Ultrasound-Musculoskeletal

This procedure is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is Ultrasound Imaging of the Musculoskeletal System?

Ultrasound (US) or sonography involves the sending of sound waves through the body. Those sound waves are reflected off the internal organs. The reflections are then interpreted by special instruments that subsequently create an image of anatomic parts. No ionizing radiation (x-ray) is involved in ultrasound imaging.

An ultrasound image is a useful way of examining the musculoskeletal system of the body to detect problems with muscles, tendons, joints and soft tissue. Ultrasound images are captured in real time, so they can often show movement, function, and anatomy, as well as enable radiologists to diagnose a variety of conditions and assess damage after an injury or illness.

What are some common uses of the procedure?

Ultrasound images can be useful in diagnosing tendon tears, such as tears of the rotator cuff in the shoulder. Abnormalities of the muscles can also be seen such as tears and soft-tissue masses. Bleeding or other fluid collections within the muscles, bursae, and joints can also be detected. Ultrasound has not proven useful in detecting whiplash injuries or other causes of back pain.

How should I prepare for the procedure?

You should wear comfortable, loose-fitting clothing for your ultrasound exam. No other preparation is required.

What does the equipment look like?

The equipment consists of a transducer and a monitoring system. The transducer is a small hand-held device that resembles a microphone. The radiologist or sonographer spreads a lubricating gel on the area being examined and then presses this device firmly against the skin.

The ultrasound image is immediately visible on a nearby screen that looks much like a computer or television monitor. The radiologist or sonographer watches this screen during an examination and captures representative images for storage. Often, the patient is able to see it as well.

Following is an example of the ultrasound equipment that may be used.

How does the procedure work?

Ultrasound imaging is based on the same principles involved in the sonar used by bats, ships at sea, and anglers with fish detectors. As a controlled sound bounces against objects, its echoing waves can be used to identify how far away the object is, its shape, how large it is, and its internal consistency (fluid, solid, or mixed).

The ultrasound transducer functions as both a loudspeaker (to create the sounds) and a microphone (to record them). When the transducer is pressed against the skin, it directs a stream of inaudible, high-frequency sound waves into the body. As the sound waves echo from the body's 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. The live images of the examination can be recorded on videotape. In addition, still frames of the moving picture are usually "frozen" to capture a series of images.

How is the procedure performed?

The patient is positioned on an examination table that can tilt and move. A clear gel is applied to the area that will be examined. The gel helps the transducer make a secure contact and eliminates air pockets between the transducer and the skin, since the sound waves cannot penetrate air. The radiologist then presses the transducer firmly against the skin and sweeps it back and forth to image the area of interest, reviewing the images on the monitor and capturing "snapshots" as required.

When the examination is complete, the patient may be asked to dress and wait while the ultrasound images are reviewed, either on film or on a monitor. Often, though, the sonographer or radiologist is able to review the ultrasound images in real time as they are acquired, and the patient can be released immediately.

What will I experience during the procedure?

Most ultrasound studies are relatively quick and well tolerated by the patient. If scanning is performed over an area of tenderness, then there may be minor pain associated with the procedure. Otherwise the procedure is painless. You will be either lying or sitting on an examining table that may be tilted or moved to provide access to the area that will be imaged. The sonographer or radiologist will spread some gel on your skin and then press the transducer firmly against your body, moving it until the desired images are captured. Most exams take 45 minutes or less.

Who interprets the results and how do I get them?

A radiologist, who is a physician experienced in ultrasound and other radiology examinations, will analyze the images and send a signed report with his or her interpretation to the patient's personal physician. The patient receives ultrasound results from the referring physician who ordered the test results. New technology also allows for distribution of diagnostic reports and referral images over the Internet at some facilities.

What are the benefits vs. risks?

Benefits

- Ultrasound scanning is usually painless and noninvasive.
- Ultrasound is widely available and easy to use.
- Ultrasound imaging uses no ionizing radiation.
- Ultrasound provides real-time imaging, making it a good tool for guiding minimally invasive procedures, such as needle biopsies and aspiration of fluid in joints or elsewhere.
- 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.

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 waves are reflected by air or gas, therefore ultrasound is not an imaging exam for bowel. Barium exams and Computed Tomorgraphy (CT) scanning are the methods of choice for bowel-related problems.

Ultrasound has difficulty penetrating bone and therefore can only see the outer surface of bony structures and not what lies within and beyond. For visualizing bone or internal structure of certain joints, waves do not reflect clearly from bone or air. For visualization of bone, other imaging modalities, such as MRI, should be selected.