Updates in neonatal gastrointestinal US

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Sonography has come to play a significant role in imaging of the gastrointestinal (GI) tract in neonates. Although plain radiographs of the abdomen remain essential in some situations, the information obtained from radiographs regarding the bowel itself is often limited. US has several advantages over radiographs in that it can provide detailed information about the bowel wall regarding echogenicity (including intramural gas) and thickness; real-time images can provide information regarding peristalsis, and Doppler techniques can provide information regarding perfusion. US can also clarify whether a gasless area on a radiograph is the result of collapsed bowel, fluid-filled bowel, free fluid or a focal fluid collection. Separation of bowel gas on abdominal radiographs is a nonspecific appearance, and US might elucidate whether this is a result of true bowel wall thickening or fluid within the bowel lumen or in the peritoneal cavity. Furthermore, US can easily depict pneumoperitoneum caused by very small amounts of free gas at least as accurately as plain radiographs and probably even more accurately.

To make the best use of US in the evaluation of the neonatal GI tract one has to optimize technique. The wider field of view obtained with vector or curved-array transducers is essential to evaluate the abdomen as a whole and to delineate the overall relationship of the bowel to other structures and free fluid or focal fluid collections. However, the features of the GI tract itself are often better depicted with the high-megahertz linear-array transducers. It is

essential to magnify these images so as to depict only an individual or just a few bowel loops at any one time and to ensure that the focal zone is directed at the level of maximum interest in the GI tract.

A relative limitation of US is the presence of large amounts of bowel gas but the technique of gentle graded compression can be useful in displacing the gas for better visualization. In neonates with severe abdominal tenderness, abdominal US might cause significant discomfort but the use of a large amount of gel on the abdominal wall can facilitate the examination by enabling images to be obtained without the transducer actually touching the abdomen. US should not be attempted in any neonate who is labile or unstable.

There is a wide range of clinical situations in which abdominal US is invaluable for assessment of the neonate with known or suspected GI tract pathology. For example, in neonates with non-bilious vomiting, US can easily differentiate those with hypertrophic pyloric stenosis from those with gastric foveolar hyperplasia or other rarer causes of gastric outlet obstruction. In neonates with bilious vomiting US is the modality of choice to determine whether a midgut volvulus is present. In those neonates without a volvulus, US evaluation of the anatomical position of the entire duodenum (facilitated with intraluminal fluid) might elucidate the presence or absence of midgut malrotation. In the above examples US will obviate the necessity for an upper GI series. Another less common use of US is in the evaluation of the esophagus in neonates suspected of having an N-type tracheoesophageal fistula.

Abdominal radiographs are still important in neonates suspected of having necrotizing enterocolitis (NEC). However, US can be invaluable in two clinical situations: first, in those neonates in whom the clinical and radiographic findings are nonspecific and the diagnosis remains indeter-

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minate and second, in those neonates in whom the diagnosis of NEC has been established but who are not responding to medical therapy and in whom the radiographs are unhelpful as they are nonspecific. In the latter situation, US has been shown to be far more accurate than radiographs in defining which neonates require surgery by depicting necrotic bowel (as radiographs cannot) or small amounts of free intraperitoneal gas when the abdominal

radiographs fail to do so. The challenge remains to demonstrate in a prospective study the exact role US plays in guiding management in NEC.

Exquisite images of the neonatal GI tract can be produced using modern US equipment if one pays meticulous attention to technique. Recognition of this might lead to many other applications of US for evaluation the GI tract in neonates.