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Diagnosis of childhood intussusception: Ultrasound features

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We report ultrasonographic features of 24 children with surgically confirmed intussusception. Ultrasonography was the primary diagnostic procedure in all children, and in 22 patients ultrasound examination was followed by barium enema study. In 2 patients barium enema was contraindicated due to long duration of symptoms and early signs of peritonitis. Those 2 patients were operated following the ultrasound findings only.

Key words: intussusception; ultrasonography; child; infant

Introduction

Intussusception refers to invagination of a segment of bowel into its contiguous neighbour. Most cases of intussusception are idiopathic ileocolic1 and occur in children between the ages of 3 months and 2 years, thus representing the most common abdominal emergency of early childhood.2-4 The use of ultrasonography has brought considerable changes in the diagnosis and therapy of intussusception in the past few years.5,6 The preference of ultrasound (US) is based on its performance and ability to image entire abdomen, solid organs and hollow gastrointestinal tract. US proved to be sufficient for high-accuracy investigation of clinically suspected intussusception, enabling selection of those patients in need of an enema diagnostic or therapeutic study.

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Patients and methods

In our study we reviewed 24 patients with intussusception diagnosed on US. The US findings were confirmed either by barium enema study or on surgery

The equipment used in all examinations was ALOKA 1700 and ACUSON 128 XP, with curved and linear transducers of 5 and 7 MHz. Patients were not specially prepared for the examination. All patients lied in supine position and there were no anesthesia or sedation needed. After an orientational investigation of the entire abdomen by curved transducer, a linear array transducer was used to analyze the intussuscepted part of the bowel. In 2 patients with long lasting symptoms of intussusception barium enema study was not done and the patients were referred to surgery. Intussusception was confirmed in both cases.

Results

There were altogether 24 patients clinically suspected of intussusception. Diagnosis was made upon US findings and all of these were also surgically confirmed. In most cases (21 i.e. 87.5%) there was ileocolic intussusception present; 16 of them produced "doughnut" sign with outer hypoechogenic ring surrounding an echogenic center (Figure 1a), while 5 of them were seen as "target" signs with multiple concentric hypoehogenic rings surrounding an ehogenic center (Figure 1b). On longitudinal images the intussusception has a reniform or sandwich appearance (Figure 2). In 3 patients (12.5%) there was ileoileal intussusception surgically confirmed (Figure 3). Pathologic lead point was not found. One patient with clinical and US suspicion of ileocolic intussusception underwent barium enema study and endoscopy, and a primary lymphoma of non-Hodgkin type was found. On sonography, there was evidence of hypoechogenic bowel wall thickening and mesenteric lymph node enlargement; this patient was only false positive in

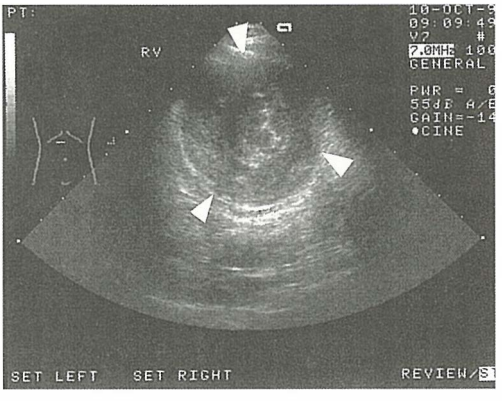

Figure 1a. Transverse ultrasound scan of an infant with abdominal pain and vomiting shows a mass (arrows) with an echogenic center and hypoechogenic wall ("doughnut sign"); the appearance strongly suggests intussusception.

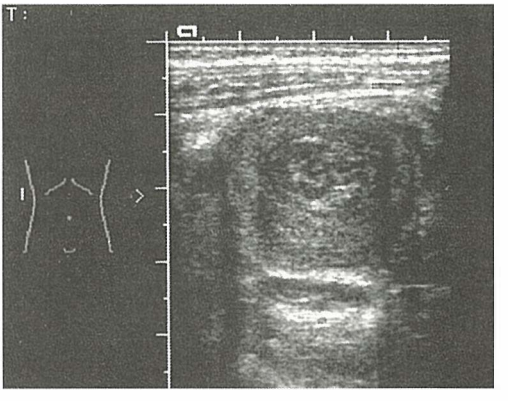

Figure 1b. Transverse scan shows a mass with multiple hypoechogenic concentric rings ("target sign").

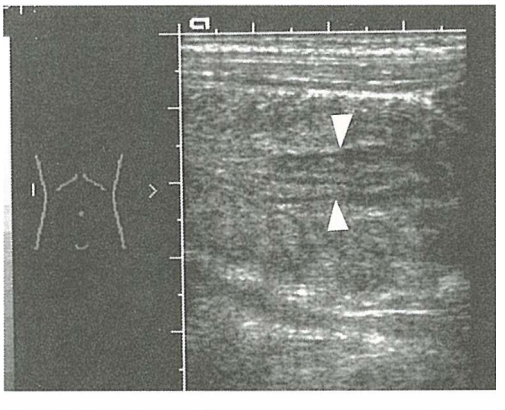

Figure 2. On a longitudinal scan the intussusception has a reniform or "sandwich" shape; intussuscepted small bowel (arrows).

