

ULTRASOUND DIAGNOSIS OF INTUSSUSCEPTION

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ABSTRACT

Retrospective study of ultrasound (US) appearance of intussusception was done in 15 patients with clinically suspected of intussusception, 12 pediatric and 3 adult patients. Intussusception was correctly diagnosed and correctly excluded by US in 12 and 3 patients respectively. Most common characteristic US findings are smooth, well defined round or oval mass with multiple concentric rings. Other signs included sandwich sign, donut sign, crescent-in-donut sign, Hayfork sign. Clinical signs and symptoms are often not typical, only 33% of our patients had classic triad. US is useful for screening and diagnosis of intussusception. Unnecessary invasive procedures for diagnosis or treatment could be avoided.

INTRODUCTION

In the past, barium enema was used for the diagnosis of intussusception. Clinical diagnosis is frequently uncertain, leading to unnecessary barium enema. At present role of US in the diagnosis of various gastrointestinal lesions including intussusception is widely accepted. US is an appropriate procedure especially for pediatric patients because it is non-invasive and without radiation. We have performed several cases clinically suspected intussusception with US. We retrospectively reviewed the US images to define its appearances.

MATERIAL AND METHOD

Retrospective study was done in 15 patients with clinically suspected of intussusception. Ultrasound was performed with realtime, 3.75 MHz machine. The US images were reviewed as well as clinical data, operative and pathological findings from the medical records.

Age of the patients with intussusception is

varied from 4 months to 43 years, 5 males and 7 females. Mean age of pediatric patients is 9.7 months. Seven cases were proven by barium enema, one case of ileoileal intussusception by GI-follow through and the other four cases by surgery. Three cases were successfully reduced by hydrostatic barium reduction.

RESULTS

Twelve cases of intussusception were correctly diagnosed by US. There are 3 negative cases who were given conservative treatment and discharged uneventfully. US findings of intussusception are characteristic. Most common findings were well-defined smooth round or oval mass with multiple concentric hypo- and hyperechoic rings (Fig. 1). Other US findings were donut appearance (Fig. 2), sandwich appearance (Fig. 3), triangular hyperechoic band (Fig. 4), crescent-in-donut appearance (Fig. 5) and "Hayfork" appearance (Fig. 6)

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Fig. 1 Transverse image of the intussusception shows well-defined round mass with multiple concentric rings. Hypoechoic (arrowheads) alternates with hyperechoic rings (arrow) are demonstrated.



Fig. 2 Transverse image of the intussusception shows a donut sign. A well defined round mass with hyperechoic center surrounded by thick hypoechoic rim of edematous wall.



Fig. 3 Longitudinal image of the intussusception reveals an oval mass with multiple hypo-and hyperechoic layers (arrowheads), the sandwich sign.¹⁵

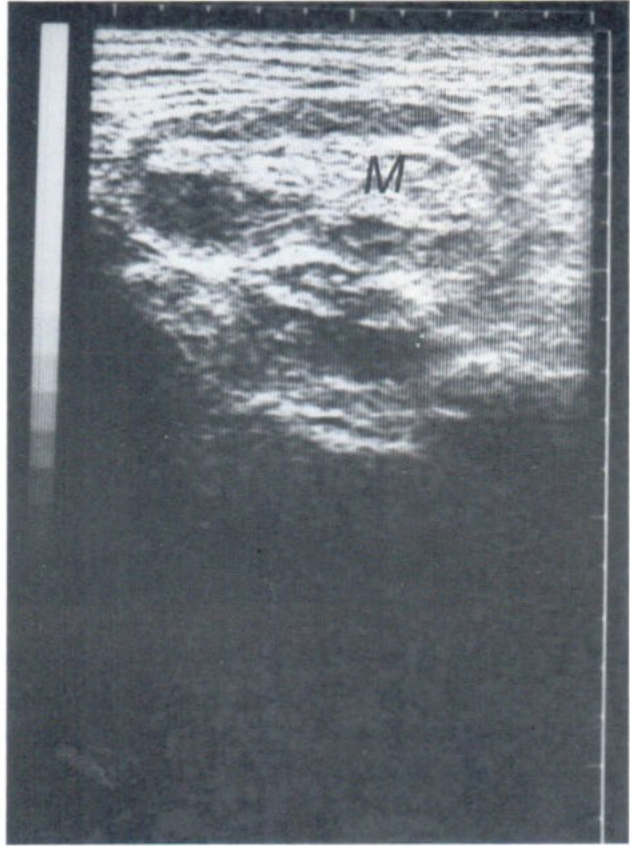


Fig. 4 Longitudinal image shows a triangular hyperechoic area with its apex directed to the apex of intussusception corresponding to mesentery with abundant fat.



