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Ultrasound - Musculoskeletal

What is Ultrasound Imaging of the Musculoskeletal System?

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.

Ultrasound images of the musculoskeletal system provide pictures of muscles, tendons, ligaments, joints and soft tissue throughout the body.

What are some common uses of the procedure?

Ultrasound images are typically used to help diagnose:

- tendon tears, such as tears of the rotator cuff in the shoulder or Achilles tendon in the ankle.
- abnormalities of the muscles, such as tears and soft-tissue masses.
- bleeding or other fluid collections within the muscles, bursae and joints.
- small benign and malignant soft tissue tumors.
- early changes of rheumatoid arthritis.
- dislocations of the hip in infants.
- fluid in a painful hip joint in children.
- lumps in the neck muscles of infants.

How should I prepare?

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

You may be asked to wear a gown during the procedure.

Ultrasound exams are very sensitive to motion and an active or crying child will slow the exam process.

To ensure a smooth experience, it would be beneficial to explain the procedure to the child prior to the exam. You may bring a book to read to the child to ease anxiety. Ultrasound departments often have a television in the examination room and the child's favorite show may be played if there are no other available distractions.

No other preparation is required.

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 scan the body and blood vessels. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. The transducer sends out high frequency sound waves 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 nearby video display screen that looks much like a computer or television monitor. The image is created based on the amplitude (strength), frequency and time it takes for the sound signal to return from the patient to the transducer and the type of body structure the sound travels through.

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.

How is the procedure performed?

For most ultrasound exams of the musculoskeletal system, the patient is seated on an examination table or a swivel chair. For some ultrasound exams, the patient is positioned lying face-up on an examination table that can be tilted or

moved.

Almost all of the ultrasound studies of infants and children are performed with the child lying on his or her back on the examination table.

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. The sonographer (ultrasound technologist) or radiologist then presses the transducer firmly against the skin in various locations, sweeping over the area of interest or angling the sound beam from a farther location to better see an area of concern.

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.

This ultrasound examination is usually completed within 15-30 minutes but may occasionally take longer.

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 water-based 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.

The radiologist or sonographer may ask you to move the extremity being examined or may move it for you to evaluate not only anatomy but also function of a joint, muscle, ligament or tendon.

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 immediately.

Who interprets the results and how do I 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 the physician who referred you for the exam, who will share the results with you. In some cases the radiologist may discuss results with you at the conclusion of your examination.

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 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 needle aspiration.
- Unlike the strong magnetic field of magnetic resonance imaging (MRI), ultrasound is not affected by cardiac pacemakers, ferromagnetic implants or fragments within the body. Ultrasound is also an excellent alternative to MRI for claustrophobic patients.
- Ultrasound may actually have advantages over MRI in seeing tendon structure, which is better appreciated by ultrasound than MRI.
- The hip joints of infants, unlike those of adults, are largely made of cartilage which allows excellent views of them using ultrasound.

Risks

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

What are the limitations of Ultrasound Imaging of the Musculoskeletal System?

Ultrasound has difficulty penetrating bone and therefore can only see the outer surface of bony structures and not what lies within. For visualizing internal structure of bones or certain joints, other imaging modalitiessuch as MRI are typically used.

Ultrasound has not proven useful in detecting whiplash injuries or other causes of back pain.