

Occult Megarectum—A Commonly Unrecognized Cause of Enuresis

Steve J. Hodges and Evelyn Y. Anthony

OBJECTIVE	To determine whether occult megarectum remains a commonly unrecognized cause of enuresis and whether treating it will cure enuresis in most children. A landmark study proved constipation was a commonly unrecognized cause of enuresis in 1986 in which constipation was defined as abnormal rectal distension. However, modern recommendations have focused on signs of functional constipation, such as hard or rare stools.
METHODS	A retrospective review of 30 consecutive patients seen in our clinic with a chief complaint of nocturnal enuresis was performed, with an analysis of the results of their plain abdominal radiographs. The results of the studies were determined using a novel method termed the rectal/pelvic outlet ratio and Leech criteria. These results were compared with the reported constipation history according to the International Children's Continence Society guidelines, which recommends asking parents and children whether the child's bowel movements occur less often than every other day and whether the stool consistency is hard. Patients diagnosed with megarectum were treated with laxatives, with the goal of restoring normal rectal tone.
RESULTS	All patients demonstrated rectal distension according to the rectal/pelvic outlet ratio, and 80% were constipated according to the Leech criteria. Only 10% of the patient or families reported clinical symptoms of constipation. All the adolescent patients in our study and 80% of the younger patients were cured of enuresis with laxative therapy.
CONCLUSION	Occult megarectum remains a commonly undiagnosed cause of nocturnal enuresis. Abdominal radiographs represent a simple, noninvasive method to diagnose megarectum and might improve the treatment of nocturnal enuresis. UROLOGY 79: 421–424, 2012. © 2012 Elsevier Inc.

Nocturnal enuresis represents a common complaint in pediatric urology clinics. The evaluation and treatment of nocturnal enuresis has been standardized, and the International Children's Continence Society recently published these guidelines.¹ It is well known that constipation is a significant cause of nocturnal enuresis, with $\leq 75\%$ of children with monosymptomatic nocturnal enuresis having abnormal bowel patterns.²

The link between constipation and nocturnal enuresis was first mentioned in a landmark report by O'Regan et al³ in 1986. They demonstrated that constipation is a commonly unrecognized cause of enuresis. However, in examining their report, it is clear that by constipation, O'Regan et al³ meant rectal distension, as they diagnosed "constipation" in children primarily with rectal examination and anorectal manometry, often in children with normal bowel habits.

Rectal examination, anorectal manometry, and radiographic imaging of the bowel, all of which can diagnose

occult rectal distension or megarectum, are no the longer the standard of care in the modern evaluation of enuretic children. Experts simply suggest asking the children and parents whether the child's bowel movements occur less often than every other day, and whether the stool consistency is hard.¹ In addition to the discordance of these methods with the research findings from O'Regan et al,³ additional evidence has shown that this might be inadequate, because the prevalence of constipation by parental assessment has been reported to be 14.1% compared with a prevalence by clinical assessment of 36.1%.² We hypothesized that many cases of nocturnal enuresis are associated with undiagnosed and, therefore, undertreated megarectum, making cure more difficult, costly, and lengthy.

Thus, occult megarectum remains a commonly unrecognized cause of nocturnal enuresis, and most clinicians have focused on functional constipation and not rectal distension. We believe treating this occult megarectum will cure enuresis in most children, as described by O'Regan et al³ in 1986.

MATERIAL AND METHODS

A retrospective review of 30 consecutive patients seen in our clinic with a chief complaint of nocturnal enuresis was performed, with an analysis of the results of their plain abdominal radiographs. The

From the Departments of Urology and Radiology, Wake Forest University School of Medicine, Winston-Salem, North Carolina.

Reprint requests: Steve J. Hodges, M.D., Department of Urology, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157. E-mail: shodges@wfubmc.edu

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results of the studies were determined using a novel method termed the rectal/pelvic outlet ratio (RPOR). The RPOR is a ratio of the measurement of the rectum at its widest point when distended by stool, over the pelvic outlet (defined as the distance between the obturator stripes at the level of the femoral heads). Abnormal distension is defined as an RPOR >1. The Leech score for each radiograph was also recorded. These results were compared with the reported constipation history according to the International Children's Continence Society guidelines, which recommend asking parents and children whether the child's bowel movements occur less often than every other day, and whether the stool consistency is hard.

