Universal Fetal Cardiac Ultrasound-
At the Heart of Newborn Well-Being
HUDSON VALLEY RADIOLOGY ASSOCIATES

MR CASE STUDY: Celiac artery to portal vein fistula. Probable small bowel ischemia resulting in fetal demise.

HISTORY: 22-week diamniotic/dichorionic intrauterine twins, the result of assisted reproduction. Outside ultrasound performed two days prior to MR imaging demonstrated Twin A echogenic bowel, and Twin B mild ventriculomegaly as indications for fetal MR referral. Outside ultrasound studies demonstrated symmetric and adequate amniotic fluid and good fetal movement for each twin.

The MR protocol for Twin A was targeted to evaluate any signs of intestinal pathology to account for echogenic bowel.

FINDINGS: **Image #1** is a coronal T1 sequence demonstrating three longitudinally oriented loops of normal caliber intermediate signal intensity small bowel stacked in a side-by-side orientation.

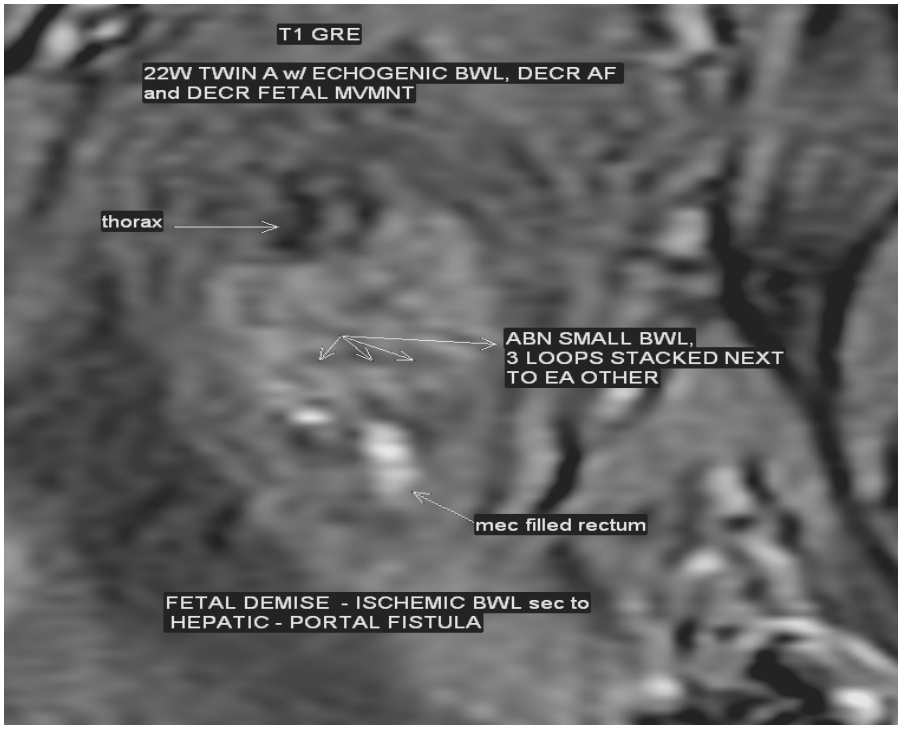


Image #2 is a gestational age matched appearance of normal small bowel in a different fetus.