Fig. 5 Transverse image shows the crescent-in-donut sign. Echogenic crescent(arrow) enclosing hypoechoic center(arrowhead) represent mesentery enclosing the entering limb of intussusceptum. The outer hypoechoic ring is formed by the intussusciens and returning limb of intussusceptum.



Fig. 6 Longitudinal image shows the intussusception (between cursors) and the "Hayfork" sign (arrowheads)

Five of the twelve cases had leading points found at surgery. They are Meckel's diverticulum and ectopic pancreas in pediatric patients, lymphoma, lipoma and caseous granuloma in the

adults. The types of intussusception and clinical signs are shown in table 1 and 2. There is 1 case of ileocolocolic type which the intussusceptum reached the rectum.

Table 1 : Types of intussusception

Type of intussusception	No.	remarks
Ileocolic	8 (67%)	-
Ileoileal	2 (17%)	Ectopic pancreas, Caseous granuloma
Ileoileocolic	1 (8%)	Meckel's diverticulum
Ileocolocolic	1 (8%)	-
Total	12	

Table 2 : Clinical signs and symptoms

Clinical signs	No.
Abdominal pain	10 (83%)
Vomitting	9 (75%)
Currant jelly stool	7 (58%)
Palpable abdominal masses	7 (58%)
Questionable abdominal masses	3 (25%)
No palpable mass	2 (16%)
Classic triad	4 (33%)
Classic triad and masses	2 (16%)

DISCUSSION

The US findings of intussusception is characteristic and quite different from that of the other gastrointestinal lesions such as tumour, inflammatory disease and some other lesions. Various US findings of intussusception were described in the literature. The target-like abdominal mass,^{1,2,11} hourglass, fused target-like configurations³ were described in the early reports. Subsequently, dual-pattern images with anatomical explanation was reported by several authors.^{4,5,6,7,10} Later US findings that were described were multiple concentric ring sign,⁶ Hayfork¹³ or trident sign¹⁴ and recently the crescent-in-donut sign.¹⁰

The various US findings depend on the level and direction of scanning plane^{5,10} degree of parietal edema as well as the length of the dragged mesentery.¹⁰ The intussusceptum is telescoped into the intussusceptans until it cannot go further owing to traction of the mesentery which is dragged between the entering and returning limbs of intussusceptum. Venous obstruction occurs with resultant wall edema. The edema is maximal at the apex of intussusceptum.⁴ Therefore at or near the apex a target-like or donut pattern was demonstrated. Very thick hypoechoic rim is due to severe edema of the entering and returning limbs of intussusceptum⁵ with resultant obliteration of echogenic interface between them and also due to the absence of mesentery.¹⁰ Scanning at the middle or at the base of intussusception may show the crescent-in-donut appearance, of which the echogenic crescent represents mesentery enclosing the entering limb of the intussusceptum.¹⁰ Multiple concentric ring appearance on the transverse plane and the layering tubular mass (sandwich-like) on the longitudinal plane are due to parietal edema of the more proximal intussuscepted bowel in less severe cases.⁵

In our patients, the most common US finding is the multiple concentric rings. This was

a retrospective study so not all signs were expected to be demonstrated on the films. Multiple concentric ring sign is characteristic and easiest to be recognized. There may be no need to try to demonstrate all signs that have been described. In adult patients, one may need to differentiate mass of intussusception from tumour mass. The contour of intussusception is smooth, round or oval shaped with uniform wall thickening. Tumour frequently have irregular lobulated contour with asymmetrical wall thickening.

Prospective studies of the diagnostic value of US in clinically suspected intussusception compared with barium enema showed negative predictive value of 100%, sensitivity of 100% and specificity of 88%-93%.^{8,9,12} In our series, only 4 in 12 patients (33%) had clinical triad, abdominal pain, vomiting and currant jelly stool (Table 2). US diagnosed intussusception in the 4 patients with the classic triad as well as the 8 patients without it.

Searching for intussusception is easy to perform because of its relatively large size and characteristic appearances. Its widest diameter is usually 3 cm. or greater.⁸ The majority of intussusception (88%) were found in transverse or subhepatic portion of colon.⁸ In our patients, most of them are located in the right side of abdomen. Examination should be done throughout the abdomen especially in case without palpable mass.

US can demonstrate intussusception even through it is ileoileal type. But it could be difficult to recognize that it is ileoileal type. This may cause problem when trying to reduce it either by barium, air or saline enema. If barium enema is performed and results in negative study, intussusception should not be excluded yet. GI-follow through or CT scan should be considered.

CONCLUSION

Retrospective study of intussusception was done. Intussusception was correctly diagnosed and correctly excluded by US in all cases. It showed characteristic appearance. Clinical signs are frequently not typical, US screening could prevent unnecessary invasive procedures for diagnosis or treatment.

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