Position of a sigmoid colon in right iliac fossa in children:
A retrospective study

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ABSTRACT

Aim: The aim was to identify the position of sigmoid colon in children and discuss its clinical significance. Materials and Methods: Ninety-one contrast enema studies were retrospectively evaluated and the position of sigmoid colon categorized as below: Left lower quadrant, right lower quadrant, midline, and indeterminate. Results: The position of sigmoid colon in the right lower quadrant, left lower quadrant, midline, and indeterminate was 32 (35.16%), 33 (36.26%), 12 (13.19%), and 14 (15.38%), respectively. There was no statistically significant difference in mean age (P = 0.87) or gender prevalence (P = 0.49) for different positions of the sigmoid colon. Conclusion: The sigmoid colon occupies the right lower quadrant in a large number of children. Awareness of this finding is of crucial importance in correct interpretation of abdominal radiographs in the emergency room.

KEY WORDS: Children, radiographs, sigmoid colon

INTRODUCTION

Despite their limitations, plain radiographs of the abdomen continue to be the initial radiological modality used for the evaluation of several gastrointestinal pathologies including intestinal obstruction, intussusception, malrotation, and appendicitis. Confident identification of cecal gas shadow in the right iliac fossa is important while interpreting these radiographs. However, a recent study suggests that the sigmoid colon in children may lie in the right iliac fossa causing potential problems in diagnosis. We undertook this retrospective study to evaluate the position of sigmoid colon in children.

MATERIALS AND METHODS

This was a retrospective study which was approved by the ethics committee of our department. The records of the Radio Diagnosis department were searched for barium/contrast enema studies. All these studies were done for clinically suspected large bowel diseases. Only those studies were included in which the images were available for review. All the studies were done on Shimadzu UD150B30 Digitex Pro series, Kyoto, Japan fluoroscopy machine.

The position of the sigmoid colon was evaluated in an anteroposterior view of the abdomen and categorized as below:
1. Left lower quadrant: If most or all of the loops of the sigmoid colon were located to the left of the lumbar vertebral bodies.
2. Right lower quadrant: If one or more complete loops of the sigmoid colon were to the right of the lumbar vertebral bodies.
3. Midline: If the sigmoid colon extended superiorly in a vertical direction, overlying the midline to the level of the second lumbar vertebra before entering the left or right side of the abdomen.
4. Indeterminate: If the position of the sigmoid colon could not be ascertained from available images.
The frequency of the sigmoid colon for the above-mentioned positions was calculated. The mean (95% CI) age for different positions of the sigmoid colon was ascertained using a Kruskal-Wallis test. The prevalence of gender for different positions of the sigmoid colon was ascertained using a Chi-square test.

RESULTS

During a period of 1 year (2007), 113 contrast enema studies were done at our center. The images of 91 studies were available for review. There were 68 male and 23 female children. The age range varied from 2 days to 13 years (mean age 2.3 years). There were 76 preoperative and 15 postoperative cases.

Clinically suspected Hirschsprung’s disease (60 cases; 65.9%) was the most common indication (in preoperative cases) for which request for contrast enema was received. The clinical diagnosis in the remaining preoperative cases was anorectal malformation in 9 (9.89%) (anovestibular fistula 7, anal stenosis 1, anterior ectopic anus 1), intussusception in 4 (4.39%), disseminated tuberculosis in 1 (1.1%), failure to thrive in 1 (1.1%), and anal incontinence in 1 (1.1%) patients. Among the 15 postoperative cases included in the study, surgery had been done for Hirschsprung’s disease in six (40%) cases, for anorectal malformation in six (40%) cases, and for one case (6.7%) each of intussusception, ileal perforation, and pyloplasty.

Evaluation of the available images in 91 patients revealed that 33 (36.26%) children had the sigmoid colon in the left lower quadrant [Figure 1] while in 32 (35.16%) the sigmoid colon was in the right lower quadrant [Figure 2]. The sigmoid colon was observed in the midline overlying lumbar vertebrae [Figure 3] in 12 (13.19%) patients while its position was indeterminate in 14 (15.38%) cases.

The left-sided sigmoid colon was seen in 23 boys (69.7%) and 10 girls (30.3%); the right-sided sigmoid colon was present in 24 boys (75%) and 8 girls (25%); the midline position was seen in 9 boys (75%) and 3 girls (25%); and the indeterminate position was found in 12 boys (85.71%) and 2 girls (14.29%). In children with age more than 5 years, the right lower quadrant, left lower quadrant, midline, and indeterminate positions of the sigmoid colon were 6/11 (54.5%), 3/11 (27.3%), 1/11 (9.09%), and 1/11 (9.09%), respectively.

The mean (95% CI) age was not significantly different for different positions of the sigmoid colon using a Kruskal-Wallis test ($P = 0.87$). The prevalence of gender was also not significantly different for different positions of the sigmoid colon using a chi-square test ($P = 0.49$).

DISCUSSION

Conventionally, the sigmoid colon is believed to occupy the left iliac fossa.[1,2] However, a recent study suggests that the sigmoid colon in young children (age <5 years) differs from the adult sigmoid colon as it has greater redundancy, and may often lie entirely to the right side.[1] This study included patients of age 5 years or younger and excluded postoperative cases. We also included postoperative cases in our study group as we believed that the position of the sigmoid colon in right iliac fossa has the potential of causing diagnostic problems in interpretation of plain films of postoperative patients also. Our study, apart from reaffirming the finding of previous study, also found that the sigmoid colon

Figure 1: Nine-month-old female child with clinically suspected Hirschsprung’s disease. Stored fluoroscopic image of the contrast enema study reveals a sigmoid colon in the left lower quadrant

Figure 2: Six-month-old male child with clinically suspected Hirschsprung’s disease. Stored fluoroscopic image (also called fluoro grab or last image hold) of the contrast enema study reveals a sigmoid colon in the right lower quadrant
may lie in the right lower quadrant in older children as well. In our study, the frequency of the right-sided sigmoid colon was 35.16%. In children with age more than 5 years also, the sigmoid colon was located in the right iliac fossa in 54.5%. The clinical significance of correct identification of the sigmoid colon in the right iliac fossa is discussed below.