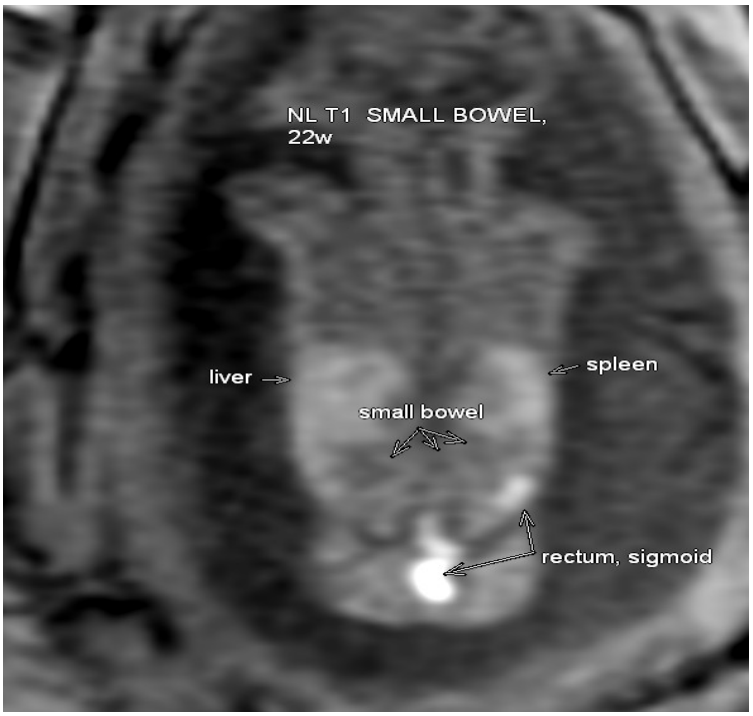
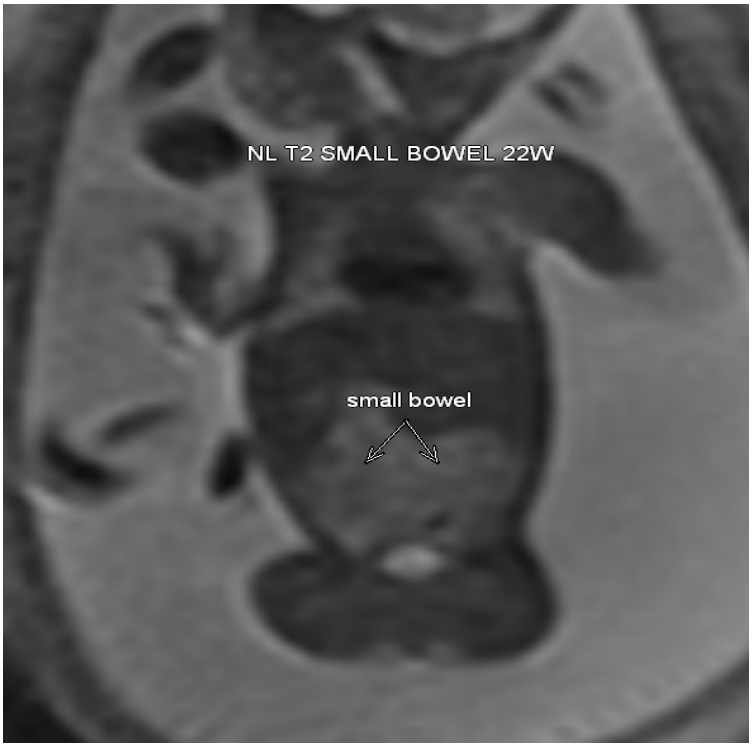


Image #3 is a coronal T2 sequence of Twin B demonstrating the same three loops of longitudinally oriented normal caliber small bowel with an unchanged stacked side-by-side orientation.

Image #4 demonstrates a gestational age matched normal small bowel in a different fetus.



After MR, Twin A's fetal cardiac ultrasound was performed demonstrating the absence of structural heart disease. While scanning into the upper abdomen, an enlarged celiac artery was identified demonstrating direct communication to the main portal vein creating an arterial-portal venous fistula – Image #5. Shunt physiology is demonstrated by the abnormal high volume low resistive flow within the intrahepatic hepatic artery – Image #6.