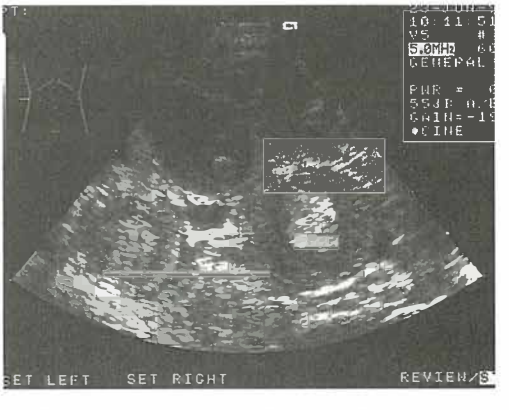

Figure 3. Ileoileal intussusception; two echogenic centers surrounded with hypoechogenic edematous small bowel wall.

our study according to US features. In 10 patients with ileocolic intussusception, intussuscepted part of the small bowel could be followed up to the hepatic flexure, in 2 patients even further up to the splenic flexure, and in 2 patients the loop of the small bowel reached the sigmoid part of the colon.

Discussion

Utrasonography can be used as a rapid and sensitive screening method in the diagnosis or exclusion of childhood intussusception. US finding of intussusception is characteristic, particularly on transverse sonograms.[7,8] In our group of patients the most frequent US finding (16 ileocolic and 3 ileoileal) was echogenic central part surrounded by hypoechogenic thickened bowel wall ("doughnut" sign), and in the rest of 5 patients intussusception was shown as concentric hypoechogenic circles ("target" sign). On longitudinal scans, the appearance has been described as the sandwich or pseudokidney sign. Free fluid in the pelvis was found in 4 patients only. This sign is probably due to a long duration of intussusception, hence it is absent when the diagnosis is made early enough. In addition to identifying the intussusception, which is usually found either in the mid upper abdomen on the right side, the whole abdomen should be examined because an intussusception ca also be present in the pelvis or in the left abdomen. More than 90% of intussusception have no lead point as a cause of intussusception and are believed to be caused by enlarged lymphoid follicles in the terminal ileum.[9] In the remaining cases, pathologic lead points are present; the most common are Meckel's diverticula, polyps, duplication cysts, hematomas.[10,11] Intussusception may be a presenting feature of non-Hodgkin lymphomas, although lymphoma itself could give US signs mimicking intussusception (circular thickened hypoechogenic bowel wall)

According to our experience, whenever intussusception is suspected ultrasound examination of the abdomen is diagnostic procedure of choice. Children with low-risk of intussusception, according to anamnestic and clinical data, should be examined by US, while in children with high-risk of intussusception US should always be followed by barium enema study with intention not only of diagnosing but also reducing the intussusception.

In conclusion, US is a very useful screening method in the diagnosis of intussusception which yields very characteristic US signs. Barium enema study still retains its place in the diagnosis of intussusception, both as a diagnostic and therapeutic procedure (reduction of intussusception), although in the future the technique of ultrasound monitoring of intussusception reduction (US-guided hydrostatic reduction) will be surely improved and it will become a diagnostic and therapeutic routine.[6,12-14]

References

1. Siegel MJ. Gastrointestinal tract. In Siegel MJ, editor. *Pediatric sonography*. New York: Raven Press; 1995. p. 278-81.

2. West KW, Stephens B, Vane DW, Grosfeld JL. Intussusception: current management in infants and children. *Surgery* 1987; **102:** 704-10.

3. Bisset GS, Kirks DR. Intussusception in infants and children: diagnosis and therapy. *Radiology* 1988; **168:** 141-5.

4. Morrison SC, Stork E. Documentation of spontaneous reduction of childhood intussusception by ultrasound. *Pediatr Radiol* 1990; **20:** 358-9.

5. Bhisiktul DM, Listernick R, Shkolnik A, Donaldson JS, Henricks BD, Feinstein KA, Fernbach SK. Clinical application of ultrasonography in the diagnosis of intussusception. *J Pediatr* 1992; **121:** 182-6.

6. Wood SK, Kim JS, Suh SJ, Paik T, Choi SO. Childhood intussusception: US-guided hydrostatic reduction. *Radiology* 1992; **182:** 77-80.

7. Swischuk LE, Hayden CK, Boulden T. Intussusception: indications for ultrasonography and explanation of the doughnut and pseudokidney signs. *Pediatr Radiol;* 1985; **15:** 388-91.

8. Bowerman RA, Silver TM, Jaffe MH. Real-time ultrasound diagnosis of intussusception in children. *Radiology* 1982; **143:** 527-9.

9. Ein SH. Leading points in childhood intussusception. *J Pediatr Surg* 1976; **11:** 209-11.

10. Patriquin HB, Afshani E, Effman E, et al. Neonatal intussusception: a report of 12 cases. *Radiology* 1997; **125:** 463-6.

11. Mulvihill DM. Ultrasound findings in chronic intussusception in a patient with cystic fibrosis. *J Ultrasound Med* 1988; **7:** 353-5.

12. Bolia AA. Case report. Diagnosis and hydrostatic reduction of an intussusception under ultrasound guidance. *Clin Radiol* 1985; **36:** 655-7.

13. Riebel TW, Wasir R, Weber K. US-guided hydrostatic reduction of intussusception in children. *Radiology* 1993; **188:** 513-6.

14. Arnaud O, Weil D, Boseq M, Michel J, Robert M. Acute intestinal intussusception in infants and children and abdominal sonography. *J Radiol* 1986; **67:** 135-6.