مجلة العلوم الطبية
Journal of Medical Sciences
www.Suj.sebhau.edu.ly
Received 27/03/2018 Revised 21/09/2018 Published online 15/11/2018

Small Bowel Intussusceptions by Ultrasound

Emhmed Saaid[1], Emraga Abohamod[2]
[1]Department of Diagnostic Radiology, Sebha Medical Center Hospital/College of Medicine ,Sebha University.
[2]Department of anatomy ,College of medicine, Sebha university ,Libya.

Abstract The purpose of this study was to evaluate the typical ultra-sonographic findings of transient Small Bowel Intussusceptions (SBI)) in paediatrics. 6 transient SBI (male: female =4:2, age: 7–120 months (mean 38.months)) patients diagnosed on ultrasonography were retrospectively evaluated. The findings of location, diameter, thickness of outer rim, and inclusion of mesenteric lymph nodes within intussusceptions were compared. In the transient SBI, the head of intussusceptions was located in the right lower quadrant (RLQ) in 3 (50%), the right upper quadrant (RUQ) in 1 (16,1%) and the periumbilical area in 2 (33,4%) cases. The anteroposterior (AP) diameter ranged from 0.9–2.5 cm (mean 1.38 cm), and thickness of outer rim ranged from 0.10–0.34 cm (mean 0.26 cm). No mesenteric lymph nodes were contained within the intussuscipiens. In conclusion, the transient SBI occurs predominantly in the RLQ or periumbilical region has a smaller AP diameter, a thinner outer rim, and dose not contain mesenteric lymph nodes.

Intussusception is a common abdominal emergency that requires prompt diagnosis and adequate management.[1] The wider use of ultrasonography and its improved resolution and better appreciation, transient small bowel intussusception (SBI) is frequently visualized on practical daily ultrasound. In recent literature,[2–5] careful ultrasonographic examination and/or interpretation of CT scans have disclosed many SBIs that were reduced spontaneously without any intervention. Conservative observation was warranted in these patients by Doi et al.[5] The purpose of this article is to evaluate the typical ultrasonographic findings of transient small bowel intussusceptions (SBI).

Methods and materials

The 6 cases diagnosed as intussusception on ultrasonography during the period from January 2009 to July 2014 were retrospectively evaluated. The findings of ultrasonography and the medical records were reviewed. Because all ultrasonography was performed for the evaluation of possible intussusception, and because this is a retrospective study, according to the policy of our institute, approval by the institutional review board was not required.

During this period, a total of 6 SBIs were diagnosed by ultrasonography.

The ultrasonographic examination is performed by radiologist using the HDI 5000 (Advanced Technology Laboratories). After scanning the solid abdominal organs using a convex transducer, a 5–12 MHz linear transducer is then used for the detailed evaluation of the bowel and mesentery.

Ultrasonographic criteria for the diagnosis of intussusceptions consists of the presence of one or more sonographic characteristic signs: a doughnut sign (an even thickened hypoechoic outer and a central hyperechoic core), a crescent-in doughnut sign (an even outer hypoechoic rim with a central hyperechoic crescent) or a multiple concentric rings sign (a mass with multiple alternating hypoechoic and hyperechoic concentric rings).

The location of the intussusception was documented according to the site of its head: the right upper, right lower, left upper, left lower, periumbilical or epigastric region. The diameter and the thickness of the outer sonolucent rim (outer wall to the luminal surface) of the intussusception were measured on transverse scan by using the electronic callipers of the ultrasonography equipment.

The presence or absence of mesenteric lymph nodes in the intussuscipiens was evaluated.

In the suspected transient SBI patients, follow-up ultrasonography was performed 1–2 days after the initial examination to check for the persistence or disappearance of the transient SBI.

Results:

On ultrasonography, transient SBI appeared as a crescent-in-doughnut (Figure 1a) or multilayered round mass on a transverse scan, and the short segmental sandwich sign (Figure 1b) was seen on a longitudinal scan. In the SBIs, the head of the intussusception was located in the right lower quadrant in 3 cases (50%), the right upper quadrant in 1 cases (16,7 %) and the periumbilical area in 2 cases (33.3%).

The anteroposterior diameter of the SBIs ranged from 0.84 cm to 2.4 cm with a mean diameter of 1.38 cm. The thickness of the outer rim of the SBIs ranged from 0.10 cm to 0.34 cm with a meandiameter of 0.26 cm. One patient underwent CT scan for evaluation of bowel ischaemia or perforation, but this was negative and the patient was finally diagnosed with acute gastroenteritis.