Image # 5

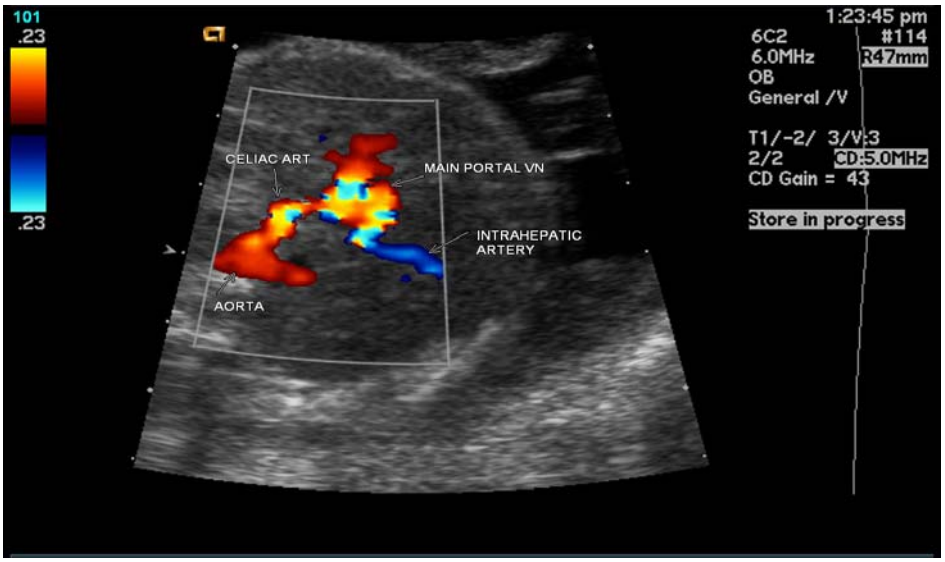
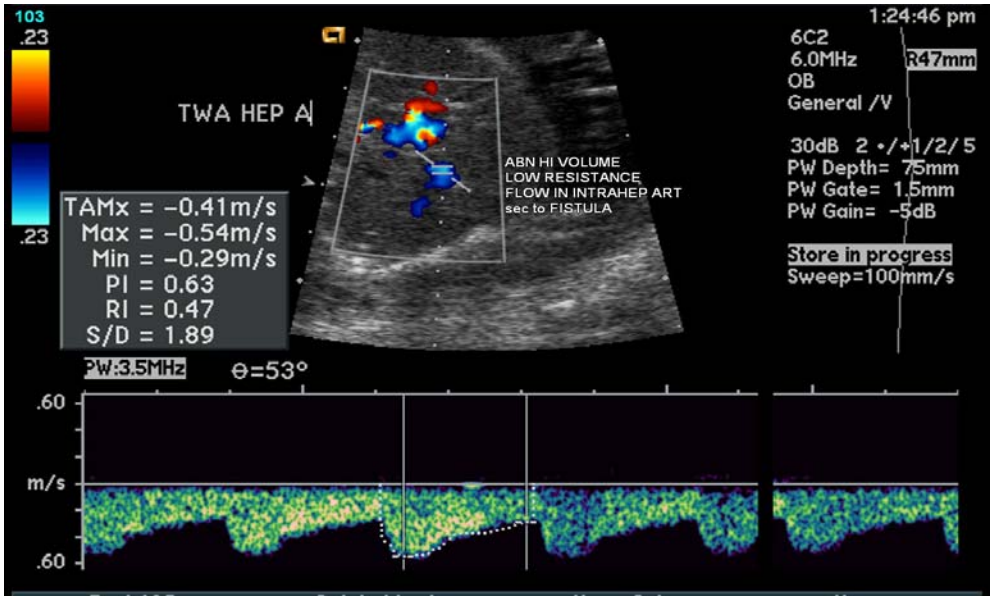


Image # 6



MR and ultrasound demonstrated for Twin A, asymmetrically diminished amniotic fluid (but not oligohydramnios) and no fetal movement.

The patient returned two days later to the referring MFM for amniocentesis at which time Twin A was a demise. This is an ongoing pregnancy with Twin B doing well.

DISCUSSION: The unique contribution of MR was the ability to demonstrate abnormalities in the small bowel that remained of normal caliber. The clues to ischemic small bowel are abnormal T1 intermediate signal intensity and abnormal orientation.

The normal T1 appearance of small bowel is of low signal intensity (dark). The T1 gradient echo sequence is sensitive to blood by-products and exudative proteinaceous material being of intermediate signal intensity.

The T1 and T2 sequences demonstrated an abnormal orientation of long straight segments of normal caliber small bowel stacked side-by-side. This is in marked contradistinction to the orientation of normal small bowel which appears as multiple serpiginous small circles and semicircles.

The celiac arterial-portal venous fistula shunts blood away from the small bowel resulting in small bowel ischemia. The venous congestion and mural hemorrhage accompanying small bowel ischemia accounts for the abnormal small bowel T1 intermediate signal intensity and abnormal orientation of small bowel loops.

This case also demonstrates the import of cardiovascular ultrasound in the imaging evaluation of echogenic bowel. The role of cardiovascular ultrasound is to exclude congenital heart disease in association with chromosomal and nonchromosomal syndromic conditions and to evaluate for abnormal umbilical and IVC venous drainage patterns, agenesis of the ductus venosus and arterial-venous shunts; all of which are seen with increased incidence in the aneuploid fetus, including Down syndrome.

Sincerely,
Daniel J. Cohen, M.D.
Hudson Valley Radiology Associates
Email: danjcohen@optonline.net
Personal cell: (914) 391-0109
Scheduling (845) 634-9729