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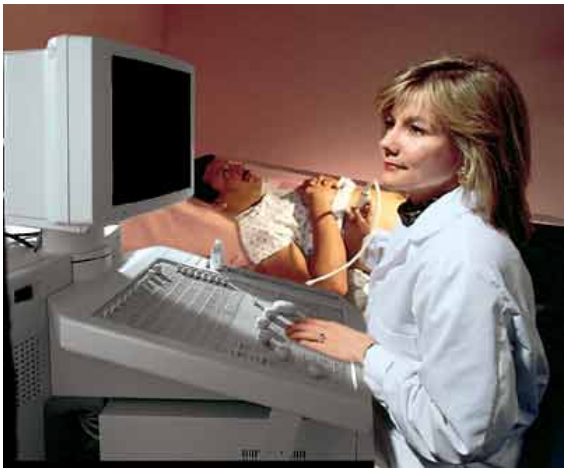
For patients

Musculoskeletal Ultrasound



Ultrasound imaging uses sound waves to produce pictures of muscles, tendons, ligaments, nerves and joints throughout the body. It is used to help diagnose sprains, strains, tears, trapped nerves, arthritis and other musculoskeletal conditions. Ultrasound is safe, noninvasive, and does not use ionizing radiation.

This procedure requires little to no special preparation. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is Ultrasound Imaging of the Musculoskeletal System?

Ultrasound imaging is a noninvasive medical test that helps physicians diagnose and treat medical conditions. It is safe and painless. It produces pictures of the inside of the body using sound waves. Ultrasound imaging is also called sonography (http://www.radiologyinfo.org) . It uses a small probe called a transducer and gel placed directly on the skin. High-frequency sound waves travel from the probe through the gel into the body. The probe collects the sounds that bounce back. A computer uses those sound waves to create an image. Ultrasound exams do not use radiation (http://www.radiologyinfo.org) (x-rays (http://www.radiologyinfo.org)). Because ultrasound captures images in real-time, it can show the structure and movement of the body's internal organs. The images can also show blood flowing through blood vessels.

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

What are some common uses of the procedure?

Ultrasound images are typically used to help diagnose:

- tendon tears or tendinitis of the rotator cuff in the shoulder, Achilles tendon in the ankle and many other tendons throughout the body.
- muscle tears, masses or fluid collections.
- ligament sprains or tears.
- inflammation or fluid (effusions) within the bursae (http://www.radiologyinfo.org) and joints.
- early changes of rheumatoid arthritis.
- nerve entrapments such as carpal tunnel syndrome.
- benign and malignant soft tissue tumors.
- ganglion cysts.
- hernias.
- foreign bodies in the soft tissues (such as splinters or glass).
- dislocations and dysplasia of the hip in infants.

- fluid in a painful hip joint in children.
- neck muscle abnormalities in infants with torticollis (neck twisting).
- soft tissue masses (lumps/bumps) in children.

How should I prepare?

Wear comfortable, loose-fitting clothing. You may need to remove all clothing and jewelry in the area to be examined.

You may need to change into a gown for the procedure.

Ultrasound exams are very sensitive to motion, and an active or crying child can prolong the examination process. To ensure a smooth experience, it often helps to explain the procedure to the child prior to the exam. Bring books, small toys, music, or games to help distract the child and make the time pass quickly. The exam room may have a television. Feel free to ask for your child's favorite channel.

No other preparation is required.

What does the equipment look like?

Ultrasound machines consist of a computer console, video monitor and an attached transducer (http://www.radiologyinfo.org) . The transducer is a small hand-held device that resembles a microphone. Some exams may use different transducers (with different capabilities) during a single exam. The transducer sends out inaudible, high-frequency sound waves into the body and listens for the returning echoes. The same principles apply to sonar used by boats and submarines.

The technologist applies a small amount of gel to the area under examination and places the transducer there. The gel allows sound waves to travel back and forth between the transducer and the area under examination. The ultrasound image is immediately visible on a video monitor. The computer creates the image based on the loudness (amplitude), pitch (frequency), and time it takes for the ultrasound signal to return to the transducer. It also considers what type of body structure and/or tissue the sound is traveling through.