Children with megarectum according to radiography were treated with an initial bowel cleanout using polyethylene glycol 3350 (depending on size, 7-14 capfuls in 32-64 oz of fluid within a 24-hour period) and then maintained on a daily dose titrated to keep the stools the consistency of a milk shake.

The children were followed up at 1 and 3 months for additional imaging studies. In those children with persistent megarectum, the polyethylene glycol 3350 was supplemented with daily phosphate (Fleet) enemas or stimulant laxatives (in our study, 1 chocolate Ex-Lax square daily).

Children with persistent enuresis at 3 months and no rectal stool on the plain radiographs were considered to have treatment failure.

RESULTS

We reviewed the charts of 30 patients, 19 boys and 11 girls, referred to our clinic for nocturnal enuresis. Their age range was 5-15 years (average age 9). Four of the patients were adolescents.

All radiographs demonstrated fecal rectal distension, as defined by an RPOR >1. Of the abdominal radiographs, 80% demonstrated an abnormal fecal burden (as defined by the Leech criteria), consistent with constipation. Only 10% of the parents or children with abnormal radiographs described a bowel history consistent with constipation (Fig. 1). To test whether a significant difference was present between self-reported constipation and the radiographic findings (Leech criteria) within a patient, we used McNemar's test and found a highly statistically significant trend toward the radiographic findings identifying unknown constipation ($P = 4.6 \times 10^{-6}$; Table 1).

In the 4 constipated adolescent patients in our study, polyethylene glycol therapy for ≥ 2 weeks cured the nocturnal enuresis in all cases. In the younger patients, aggressive constipation therapy alone (which completely resolved the rectal distension) cured nocturnal enuresis in most (80%), but not all, patients. In the younger patients, when polyethylene glycol failed to decrease the rectal distension at the monthly follow-up visits, stimulant laxatives and/or enemas were added to achieve the treatment goal. All children who showed improvement were dry by 3 months.

COMMENT

The current belief is that nocturnal enuresis arises from a combination of 3 main causes: nocturnal polyuria, detru-



Figure 1. Plain film abdominal radiography of child with normal bowel habits, but constipated according to Leech criteria and with rectal distension according to RPOR (line A/line B >1).

Table 1. Differences between self-reported and radiographically diagnosed constipation

Self-Reported Constipation	Radiographically Diagnosed Constipation		
	Yes	No	Total
Yes	3	0	3
No	21	6	27
Total	24	6	30

To test for significant differences between self-reported constipation and radiographic findings, we used McNemar's test and found highly statistically significant trend toward radiographic findings identifying unknown constipation ($P = 4.6 \times 10^{-6}$).

sor overactivity, and an increased arousal threshold.^{1,2} All studies agree, however, that comorbid conditions can influence these factors (eg, the effects of constipation on bladder capacity and overactivity) and must be treated before initiating direct therapy, because it might be difficult to succeed otherwise.²

Several dilemmas are inherent in the evaluation of children for constipation. The first is that the definition of constipation is not standardized or uniformly understood by all physicians and lay people. Most parents believe that if their child passes stools everyday, or every other day, they are not constipated. The problem with that definition is that many children have daily bowel movements but do not fully empty their rectum and, therefore, retain stool, which can have a negative effect on bladder capacity.²

What appears to be a more clinically significant definition of constipation in terms of its effects on bladder function relies on the evaluation of the fecal burden in the child's colon, particularly the rectum. O'Regan et al³ had great success in curing enuresis by treating constipation only because they treated constipation using enemas "in an aggressive manner to allow for evacuation of the rectum and its maintenance in an empty state until normal rectal tone returned," regardless of the frequency or consistency of bowel movements.²

Others have echoed the findings from O'Regan et al,³ with Robson² stating that the presence of stool in the rectum can reduce bladder capacity, and a low functional bladder capacity is a known risk factor for nocturnal enuresis. Thus, Robson² surmised that "Many children with nocturnal enuresis have a bowel pattern that places them at risk for nocturnal enuresis but does not conform to current definitions of constipation." Additionally, studies have demonstrated that rectal distension might lead to bladder overactivity, another known risk factor for nocturnal enuresis, independent of its effects on bladder capacity.⁴

Consistent with this view, we developed a tool we believe represents a simple and accurate measurement of fecal burden, the RPOR. In this method, we calculate the ratio of the diameter of the rectum at its widest point as distended by the stool over the diameter of the pelvic outlet (defined as the distance between the obturator stripes at the level of the femoral heads). This technique is much less subjective than the Leech criteria and focuses only on the component of the bowel relevant to bladder function, the rectum. Although the measurement has not yet been validated (studies regarding RPOR inter- and intraobserver variability are ongoing), it is consistent with other published radiographic definitions of megarectum.^{5,6} Also, images of stool filling the entire anatomic pelvis (representing an RPOR >1) are not subtle or esoteric findings, but obvious to even the uninitiated, such as the patients' parents (Fig. 1).

