

Plain Abdominal Radiography in Diagnosis of Children with Constipation

*Thidarat Weeraset Siri, M.D.**
*Panee Visrutaratna, M.D.***
*Nuthapong Ukarapol, M.D.**

ABSTRACT

Objective: To evaluate the value of abdominal radiograph using stool retention rating record (SRRR) for diagnosis of constipation.

Patients and Methods: This was a retrospective study. All children with constipation and recurrent abdominal pain (RAP), who had abdominal radiograph done, were enrolled into the study from Jan 2001-Jun 2003. The abdominal radiograph was blindly interpreted using SRRR by a pediatric gastroenterologist and pediatric radiologist.

Results: Seventy cases were enrolled, forty in the constipation group and the rest was RAP group. The mean age was 5.36 ± 4.18 years and 8.86 ± 4.1 years, in constipation and RAP group, respectively ($p = 0.001$). There was no gender difference between two groups. In constipation group, twelve and twenty-eight patients were classified as simple and complicated constipation, respectively. There was no statistical significance noted on SRRR score between constipation and RAP groups by two observers. However, there was statistically significant difference noted by the pediatric radiologist in children with complicated constipation compared to simple constipation ($p = 0.018$)

Conclusion: There was no statistical difference using plain abdominal radiograph to differentiate children with constipation from RAP children without constipation. Therefore, the use of plain abdominal radiographs was not a substitute for complete history taking and physical examination in diagnosis of constipation. Routine investigation using plain abdominal radiograph is not recommended, except in intractable or complicated cases.

Key words : Diagnosis, X-ray, plain abdominal roentgenography, constipation

[*Thai J Gastroenterol 2004; 5(3): 157-160*]

BACKGROUND

Constipation is one of common and frequently ignored condition in children. It accounts for approximately 3% and 25% of cases visiting to a general pediatric and pediatric gastroenterology clinic, respectively⁽¹⁾. If left untreated, it could contribute to many complications, for example abdominal pain, anal fissure, encopresis, rectal prolapsed, stasis syndrome, and even social exclusion/anxiety/depression⁽²⁾. Therefore, careful clinical evaluation is needed to promptly recognize and manage of this condition. Although functional constipation comprises 90-95% of the cases, complete history taking and examination are important to exclude organic diseases. Radiological investigations, including plain abdominal radiograph, contrast studies, and colonic transit time, have been used in intractable and complicated cases⁽³⁻⁵⁾. The aim of this study was to evaluate the value of abdominal radiograph using stool retention rating record (SRRR) for diagnosis of constipation.

PATIENTS AND METHODS

From January 2001 to June 2003, the medical records of all children at Chiang Mai University Hospital, diagnosed as constipation and recurrent abdominal pain (RAP), were retrospectively reviewed. Constipation was diagnosed if there was at least one of the following, the frequency of less than 3 times a week, hard consistency of the stools, and difficulty/painful during defecation. RAP was defined as at least 3 episodes of upper abdominal pain during the 3 consecutive months preceding the study and severe enough to affect their normal activities and require medical attention. Children with RAP accompanying with a history of constipation were excluded. Only patients who had an abdominal radiograph performed was enrolled into the study and divided into two groups, the study (constipation) and control (RAP) group. Demographic data were retrieved in a standardized form. Complete history taking and physical examination, including per rectal examination and abdominal mass, were used for data analysis.

Constipated children, having clinical course longer than 3 months and/or developing one of the following, encopresis/soiling, enuresis, anal fissure/bleeding per rectum, urinary tract infection, and anxiety/depression, were considered as complicated constipation;

whereas the remaining were simple constipation.

The abdominal radiograph was scored using stool retention rating record (SRRR) proposed by Barr RG.6 Both semi-quantitative and qualitative parameters were measured. The quantitative parameters included relative volume of stools retained in the different parts of the colon, in which they were defined as 1) small/little/few/none, 2) moderate, and 3) large/throughout, if there was stool, containing in the certain part of the colon, of less than a quarter, a quarter to half, and more than half, respectively. Stool characteristics, including granular and rock-like appearance, were also qualitatively assessed. The maximum score was 25 points. The abdominal radiographs were blindly evaluated by two independent observers, pediatric gastroenterologist and pediatric radiologist, who did not know the clinical background of the patients. Comparisons between groups and observers were studied using student t-test and linear regression analysis, respectively. A p value <0.05 was considered statistically significant. This study was approved by the Research Ethics Committee of the Faculty of Medicine, Chiang Mai University.