How does the procedure work?

Ultrasound imaging uses the same principles as the sonar that bats, ships, and fishermen use. 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 its size, shape, and consistency. This includes whether the object is solid or filled with fluid.

Doctors use ultrasound to detect changes in the appearance of organs, tissues, and vessels and to detect abnormal masses, such as tumors.

In an ultrasound exam, a transducer (http://www.radiologyinfo.org) both sends the sound waves and records the echoing (returning) waves. When the transducer is pressed against the skin, it sends 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. A computer instantly measures these signature waves and displays them as real-time pictures on a monitor. The technologist typically captures one or more frames of the moving pictures as still images. They may also save short video loops of the images.

How is the procedure performed?

For certain ultrasound examinations of the musculoskeletal system, the patient may be seated on an examination table or a swivel chair. For other ultrasound exams, the patient is positioned lying face-up or face-down on an examination table. The radiologist or

sonographer may ask you to move the extremity being examined or may move it for you to evaluate the anatomy and function of the joint, muscle, ligament or tendon.

Most ultrasound studies of infants and children are performed with the child lying on his or her back on the examination table, but other positions may be required.

The radiologist (a doctor specifically trained to supervise and interpret radiology exams) or sonographer will position you on the exam table. They will apply a water-based gel to the area of the body under examination. The gel will help the transducer make secure contact with the body. It also eliminates air pockets between the transducer and the skin that can block the sound waves from passing into your body. The sonographer places the transducer on the body and moves it back and forth over the area of interest until it captures the desired images.

There is usually no discomfort from pressure as they press the transducer against the area being examined. However, if the area is tender, you may feel pressure or minor pain from the transducer.

Once the imaging is complete, the technologist will wipe off the clear ultrasound gel from your skin. Any portions that remain will dry quickly. The ultrasound gel does not usually stain or discolor clothing.

What will I experience during and after the procedure?

Most ultrasound exams are painless, fast, and easily tolerated.

Musculoskeletal ultrasound examination is usually completed within 15 to 30 minutes but may occasionally take longer.

When the exam is complete, the technologist may ask you to dress and wait while they review the ultrasound images.

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 doctor trained to supervise and interpret radiology exams, will analyze the images. The radiologist will send a signed report to the doctor who requested the exam. Your doctor will then share the results with you. In some cases, the radiologist may discuss results with you after the exam.

You may need a follow-up exam. If so, your doctor will explain why. Sometimes a follow-up exam further evaluates a potential issue with more views or a special imaging technique. It may also see if there has been any change in an issue over time. Follow-up exams are often the best way to see if treatment is working or if a problem needs attention.

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 most other imaging methods.
- Ultrasound imaging is extremely safe and does not use 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. This makes it a good tool for guiding minimally invasive (http://www.radiologyinfo.org) procedures such as needle biopsies (http://www.radiologyinfo.org) and fluid aspiration.
- Patients with cardiac pacemakers and certain types of metallic implants or fragments in the body often cannot be safely

exposed to the strong magnetic field required for magnetic resonance imaging (MRI) (http://www.radiologyinfo.org) ; however, patients can safely receive ultrasound imaging.

- Ultrasound is also an excellent alternative to MRI for claustrophobic patients.
- Compared to MRI, ultrasound may provide greater internal detail when assessing soft tissue structures such as tendons and nerves.
- Because ultrasound images are captured in real time, they can show the movement of a soft tissue structure such as a tendon, joint or an extremity.
- Ultrasound imaging is faster than MRI and does not require the patient to remain completely still, allowing infants to be imaged without sedation.
- The hip joints of infants, unlike those of adults, are largely made of cartilage. Ultrasound is able to clearly see cartilage.

Risks

- Standard diagnostic ultrasound (http://www.radiologyinfo.org) has 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 (except in infants who have more cartilage in their skeletons than older children or adults). Doctors typically use other imaging modalities (http://www.radiologyinfo.org) such as MRI (http://www.radiologyinfo.org) to visualize the internal structure of bones or certain joints.

There are also limitations to the depth that sound waves can penetrate; therefore, deeper structures in larger patients may not be seen easily.

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