Children's (Pediatric) Contrast-enhanced Voiding Urosonography

Pediatric contrast-enhanced voiding urosonography uses ultrasound to examine a child's bladder and urinary tract. It is often used after a urinary tract infection to check if urine is backing up into the kidneys.

Little to no special preparation is required and sedation is rarely needed. Explain what will happen during the exam to your child. This will help ease anxiety and any confusion about what is expected.

What is Pediatric Contrast-enhanced Voiding Urosonography?

Pediatric contrast-enhanced voiding urosonography (ceVUS) examines the bladder and urinary tract with ultrasound. Before the exam, liquid contrast material is introduced into the bladder through a catheter. The liquid helps show what may be causing pain or problems with urination. Ultrasound is particularly suitable for children because it does not use radiation.

What are some common uses of the procedure?

Doctors often use ceVUS after a urinary tract infection to check for vesicoureteral reflux (VUR). Kidneys produce urine which flows through tubes called ureters to the bladder. As the bladder fills, a valve prevents urine from backing up into the kidneys. During urination, urine leaves the bladder through the urethra.

Some children have a valve or ureter problem that allows urine to flow backwards. This is called VUR. In mild cases, urine backs up into the lower ureter. In severe cases, it can back up into the kidney. Children with VUR are usually born with it. Other causes include:

- blockage in the bladder
- abnormal urination with very high pressure within the bladder
- incomplete emptying of the bladder

The only symptom of VUR may be a urinary tract infection.

Pediatric ceVUS may be used to detect blockages in the urinary tract caused by valves or focal narrowing. It also helps assess problems such as incomplete emptying of the bladder.

How should we prepare for the procedure?

Tell your doctor if your child has recently been sick. Discuss any medical conditions, medications and allergies, especially to contrast material. Your child will have to remove their clothing and wear a gown. Little to no special preparation is required. Sedation is rarely needed. Tell your child what will happen during the exam so there will be no confusion about what is expected.

What does the equipment look like?

Ultrasound scanners consist of a console containing a computer and electronics, a video display screen and a transducer that is used to do the scanning. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. Some exams may use different transducers (with different capabilities) during a single exam. The transducer sends out high-frequency sound waves (that the human ear cannot hear) into the body and then listens for the returning echoes from the tissues in the body. The principles are similar to sonar used by boats and submarines.

The ultrasound image is immediately visible on a video display screen that looks like a computer or television monitor. The image is created based on the amplitude (loudness), frequency (pitch) and time it takes for the ultrasound signal to return from the area within the patient that is being examined to the transducer (the device placed on the patient's skin to send and receive the returning sound waves), as well as the type of body structure and composition of body tissue through which the sound travels. A small amount of gel is put on the skin to allow the sound waves to travel from the transducer to the examined area within the body and then back again. Ultrasound is an excellent modality for some areas of the body while other areas, especially air-filled lungs, are poorly suited for ultrasound.

The bladder is filled with contrast material using a flexible, hollow plastic tube called a catheter. The catheter has a diameter smaller than the urethra.

How does the procedure work?

Ultrasound imaging is based on the same principles involved in the sonar used by bats, ships and fishermen. When a sound wave strikes an object, it bounces back, or echoes. By measuring these echo waves, it is possible to determine how far away the object is as well as the object's size, shape and

consistency (whether the object is solid or filled with fluid).

In medicine, ultrasound is used to detect changes in appearance, size or contour of organs, tissues, and vessels or to detect abnormal masses, such as tumors.

In an ultrasound examination, a transducer both sends the sound waves into the body and receives the echoing waves. When the transducer is pressed against the skin, it directs small pulses of inaudible, high-frequency sound waves into the body. As the sound waves bounce off internal organs, fluids and tissues, the sensitive receiver in the transducer records tiny changes in the sound's pitch and direction. These signature waves are instantly measured and displayed by a computer, which in turn creates a real-time picture on the monitor. One or more frames of the moving pictures are typically captured as still images. Short video loops of the images may also be saved.