RESULTS

A total of seventy patients were enrolled, forty in the study group. There was no gender difference; however, the patients in the RAP group were significantly older than those in the constipation group with the mean age of 8.86 ± 4.1 years and 5.36 ± 4.18 years, respectively ($p = 0.001$). Of the children with constipation, fifty-seven per cent had three symptoms, whereas twenty-five and eighteen per cent of the cases had two and one symptom, respectively. Difficulty/painful defecation was the most common clinical presentation (28/40), followed by hard stool (26/40) and the frequency of <3 times a week (23/40). Twenty-eight children were diagnosed as complicated constipation, in which thirteen cases developed anal fissure/bleeding per rectum; eight cases had encopresis; and one case was anxious and depressed. Fecal impaction noted on digital examination was present in 54.5%. This was commonly found in complicated constipation (66.7%) compared to simple constipation (33.3%) ($p = 0.06$). On contrary, palpable fecal mass was less likely to be noted (37.5% of all cases).

Among children with RAP, the organic causes were identified in twelve cases, using upper endoscopy

Table 1 Stool retention rating record (mean and 95%CI) between constipation and control (recurrent abdominal pain) group

Evaluator	Constipation Group (N = 40)	Control Group (N = 30)	p value
Pediatric gastroenterologist	7.38 (5.11-9.64)	6.20 (3.70-8.70)	0.484
Pediatric radiologist	5.55 (3.24-7.86)	2.77 (0.80-4.73)	0.078

Table 2 Stool retention rating record (mean and 95%CI) between simple constipation and complicated constipation

Evaluator	Simple Constipation (N = 12)	Complicated Constipation (N = 28)	p value
Pediatric gastroenterologist	5.75 (1.22-10.28)	8.07 (5.33-10.81)	0.348
Pediatric radiologist	1.50 (0-3.22)	7.29 (4.24-10.33)	0.018

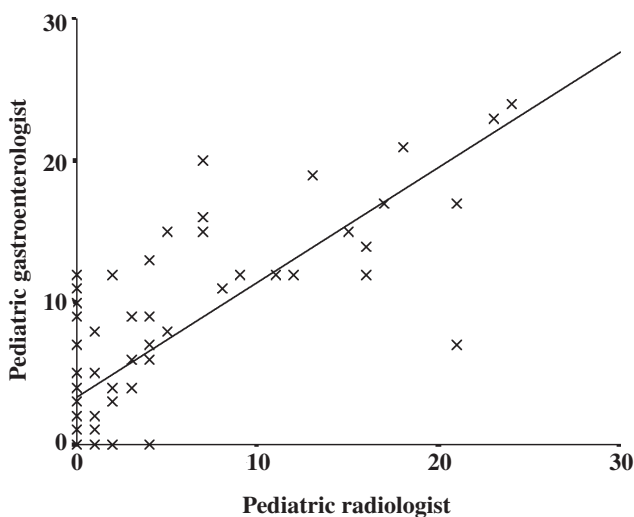


Figure 1 Linear regression analysis demonstrates Interobserver correlation between pediatric gastroenterologist and radiologist in interpreting SRRR score on plain abdominal radiographs ($r = 0.77$, p value <0.05).

and biopsy, abdominal ultrasound, and abdominal CT scan. The remaining eighteen children were diagnosed as functional abdominal pain according to Rome II criteria.

Comparison of the SRRR score between the constipation group and control (RAP) group was shown in Table 1. Although the score tended to be higher in the constipation group, there was no statistical significance either in the pediatric gastroenterologist or radi-

ologist. In subgroup analysis, however, the complicated constipation had a significant higher SRRR score than the simple constipation when evaluated by the pediatric radiologist ($p = 0.018$) (Table 2). Interobserver variation was tested using linear regression analysis. A good correlation was found between two investigators ($r = 0.77$, $p < 0.05$). However, the pediatric gastroenterologist tended to score higher than the radiologist (Figure 1).

