



## Children's (Pediatric) Ultrasound - Abdomen

Children's (pediatric) ultrasound imaging of the abdomen is a safe, noninvasive test that uses sound waves to produce a clear picture of the internal organs and blood vessels within your child's abdomen. Ultrasound does not use ionizing radiation, has no known harmful effects, and is particularly valuable for evaluating abdominal, pelvic or scrotal pain in children.



Preparation will depend on the type of examination. Ask your doctor if there are specific instructions for eating and drinking prior to the exam. Your child should wear loose, comfortable clothing and may be asked to wear a gown.

### What is Abdominal Ultrasound Imaging?

Ultrasound is safe and painless, and produces pictures of the inside of the body using sound waves. Ultrasound imaging, also called ultrasound scanning or sonography, involves the use of a small transducer (probe) and ultrasound gel placed directly on the skin. High-frequency sound waves are transmitted from the probe through the gel into the body. The transducer collects the sounds that bounce back and a computer then uses those sound waves to create an image. Ultrasound examinations do not use ionizing radiation (as used in x-rays), thus there is no radiation exposure to the patient. Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels.

Ultrasound imaging is a noninvasive medical test that helps physicians diagnose and treat medical conditions.

Children's (pediatric) abdominal ultrasound imaging produces pictures of the internal organs and blood vessels located within a child's abdomen.

A Doppler ultrasound study may be part of a child's abdominal ultrasound examination.

Doppler ultrasound, also called color Doppler ultrasonography, is a special ultrasound technique that allows the physician to see and evaluate blood flow through arteries and veins in the abdomen, arms, legs,

neck and/or brain (in infants and children) or within various body organs such as the liver or kidneys.

## What are some common uses of the procedure?

Abdominal ultrasound imaging is performed to evaluate the:

- appendix
- stomach/pylorus
- liver
- gallbladder
- spleen
- pancreas
- intestines
- kidneys
- bladder
- testicles
- ovaries
- uterus

Abdominal ultrasound images can be used to help diagnose appendicitis in children.

Except for traumatic injury, appendicitis is the most common reason for emergency abdominal surgery.

Ultrasound imaging can also:

- help a physician determine the source of abdominal pain, such as gallstones, kidney stones, abscesses or an inflamed appendix
- guide procedures such as biopsies, in which needles, whose placement can be guided by ultrasound, are used to sample cells from organs for laboratory testing
- help detect the presence and cause of an apparent enlarged abdominal organ
- identify the location of abnormal fluid in the abdomen
- help determine causes of vomiting in young infants

Because ultrasound provides real-time images, images that are renewed continuously, it also can be used to guide procedures such as needle biopsies, in which needles are used to extract sample cells from an abnormal area for laboratory testing. Ultrasound may also be used to guide the insertion of a catheter or other drainage device and helps assure safe and accurate placement and fluid drainage for diagnosis and/or relief of patient discomfort.

Doppler ultrasound images can help the physician to see and evaluate:

- blockages to blood flow (such as clots)
- narrowing of vessels
- tumors and congenital vascular malformations
- reduced or absent blood flow to various organs
- greater than normal blood flow to different areas, which is sometimes seen in infections

Doppler ultrasound images can also help the physician see and evaluate torsion or twisting of a testicle limiting proper blood flow into it.

## How should we prepare?

Your child should be dressed in comfortable, loose-fitting clothing for an ultrasound exam. Other preparation depends on the type of examination. For some scans, your doctor may ask you to withhold food and drink for several hours before your child's appointment. For others, you may be asked to have your child drink several glasses of water, depending on the child's size, two hours prior to the exam and avoid urinating so that his or her bladder is reasonably full when the scan begins. Sedation is rarely needed for ultrasound examinations.

## 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.

## 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.

Doppler ultrasound, a special application of ultrasound, measures the direction and speed of blood cells as they move through vessels. The movement of blood cells causes a change in pitch of the reflected sound waves (called the Doppler effect). A computer collects and processes the sounds and creates graphs or color pictures that represent the flow of blood through the blood vessels.

## How is the procedure performed?

For most ultrasound exams, you will be positioned lying face-up on an examination table that can be tilted or moved. Patients may be turned to either side to improve the quality of the images.

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.

Doppler sonography is performed using the same transducer.

When the examination is complete, you may be asked to dress and wait while the ultrasound images are reviewed.

An ultrasound examination is usually completed within 30 minutes.

## What will my child experience during and after the procedure?

Ultrasound examinations are painless and easily tolerated by most patients.

Your child will lie on his or her back on an examining table. The radiologist or sonographer will spread warm gel on the skin, then press and move the transducer firmly against the abdomen, moving it back and forth until the desired images are captured. There may be minimal discomfort from pressure as the transducer is pressed against the area being examined.

If scanning is performed over an area of tenderness, your child may feel pressure or minor pain from the procedure.

If a Doppler ultrasound study is performed, your child may actually hear pulse-like sounds that change in pitch as the blood flow is monitored and measured.

Once the imaging is complete, the gel will be wiped off your child's skin.

After an ultrasound exam, children should be able to resume their normal activities.

## Who interprets the results and how do we get them?

A radiologist, a physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care physician, or to the physician or other healthcare provider who requested the exam. Usually, the referring physician or health care provider will share the results with you. In some cases, the radiologist may discuss results with you at the conclusion of your examination.

Follow-up examinations may be necessary. Your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a potential abnormality needs further evaluation with additional views or a special imaging technique. A follow-up examination may also be necessary so that any change in a known abnormality can be monitored over time. Follow-up examinations are sometimes the best way to see if treatment is working or if a finding is stable or changed over time.

## What are the benefits vs. risks?

### Benefits

- Most ultrasound scanning is noninvasive (no needles or injections).
- Occasionally, an ultrasound exam may be temporarily uncomfortable, but it should not be painful.
- Ultrasound is widely available, easy-to-use and less expensive than other imaging methods.
- Ultrasound imaging is extremely safe and does not use any ionizing radiation.
- Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.
- Ultrasound provides real-time imaging, making it a good tool for guiding minimally invasive procedures such as needle biopsies and fluid aspiration.
- Ultrasound is particularly valuable for evaluating abdominal, pelvic or scrotal pain in young children. It is also valuable for evaluating the brain, spinal cord and hip joints in newborns and infants.

### Risks

- For standard diagnostic ultrasound, there are no known harmful effects on humans.

## What are the limitations of Abdominal Ultrasound Imaging?

Ultrasound waves are disrupted by air or gas; therefore ultrasound is not an ideal imaging technique for air-filled bowel or organs obscured by the bowel. In most cases, barium exams, CT scanning, and MRI are the methods of choice in such a setting.

Large patients are more difficult to image by ultrasound because greater amounts of tissue attenuate (weaken) the sound waves as they pass deeper into the body and need to be returned to the transducer for analysis.

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