General, Vascular, and Obstetric Ultrasound

What is Ultrasound Imaging?

Ultrasound imaging, also called ultrasound scanning or sonography, involves exposing part of the body to high-frequency sound waves to produce pictures of the inside of the body. Ultrasound exams do not use ionizing radiation (as used in x-rays). 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.

Conventional ultrasound displays the images in thin, flat sections of the body. Advancements in ultrasound technology include three-dimensional (3-D) ultrasound that formats the sound wave data into 3-D images. Four-dimensional (4-D) ultrasound is 3-D ultrasound in motion.

What are some common uses of the procedure?

Ultrasound is used to help physicians evaluate symptoms such as:

* pain
* swelling
* infection

Ultrasound is a useful way of examining many of the body's internal organs, including but not limited to the:

* heart and blood vessels, including the abdominal aorta and its major branches
* liver
* kidneys
* bladder
* uterus, ovaries, and unborn child (fetus) in pregnant patients
* eyes
* thyroid and parathyroid glands

How should I prepare?

You should wear comfortable, loose-fitting clothing for your ultrasound exam. You will need to remove all clothing and jewelry in the area to be examined. You may be asked to wear a gown during the procedure.

Other preparation depends on the type of examination you will have. For some scans your doctor may instruct you not to eat or drink for as many as 12 hours before your appointment. For others you may be asked to drink up to six glasses of water two hours prior to your exam and avoid urinating so that your bladder is full when the scan begins.

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 and its size, shape, and consistency (whether the object is solid, filled with fluid, or both).

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

In an ultrasound examination, a transducer both sends the sound waves and records 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 of internal organs, fluids and tissues, the sensitive microphone 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.

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, the patient is positioned lying face-up on an examination table that can be tilted or moved.

A clear 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. The sonographer (ultrasound technologist) or radiologist then presses the transducer firmly against the skin and sweeps it back and forth over the area of interest.

When the examination is complete, the patient may be asked to dress and wait while the ultrasound images are reviewed. However, the sonographer or radiologist is often able to review the ultrasound images in real-time as they are acquired and the patient can be released immediately.

Most ultrasound examinations are completed within 30 minutes to an hour.

What will I experience during and after the procedure?

Most ultrasound examinations are painless, fast and easy.

After you are positioned on the examination table, the radiologist or sonographer will apply some warm gel on your skin and then place the transducer firmly against your body, moving it back and forth over the area of interest until the desired images are captured. There is usually no discomfort from pressure as the transducer is pressed against the area being examined.

If scanning is performed over an area of tenderness, you may feel pressure or minor pain from the transducer.

Ultrasound exams in which the transducer is inserted into an opening of the body may produce minimal discomfort.

If a Doppler ultrasound study is performed, you 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 skin.

After an ultrasound exam, you should be able to resume your normal activities.

What are the benefits vs. risks?

Benefits

* Most ultrasound scanning is noninvasive (no needles or injections) and is usually painless.

* Ultrasound is widely available, easy-to-use and less expensive than other imaging methods.

* Ultrasound imaging uses no ionizing radiation.

* Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.

* Ultrasound causes no health problems and may be repeated as often as is necessary.

* Ultrasound is the preferred imaging modality for the diagnosis and monitoring of pregnant women and their unborn babies.

* Ultrasound provides real-time imaging, making it a good tool for guiding minimally invasive procedures such as cortisone injections, needle biopsies and needle aspiration of fluid in joints or elsewhere.

Risks

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