Plain radiographs of the abdomen continue to be the initial radiological investigation performed in patients suspected to have intestinal obstruction. The role of radiologist is to confirm the presence of obstruction, identify the level and severity of obstruction, ascribe a possible cause, and identify bowel ischemia. For the purpose of ascertaining the level of intestinal obstruction, it is essential to know the normal location of different segments of the bowel in abdomen. Thus correct identification of air in the right iliac fossa as the sigmoid colon may help in possible diagnosis of Hirschsprung’s disease rather than considering cecal/distal ileal obstruction.

Confident identification of cecal air shadow is important while evaluating plain radiographs of the abdomen for malrotation, appendicitis, and intussusception. Intussusception is a common emergency in the pediatric population. Although different segments of the bowel may be involved, the most common location is hepatic flexure due to ileocolic intussusception. The ileocolic intussusception is characterized by lack of air in the cecum and ascending colon. The presence of air in this bowel segment makes the diagnosis of ileocolic intussusception unlikely. Hence, while evaluating the plain radiographs for possible ileocolic intussusception, it is important to know that gas filled bowel in right iliac fossa may be a sigmoid colon. In our experience, the position of the sigmoid colon in the right lower quadrant also poses problems in assessment of endpoint of pneumatic reduction of intussusception as the sigmoid colon overlaps with the cecum and terminal ileum.

Malrotation is an anomaly which can have life-threatening complications in the form of midgut volvulus. This condition is characterized by abnormal location of the duodenojejunal flexure. It is important to note that the position of cecum is seldom normal (5-20%) in the patients of malrotation. Thus, correct identification of air shadow in right iliac fossa as the sigmoid colon can lend support to the diagnosis of malrotation and prompt an early upper gastrointestinal series. It is important to note the value of identification of cecal position as upper gastrointestinal series may be equivocal in up to 15% of patients of malrotation.

A recent prospective study proposed fecal loading of the cecum a sensitive (97.05%) and specific (85.33%) radiographic sign for diagnosis of acute appendicitis on plain radiographs. This appearance is attributed to ileus which occurs in the cecum owing to the surrounding inflammation. It is suggested that fecal loading on plain radiographs may be a useful sign associated with acute appendicitis. Again, it becomes important not to mistake a sigmoid colon for cecum in suspected cases of appendicitis.

Apart from the diagnostic significance of the right iliac fossa location of the sigmoid colon, another important issue pertains to percutaneous cecostomy procedures. This procedure is being increasingly employed for treating severe defecation disorders in children. The technique involves percutaneous puncture of cecum under fluoroscopic guidance and placement of a drainage catheter in cecum. We recommend that the interventional radiologists be aware of the possibility of a sigmoid colon overlying cecum in the right lower quadrant to avoid accidental puncture of a sigmoid colon.

A limitation of our study is that all the patients included in the study were clinically suspected to have large bowel disease. Hence, they cannot be considered to represent the normal population. However, it is pertinent to note that it is not possible to have data on normal population as it would be unethical to subject normal children to enema studies and expose them to unnecessary discomfort and radiation exposure.

In conclusion, the frequency of the right-sided sigmoid colon in children is significant enough that it cannot be ignored. Awareness of this finding is of crucial significance in interpretation of plain radiographs of the abdomen, for assessing the end result of percutaneous reduction of intussusception, and while performing percutaneous cecostomies.
REFERENCES

1. Fiorella DJ, Donnelly LF. Frequency of right lower quadrant position of the sigmoid colon in infants and young children. Radiology 2001;219:91-4.
2. Netter FH. Atlas of human anatomy. Summit NJ: CIBA; 1989. p. 231-333.
3. Burkill G, Bell J, Healy J. Small bowel obstruction: The role of computed tomography in its diagnosis and management with reference to other imaging modalities. Eur Radiol 2001;11:1405-22.
4. Ko HS, Schenk JP, Tröger J, Rohrschneider WK. Current radiological management of intussusception in children. Eur Radiol 2007;17:2411-21.
5. Applegate KE, Anderson JM, Klatte EC. Intestinal malrotation in children: A problem-solving approach to the upper gastrointestinal series. Radiographics 2006;26:1485-500.
6. Long FR, Kramer SS, Markowitz RI, Taylor GE. Radiographic patterns of intestinal malrotation in children. Radiographics 1996;16:547-56.
7. Petroianu A, Alberti LR. Importance of the new radiographic sign of fecal loading in the cecum in the presence of acute appendicitis in comparison with other inflammatory diseases of the right abdomen. Eur J Intern Med 2008;19:22-6.
8. Chait PG, Shlomovitz E, Connolly BL, Temple MJ, Restrepo R, Amaral JG, et al. Percutaneous cecostomy: Updates in technique and patient care. Radiology 2003;227:246-50.
9. Mousa HM, van den Berg MM, Caniano DA, Hogan M, Di Lorenzo C, Hayes J. Cecostomy in children with defecation disorders. Dig Dis Sci 2006;51:154-60.
10. Sierre S, Lipsich J, Questa H, Bailez M, Solana J. Percutaneous cecostomy for management of fecal incontinence in pediatric patients. J Vasc Interv Radiol 2007;18:982-5.

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