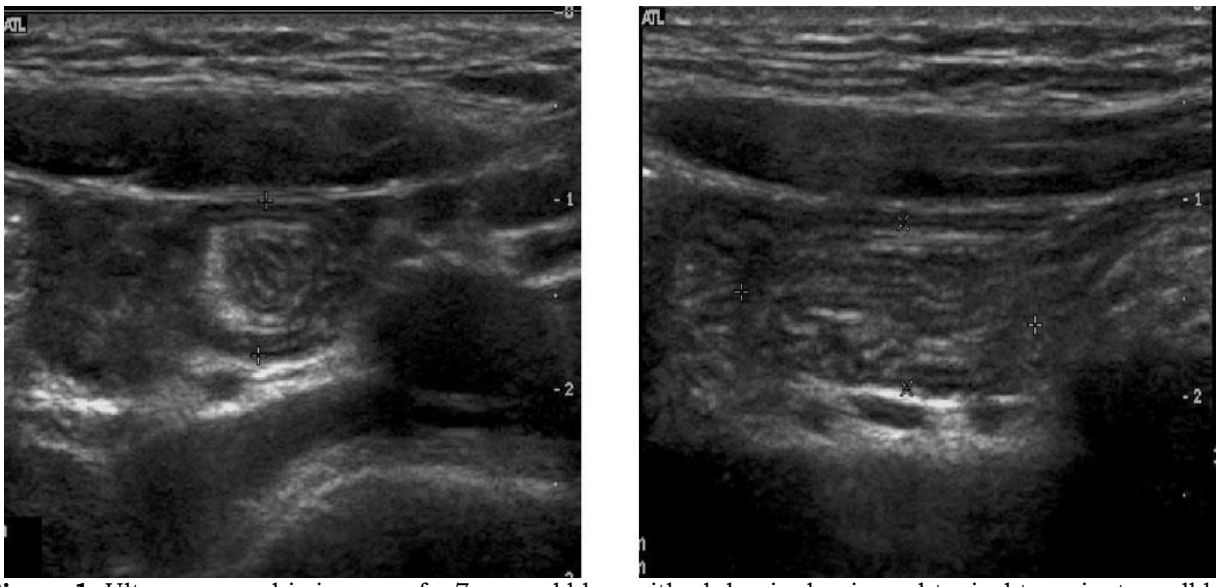

Figure 1. Ultrasonographic images of a 7-year-old boy with abdominal pain and typical transient small bowel intussusception. Image in transverse plain (a) shows the crescent-in-doughnut sign (cursors) and image in longitudinal plain (b) shows the sandwich sign (cursors). The diameter of the doughnut measured 0.84 cm and the thickness of the outer rim of the lesion measured 0.10 cm.

Discussion:

More than 90% of cases of intussusception that occur in paediatric patients are of an ileocolic, ileocaecal and most previous studies have focused on these cases.[6–10] By contrast, more than 50% of adult intussusceptions are SBI, commonly combined with underlying malignant lesions.[11,12]

Transient SBI in paediatric patients is believed to be uncommon, and the clinical and sonographic characteristics have not been well described. Recently, Kornecki et al[3] have reported that most of the SBI observed in children revealed no lead point and spontaneous reduction was common, thus conservative observation was warranted.

A high percentage of cases of transient SBI was observed in a recent ultrasonographic study in children.[13] This may be related to the increased use of abdominal ultrasound in children presenting with abdominal pain and secondary to the improvement in resolution and quality of the images.

In general, transient SBI occurs in older children (mean age 4 years) compared with large bowel intussusceptions (less than 2 years). Transient SBI patients commonly presented with non-specific symptoms, such as vomiting, irritability with crying, fever and/or abdominal pain, or with symptoms characteristic of intussusception, such as cyclic abdominal pain, a palpable mass and red currant jelly stool, which occurs in approximately one-fifth of patients. Therefore, diagnosis based on clinical examination can be problematic unless imaging studies are performed.[2]

In many instances, the causal relationship between the symptoms and SBI is uncertain. Many of the patients have additional problems, such as acute viral gastroenteritis, mesenteric lymphadenopathy, large bowel intussusception, HSP (Henoch–Scho¨nlein purpura) and the postlaparotomy state. All of which may be the causal factor of the abdominal symptoms. SBI may also occur incidentally in asymptomatic patients.

The following factors are thought to predispose children to develop SBI:

(a) Anatomical change and swelling of the bowel wall; (b) Abnormal gastrointestinal motility; and (c) Scar or adhesion of the bowel from previous insult.[3]

Sonography has been reported to be highly sensitive (98–100%) for the diagnosis of intussusceptions.[9,10,14]

Tiao et al[15] has also reported that the sensitivity of sonography for detecting SBI among paediatric patients was 84%, although a detailed sonographic evaluation of the abdomen may occasionally be limited to excessive bowel gas in the dilated bowel loops and the irritability of the patients.

The presence on axial US scans, this complication appears as the double crescent-in-doughnut sign. This finding has not been seen in any of our transient SBI patients.

Transient SBI in paediatric patients is more difficult to detect because the lesions are usually smaller and atypically located and, thus, more experience is necessary.