DISCUSSION

Although functional fecal retention is the most common cause of constipation in children, careful history taking and physical examination are still crucial to guide proper investigations in suspected organic diseases, such as Hirschsprung's disease, anal stenosis, hypothyroidism, and caudal regression syndrome. As noted previously, only the frequency of passing stools was not sufficient to make a correct diagnosis⁽⁶⁾; in fact it was the least frequent symptom reported in our study. On contrary, difficulty/painful defecation and hard stools were the most two common symptoms. Thus, incomplete history taking would readily result in misdiagnosis. However, eighty per cent of the cases had at least two symptoms at presentation. Physical examination provided some additional information, in which palpable fecal mass and impact feces on per rectal examination were noted in 37.5% and 54.5%, respectively. The findings were consistent with the study of Barr RG *et al*⁽⁶⁾. The limitation might result from

difficulty in examining fecal mass in an obese child and unwilling to have per rectal examination performed in a small child who previously experienced painful defecation or rectal enema. Thus, constipation cannot be certainly excluded in children with negative physical examination.

As a result, there have been many studies investigating on imaging modalities for diagnosis of constipation. Plain abdominal radiograph, certainly, has been firstly evaluated because it is inexpensive and least invasive⁽⁶⁻⁹⁾. Our study used the criteria diagnosis purposed by Barr RG *et al*, in which it was developed from the knowledge of normal physiologic distribution and quality of stools. In normal children, stool is normally present in the right-sided colon and rectosigmoid region, whereas there are skip areas in the transverse and descending colon. Additionally, stool is normally rocky distally and becomes granular appearance proximally. Changes from normal physiologic pattern should imply a disorder of bowel movement. Consequently, it was categorized and scored as the SRRR. In that study, the authors demonstrated statistically significant difference in SRRR between constipation group and control group⁽⁶⁾. This conclusion was also confirmed by subsequent studies⁽⁷⁻⁹⁾ Blethyn AJ *et al*, furthermore, demonstrated a correlation between bowel frequency and fecal loading graded on the plain abdominal radiograph⁽⁸⁾.

In contrast to our study, the same result could not be reproduced. Although the control group in our study was not consisted of normal children, all children with RAP did not report any symptom of constipation. And, despite statistical difference in mean age, the comparison between two groups was considered feasible because we relatively graded the stool volume independently in each representative area and there was no newborn infant included into this study. Ideally, age-match normal control subject is the best study design, but it is considered unethical to allow radiation exposure in such a normal child; in which this was a major limitation of our study.

As noted previously, our study showed good correlation between two observers. Nonetheless, the correlation was not exactly matched. The pediatric gastroenterologist tended to score higher than the radiologist. In subgroup analysis (constipation), however, there was statistically significant difference in SRRR scored by the radiologist in complicated constipation compared with simple constipation.

In conclusion, there was no statistical difference using plain abdominal radiograph to differentiate children with constipation from RAP children without constipation. Therefore, the use of plain abdominal radiographs was not a substitute for complete history taking and physical examination in diagnosis of constipation. Routine investigation using plain abdominal radiograph is not recommended, except in intractable or complicated cases.

REFERENCES

1. Loening-Baucke V. Chronic constipation in children. *Gastroenterology* 1993; 105: 1557-64.
2. Abi-Hanna A, Lake AM. Constipation and encopresis in childhood. *Pediatr Rev* 1998; 19: 23-31.
3. Halligan S, Bartram CI. The radiological investigation of constipation. *Clin Radiol* 1995; 50: 425-35.
4. Metcalf AM, Phillips SF, Zinsmeister AR, *et al*. Simplified assessment of segmental colonic transit. *Gastroenterology* 1987; 92: 40-7.
5. Zaslavsky C, Silveira TR, Maguilnik I. Total and segmental colonic transit time with radio-opaque marker in adolescents with functional constipation. *J Pediatr Gastroenterol Nutr* 1997; 27: 138-42.
6. Barr RG, Levine MD, Wilkinson RH, *et al*. Chronic and occult stool retention. *Clin Pediatr* 1979; 18: 674-86.
7. Rockney RM, McQuade WH, Days AL. The plain abdominal roentgenogram in the management of encopresis. *Arch Pediatr Adolesc Med* 1995; 149: 623-7.
8. Blethyn AJ, Verrier Jones K, Newcombe R, *et al*. Radiological assessment of constipation. *Arch Dis Child* 1995; 73: 532-3.
9. Leech SC, McHugh K, Sullivan PB. Evaluation of a method of assessing faecal loading on plain abdominal radiographs in children. *Pediatr Radiol* 1999; 29: 255-8.