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## Evaluation of typhlitis in children: CT versus US

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Sir,

I am writing in reference to the article entitled “Neutropenic enterocolitis (typhlitis) associated with infectious mononucleosis,” by Sığircı et al., that was recently published in *Pediatric Radiology* [1]. In their article the authors state that computed tomography (CT) is the study of choice for the diagnosis of typhlitis due to the absent risk of bowel perforation when compared to colonoscopy or contrast enema examination. They also imply that ultrasonography (US) is less useful for the diagnosis of typhlitis because it is operator-dependent and image quality is compromised by significant ring-down artifact caused by distended loops of small-bowel in the right lower quadrant. We previously reviewed our experience with a cohort of 92 children being treated for cancer between 1990 and 2001 who had 99 episodes of typhlitis/colitis [2, 3]. In our review, 70 episodes were imaged by US and 51 by CT (some patients had both examinations). We recorded the largest colon wall measurement obtained by each modality and found that the mean bowel wall thickness measured by CT (1.4 cm, range 0.6–3.0 cm) was significantly larger ( $P=0.009$ ) than the mean thickness measured by US (0.65 cm, range 0.30–1.34 cm). We also found that US measurements were significantly correlated with the duration of typhlitis symptoms ( $P=0.05$ ), whereas CT measurements were not ( $P=0.67$ ). These findings suggest that CT measurements overestimate bowel wall thickness and, therefore, are less accurate than measurements obtained by US. We postulate that this is because on CT images intraluminal contents impair identification of the bowel mucosa, and inflammatory changes in surrounding mesentery may inhibit identification of the serosal surface (Fig. 1). In contrast, high-resolution US

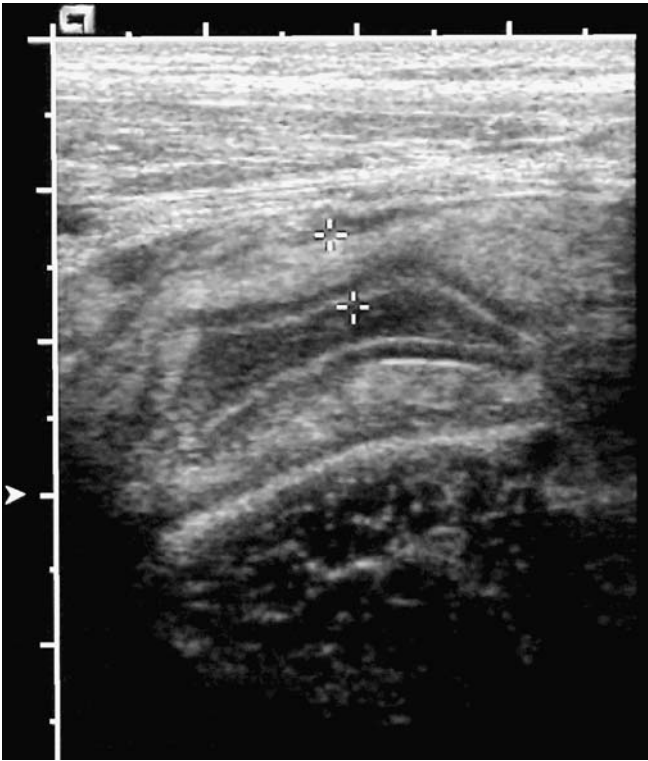


**Fig. 1** CT image of thickened colon (*arrowheads*). Note that intraluminal bowel contents (*straight arrow*) and surrounding inflammatory changes (*curved arrow*) make accurate measurement of the bowel wall difficult (reprinted with permission from McCarville et al. [2])

imaging allows visualization of individual layers of the bowel wall (the “gut-signature”) and, therefore, more accurate bowel wall measurement (Fig. 2).

We concluded that ultrasonography is superior to CT in predicting the outcome of typhlitis, and we strongly recommend its use in screening patients who are suspected of having this complication. Perhaps most important, ultrasonography has the additional benefit of not exposing the patient to the harmful effects of ionizing radiation. While the use of ultrasonography for this indication does depend on the experience of the sonographer and radiologist who perform and interpret the examination, it is incumbent upon physicians who direct the use of these imaging modalities to apply the ALARA principle whenever possible. With practice and attention to proper technique, bowel ultrasonography can be performed reliably and quickly and is well-tolerated by the patient. We use ultrasonography as the first-line imaging modality in the assessment of children with

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**Fig. 2** Transverse US image of the cecum demonstrates the alternating hyperechoic and hypoechoic layers of the bowel wall (the gut signature). Electronic calipers placed on the mucosal and serosal surfaces allow accurate bowel wall measurement (reprinted with permission from McCarville et al. [2])

suspected typhlitis. We image the colon, from cecum to rectum, with a high-resolution linear transducer and use a lower frequency sector transducer to assess the abdomen and pelvis for evidence of ascites. The average examination time is 20 min. Based on our findings, and those of others, we consider a colon wall measurement that is  $\geq 0.30$  cm to be abnormal [2–5]. This approach has been well-received by our clinical colleagues who now routinely include sonographic bowel measurements in their criteria for the diagnosis of typhlitis/colitis. We reserve CT for the rare patient with clinical signs and symptoms that suggest abdominal complications requiring invasive/surgical intervention.

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