Q. How does a radionuclide cystogram (RNC) differ from a fluoroscopic VCUG?

A. Radionuclide cystogram (RNC) and VCUG are two techniques to assess for the presence of vesicoureteral reflux. Both studies involve catheterization of the bladder and instillation of fluid by gravity, either radionuclide in saline or radiographic contrast. With RNC, sequential images are acquired during filling and emptying of the bladder. Patient discomfort and the time necessary to perform each exam are similar.

RNC results in a significantly reduced gonadal radiation dose compared with VCUG. In addition, RNC has a sensitivity for detection of vesicoureteral reflux that is equivalent to VCUG. However, RNC does not provide the same anatomic detail as VCUG and may not detect mild reflux into distal ureters (grade I/V) reflux.

Current indications for radionuclide cystography include:
1. Initial evaluation of older children, particularly females, with urinary tract infection.
2. Diagnosis of familial reflux.
3. Evaluation of vesicoureteral reflux after medical management.
4. Assessment of the results of antireflux surgery.
5. Serial evaluation of bladder dysfunction (e.g., neurogenic bladder) for reflux.

Q. What are current indications for a Lasix renogram?

A. Hydronephrosis is one of the most common indications for radionuclide evaluation of the kidneys in pediatric patients. The etiology of the hydronephrosis can be an obstructed renal pelvis or ureter, vesicoureteral reflux and bladder outlet obstruction. Ultrasonography cannot reliably differentiate obstructive from nonobstructive causes of hydronephrosis and hydroureteronephrosis. The purpose of diuretic renography is to differentiate a true obstruction from a dilated nonobstructed system by serial imaging after intravenous administration of furosemide (Lasix). The test involves starting an IV and injecting a radionuclide (MAG-3). Serial images are acquired before and after a weight-appropriate dose of Lasix. Differential uptake of MAG-3 between the kidneys as well as the presence, location and degree of obstruction is evaluated. The test takes about 1 hour to perform.

Lasix renography is used in the evaluation of:
1. Ureteropelvic and ureterovesical obstructions.
2. Evaluation after the prenatal ultrasound diagnosis of hydronephrosis.
3. Post-surgical evaluation of a previously obstructed system.
4. Distension of the pelvicalyceal system as a cause of back or flank pain, usually in older children.
Q. What are some current indications for nuclear medicine in musculoskeletal imaging?

A. While MR and CT have largely replaced nuclear medicine scans in the evaluation of musculoskeletal abnormalities in children, there are still several clinical situations where nuclear medicine scans are useful:
1. Evaluation for osseous metastases in some pediatric tumors, and to assess for synchronous lesions in certain bone tumors.
2. Radionuclide bone scans have been shown to be effective in evaluating limping children younger than about 5 years of age, particularly when the examination is nonfocal. Limping may be caused by a variety of processes including AVN (Legg-Calvé-Perthes disease), stress reactions and post-traumatic fractures from the lower spine to the pelvis, benign and malignant tumors and infections. If plain x-rays are unrevealing and symptoms are nonfocal, bone scanning is the best screening method to survey extensive areas easily, inexpensively and with great sensitivity.
3. Radionuclide studies, particularly labeled white cell scans, are still used in the evaluation of possible infection associated with spinal fusion or metallic prostheses where MR and CT exams are limited by artifact.
4. It is rare for bone scan to be the first study in a child with trauma. There are instances where bone scintigraphy may be helpful in detecting injury, particularly in nonverbal neurodevelopmentally delayed children. Bone scans may also be useful in the evaluation of subtle Toddler's fractures of the tibia or bones of the foot.

Q. When should a nuclear medicine HIDA scan be performed in children?

A. Hepatobiliary scintigraphy is a radionuclide diagnostic imaging study that evaluates hepatocellular function and patency of the biliary system by tracing the production and flow of bile from the liver through the biliary system into the small intestine. Sequential images of the liver, biliary tree and gut are obtained. Computer acquisition and analysis as well as pharmacological interventions are frequently employed.

Common Indications include:
1. Evaluation of suspected chronic biliary tract disorders, usually in older children with chronic or recurrent pain in the right upper abdomen.
2. Evaluation of common bile duct obstruction.
3. Detection of bile extravasation, usually in patients after trauma or biliary surgery.
4. Evaluation of congenital abnormalities of the biliary tree. While not as commonly utilized today in the evaluation of neonates with possible biliary atresia, HIDA scans are occasionally used in this scenario.

Please feel free to contact Primary Children’s Medical Imaging Department with any other questions. (801) 662-1802