for the evaluation and treatment of constipation.⁵ Recently the North American Society for Pediatric Gastroenterology and Nutrition developed a clinical practice guideline.⁵

Beyond the neonatal period the most common cause of constipation is functional, called idiopathic constipation, functional fecal retention and fecal withholding.⁵ In patients with voiding dysfunction the urge to void is countered by voluntary pelvic floor contraction with functional incontinence and recurrent urinary tract infections as a result. This

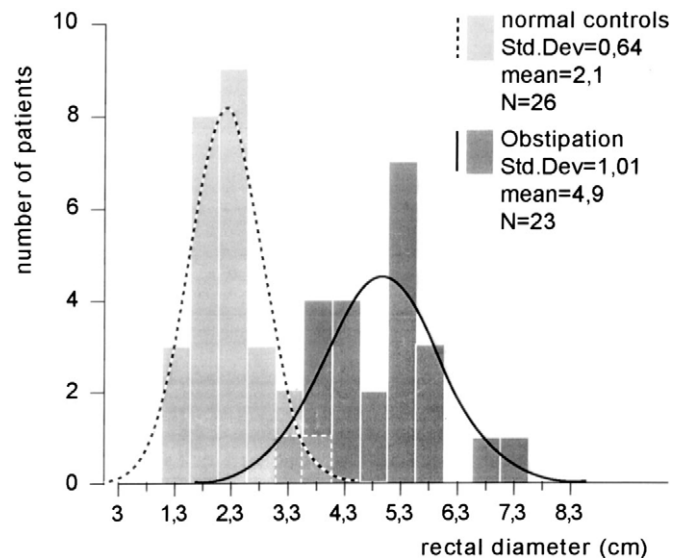


FIG. 2. Overview of all recorded rectal diameters shows only slight overlap between groups. *Std.Dev.*, SD.

leads inevitably to the inappropriate postponement of micturition and defecation.⁶

The same behavior as in dysfunctional voiding is seen in functional constipation with children postponing defecation because he or she is too busy. They show squatting behavior to withhold stool, responding to the urge to defecate by contracting the anal sphincter and gluteal muscles.⁵ Eventually the rectum habituates to the enlarging fecal mass and the urge to defecate subsides with fecal soiling as a result.⁵

The distended rectum can be visualized by transverse lower abdominal ultrasonography. In this study we observed that the diameter of the rectum in patients with constipation is significantly larger than this diameter in patients with a normal defecation pattern ($p < 0.001$). Noninvasive ultrasonography of the rectum is an easy to obtain, extra parameter to confirm a fecal mass in the rectum. Thus, it provides us with an additional parameter for diagnosing constipation.

In children with dysfunctional voiding nonneurogenic pelvic floor dyssynergia causes a loss of sensation for the filling state of the bladder and rectum. When urinary tract symptomatology is the main cause for complaints, fecal constipation is often not recognized by parents and children. The impression of the bladder base by the distended rectum can easily be visualized by transabdominal bladder ultrasonography (fig. 3). This image is of great help to convince parents and children of the need for therapy for the voiding disorder and for constipation. In our experience it is also a useful tool with which to evaluate whether therapy is successful. In our clinical routine ultrasound in these patients with pelvic floor dysfunction has almost completely eliminated repeat rectal examination and plain x-ray to assess the amount of filling of the colon and rectum. Further studies in a larger series of patients are in preparation to compare this finding to that of

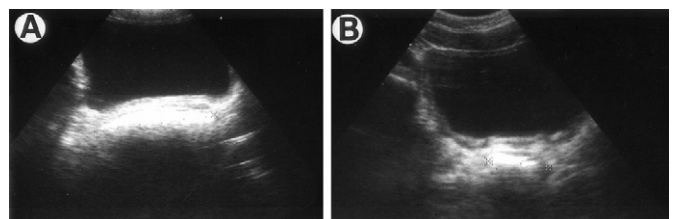


FIG. 3. Transverse view of ultrasound. A, bladder in constipated patient with bladder base compressed by fecal mass in distended rectum. B, normal rectum in nonconstipated patient.

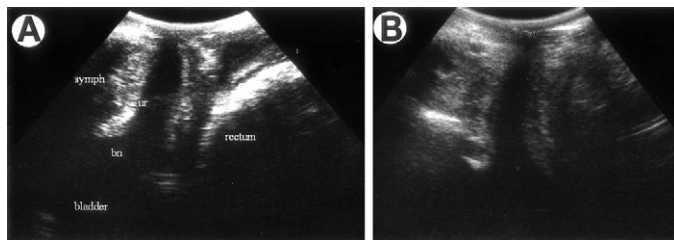


FIG. 4. Perineal ultrasound. A, sagittal view of same constipated patient demonstrates lower limit of distended rectum. Ultrasound transducer was placed on urethral meatus. *symph*, symphysis. *ur*, urethra. *bn*, bladder neck. B, normal female urethra with empty rectum behind it.

other imaging techniques, such as plain x-ray. Figure 4 shows how the anatomical relationships are clarified by perineal ultrasound in a constipated and a control patient.

CONCLUSIONS

As measured by ultrasound, the transverse diameter of the rectum can be used as an accurate extra tool for diagnosing constipation in children. Moreover, the impression of the distended rectum into the bladder and the visualization of the fecal mass are of help in convincing patients and parents of the need for constipation therapy. The success of treatment

can be followed by ultrasound without the need for repeat digital rectal examination.

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