Radiographic imaging of the bowels becomes even more important when we reflect that no well-designed studies have dictated which aspects of a medical history and physical examination are most important in the diagnosis of constipation. The clinical practice guideline of the North American Society for Pediatric Gastroenterology and Nutrition for the diagnosis of constipation in children recommends plain abdominal radiography in the case of doubt about the presence of constipation, if the child refuses a rectal examination, or if a rectal examination is considered traumatic.⁶

There are actually many proponents of radiographic evaluation of constipation. Walia et al⁷ noted that "Plain abdominal radiography is often used to complement clinical history and examination especially if the patient's body habitus precludes deep abdominal palpation." The investigators noted that the test is inexpensive, simple, and safe. In addition, they defended the notion that radiographs are also very useful for diagnosing functional

fecal retention, which we hypothesize to be one of the main risk factors for enuresis.⁷

The main concern for radiographic studies in children has been the fear of overirradiating these children. Although radiographs should be used in children sparingly and cautiously, they should not be avoided for irrational fear of causing harm to the child if they can in fact benefit their care. Data from the Food and Drug Administration states that a typical plain abdominal radiograph has an amount of radiation exposure that is equivalent to a uniform whole body exposure of 110 mrem, which is equivalent to 0.37 times the amount of background radiation that the average person in the United States receives each year (annual background 300 mrem; available from: <http://www.cancer.gov/cancertopics/causes/radiation-risks-pediatric-CT>). Therefore, the occasional plain radiograph in children seems very reasonable.

Another option could be to perform rectal ultrasonography to evaluate for fecal burden, which has been reported, with good results.⁴ Although this method is not widely used in the United States and was not evaluated in the present study, it is appealing for many reasons. For example, ultrasonography uses no ionizing radiation and focuses primarily on the rectal fecal burden, which is likely the most important component of constipation relating to bladder function.

The importance of diagnosing occult megarectum cannot be overstated, because when it is missed, children are often subjected to unnecessary and sometimes morbid therapies for an otherwise simply resolved issue. For example, physicians often prescribe high doses of desmopressin (which has safety issues and limited efficacy when withdrawn), and some have recommended adenotonsillectomy in the hope that the treatment of obstructive sleep apnea might resolve the enuresis.^{8,9} We challenge physicians considering possibly harmful medications or surgery as a treatment of nocturnal enuresis to obtain a simple plain film abdominal radiograph and to treat occult megarectum to increase the bladder capacity before exposing any children to possibly unnecessary therapy.

The present study had several weaknesses worth noting. First, it was a retrospective review; thus, it is possible that the enuresis in some of the children might have resolved with simple observation and the resolution was not from the laxative therapy. A prospective randomized trial would differentiate the true responders and those with spontaneous resolution.

Finally, the treatment and repeat imaging interval for children with enuresis and megarectum has not been established; therefore, we chose to evaluate our patients at 1 and 3 months after their initial visit. These intervals were chosen because O'Regan et al³ noted responses in their patients 2-6 weeks after the initiation of therapy.

O'Regan et al³ did not routinely reevaluate their patients for megarectum after the diagnosis, because they treated all enuretic children with enemas, which have a greater success rate in resolving megarectum than os-

motix laxatives. We have found in our practice that in a subset of children with enuresis, the megarectum will not resolve with osmotic therapy alone and, therefore, require repeat imaging to determine which patients should add stimulant laxatives or enemas to their regimen.

CONCLUSIONS

Occult megarectum, initially described by O'Regan et al³ in 1986, remains a commonly undiagnosed cause of nocturnal enuresis. We believe abdominal radiography is a safe and integral method to diagnose megarectum in children with nocturnal enuresis and have used it as a part of our standard care of these patients.

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