In one report, real-time evaluation on the video records showed peristalsis of the invaginated bowel wall in all of the 2 transient SBI patients that were recorded.[2] Visible wall motion on real-time ultrasound observation may also suggest an early reduction.

Despite the sonographic identification of various lead points, such as enterogenous cyst, lipoma, lymphangioma, Meckel's diverticulum and Peutz–Jeghers syndrome, in cases of SBI,[17–20] it was very difficult to find the underlying lesions preoperatively on ultrasonogram.[15] CT has been reported to be a sensitive examination for the diagnosis of intussusception and the

demonstration of the presence of associated lead points. In addition, it provided an excellent preoperative evaluation of the possible extension and/or dissemination of a malignant tumour, if present, and was also helpful in excluding other abdominal conditions.[11,12] Nevertheless, the routine application of CT for all paediatric patients with non-specific abdominal symptoms and signs is of doubtful use. If the ultrasonographic finding is typical of transient SBI, the patient may be managed conservatively and ultra-sonographic follow up seems to be sufficient for subsequent monitoring to confirm a spontaneous reduction as long as it is performed by an experienced radiologist.[2] Therefore, CT should not be performed to avoid unnecessary radiation exposure. Because most cases of transient SBI resolve quickly, we suggest that the timing of follow up should be 1 h or at least within 1 day from the initial examination.

Although SBI that needed surgical intervention were not included in our study, transient SBI should be differentiated from these cases. The lesion generally gets larger as swelling of the bowel wall progresses, as was demonstrated by the different outer rim thicknesses in the two groups (mean 0.26 cm vs0.72 cm for the transient and surgically managed SBIs, respectively). The lead point contained within the intussusception may also increase the size, which occurred in 46% of the surgically managed SBI cases.[21] Other ultrasonographic findings known to be associated with difficult reduction of the intussusceptions include the presence of bowel obstruction, free fluid and fluid trapped between the intussuscepted bowel walls.[22] All these were more frequent in the patients with surgically managed SBI.

The reported rates of post-operative SBI in children have ranged from 4% to 16%. The reported incidence is even higher in patients with neuroblastoma and in trauma patients after laparotomy. The diagnosis of postoperative SBI remains challenging because its clinical presentations mimic the common post-operative complaints of abdominal pain, vomiting and ileus, and radiographic imaging studies are usually inconclusive.

Therefore, close ultrasonographic follow up for patients after surgery should be carried out for possible SBI.[21]

This study was limited due to the lack of pathological correlation in small bowel intussusceptions because of their spontaneously resolving nature, which made surgery unnecessary.

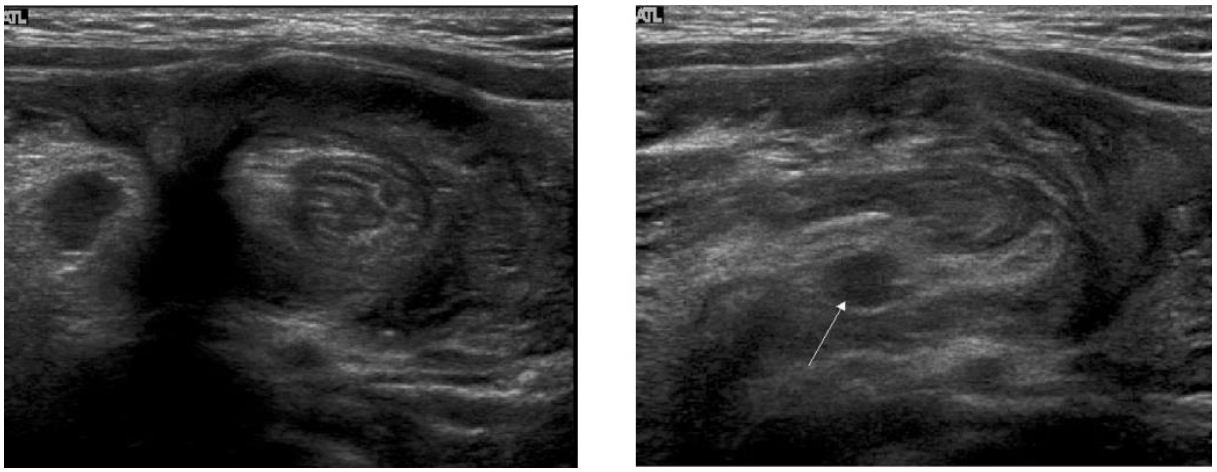

Figure 2. Ultrasonographic images of a 10-month-old boy with cyclic irritability and typical ileocolic intussusception. Transverse (a) and longitudinal (b) US scans show the diameter of the head measuring 2.88 cm and the thickness of the outer rim of the lesion measuring 0.49 cm. There was a mesenteric lymph node (arrow).

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