Microbubble Contrast Materials

The contrast material used in ceVUS is made up of tiny bubbles of gas held in a supporting shell. The bubbles are smaller than a red blood cell. They appear brighter on ultrasound because they reflect ultrasound waves. Ultrasound technology captures differences between the bubbles in the bladder and urinary tract and the surrounding tissues. These differences produce an image with increased contrast. This allows doctors to track the flow of urine and more easily identify any problems.

How is the procedure performed?

This exam is usually done on an outpatient basis.

The technologist begins by placing the child on the table. A parent can be next to the child and help them to lie still during the imaging.

For most ultrasound exams, your child will be positioned lying face-up on an exam table. Patients may be turned to either side to improve the quality of the images. They may also be asked to lie face-down.

A clear water-based gel is applied to the area of the body being studied to help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin that can block the sound waves from passing into your body. The sonographer (ultrasound technologist) or radiologist then places the transducer on the skin in various locations, sweeping over the area of interest or angling the sound beam from a different location to better see an area of concern.

The bladder and urinary tract are scanned with ultrasound. After the genital area is cleaned, the catheter is inserted through the urethra. The catheter may be taped to the skin so that it will not come loose during the procedure. The bladder is then filled with a liquid mixture of normal saline and contrast material. When the bladder is full, the child will urinate on the table. The liquid will be collected with a urinal, bed pan or absorbent pad. The child may also be allowed to sit on a potty while being scanned from the back.

The radiologist or technologist will use ultrasound to monitor the bladder during filling and urination. They will check to see if any of the liquid contrast material goes backward into one or both ureters and kidneys. They will also check the bladder and urethra to see if their shape, lumen and contour are normal.

After the exam, the radiologist or technologist may ask you and your child to wait until they confirm that all the necessary images have been obtained.

What will my child experience during and after the procedure?

Placing a tube in the bladder can be discomforting for some children. The antiseptic used to clean and prepare for the catheter insertion may feel cold. Most children accept the procedure after it is completely explained.

Parents may be allowed to stay in the exam room to comfort their child.

The transducer does not usually cause discomfort when it is pressed against the area being examined. However, if the area being scanned is tender, the transducer may cause your child to feel pressure or minor pain.

Once the imaging is complete, the clear ultrasound gel will be wiped off your child's skin. The ultrasound gel does not usually stain or discolor clothing.

Although the time may vary, the entire procedure will generally take less than 30 minutes.

After the exam, your child should be able to resume their normal activities immediately.

Who interprets the results and how do we get them?

A radiologist will analyze the images and send a signed report to your pediatrician or referring physician. That doctor will discuss the results with you.

A follow-up exam may be needed. Your doctor will explain the exact reason why. Sometimes another exam is done to further examine a problem. Or, it may be used to see if there has been a change. Follow-up exams are sometimes the best way to see if treatment is working.

What are the benefits vs. risks?

Benefits

- An ultrasound exam rarely hurts, but it may cause occasional discomfort.
- Ultrasound is widely available, easy-to-use and less expensive than other imaging methods.
- Ultrasound imaging is extremely safe and does not use any radiation.
- Ultrasound scanning gives a clear picture of many organs that do not show up well on a regular x-ray .
- Pediatric ceVUS provides your doctor with valuable, detailed information to assess a urinary tract infection.
- Pediatric ceVUS helps your doctor decide if treatment is needed. Some conditions don't require

treatment. Other conditions may require medication. Some may even need surgery.
- Pediatric ceVUS may eliminate the need for other tests such as CT and/or MRI. This is especially helpful for children who are claustrophobic or cannot lie still.

Risks

- Some children may have discomfort urinating after the procedure. This usually goes away in less than 12 hours.

What are the limitations of the procedure?

ceVUS is not recommended for children who have an active, untreated urinary tract infection.

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