

T1-weighted imaging of fetal microcolon

E. Rubesova¹, J. Gilmore¹, S. Vasanawala¹, and R. A. Barth¹

¹Pediatric Radiology, Lucile Packard Children's Hospital at Stanford, Stanford, CA, United States

Introduction: While T2-weighted images provide the diagnosis for most of fetal pathologies, T1-weighted images remain essential in the evaluation of fetal bowel. Meconium through its high content of bile salts and amino acids has high T1 signal intensity in the fetus. In utero, meconium accumulates in the rectum which is the largest segment of the fetal bowel. In newborns, microcolon is known to be associated with distal small bowel obstruction but microcolon is difficult to assess on prenatal ultrasound and has not been well described on prenatal MRI. The aim of our study was to evaluate T1-weighted MRI sequences for the diagnosis of microcolon and correlate the accuracy of prenatal diagnosis with postnatal imaging.

Materials and Methods: We performed a retrospective study (2002-2009) of 14 cases referred to us for bowel dilatation on prenatal US. All patients were scanned on a 1.5 GE magnet. T1-weighted images were obtained from FGRE (TR/TE 175/minimal, flip angle 19, slice thickness 5, FOV 32 cm) before 2008 and after (10/14 patients), from FGRE and 3D dual-echo SPGR (LAVA-Flex) (TE 2.4-5.2, flip angle 15, slice thickness 5.2, FOV 32 cm). In order to define microcolon, we established normal measures of the fetal rectum by measuring the rectum in 60 fetuses with no gastrointestinal abnormalities and plotted against gestational age. The measures were performed independently by 2 radiologists and inter observer study was performed. The measures of microcolon were compared to the normal data. FGRE and DE T1 weighted sequences and planes of acquisition were compared (grades 1-5) for the visualization of microcolon. Proximal meconium dilated bowel was noted. The prenatal diagnosis established on fetal MRI was correlated to postnatal findings.

Results: The normal rectal diameter increased with gestational age (21 to 37 weeks) –Fig 1. 13/14 patients with dilatation of small bowel on ultrasound had, on fetal MRI, rectal diameter smaller than the normal values. The sagittal plane provided slightly better visualization of the microcolon than the coronal and axial plane, FGRE and 3D dual-echo SPGR were of equal quality to demonstrate microcolon -Fig 2. Dilated bowel containing meconium was seen proximally to the microcolon in 8/14 cases. The prenatal diagnosis based on fetal MRI correlated with postnatal findings in 13/14 cases and included jejunal/ileal atresia (6) meconium ileus (1), meconium plug (3), megacystis-microcolon-hypoperistalsis syndrome (1), anorectal malformation (1), normal (1). The patient with normal outcome had microcolon on the MRI at 28 weeks but normal colon at 35 weeks of gestational age. 1/14 patients that did not correlate with postnatal findings had microcolon at 33 weeks but normal outcome.

Conclusions: T1-weighted images are essential to demonstrate the presence of microcolon in a fetus. Microcolon is the best visualized in sagittal plane and equally well seen with FGRE and 3D dual-echo SPGR.

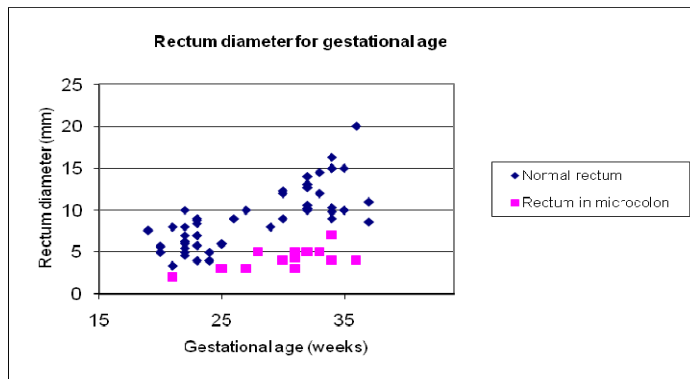


Fig 1: Scatterplot of the rectal diameter in normal fetuses (blue) as a function of the gestational age. The rectal diameters of fetuses with microcolon are represented (pink)

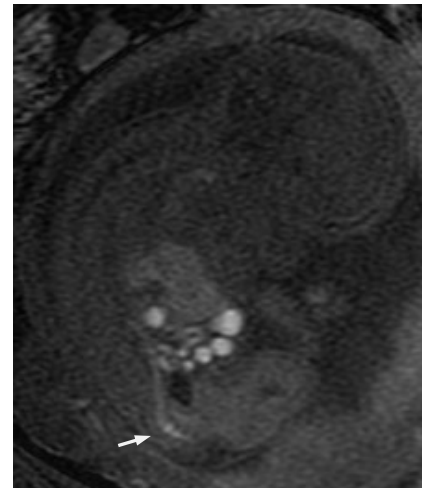


Fig 2: T1 weighted FGRE sagittal image of a fetus at 27 weeks of gestational age with microcolon (arrow). Proximally to the rectum there are some dilated loops of bowel