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EDUCATIONAL RESOURCES

Case Study Discussion

Advantages of ultrasound for imaging soft tissue and foreign bodies

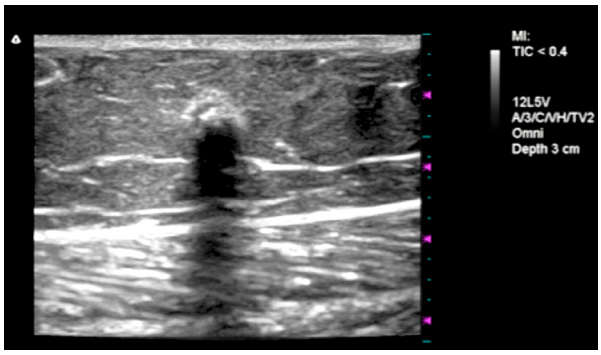
Radiographs are sensitive to, and provide accurate localization of, certain foreign bodies such as glass and metal. Unfortunately, they also expose patients to harmful electromagnetic radiation. Little if any information about the soft tissues can be gleaned via radiographs.

There is a clear advantage to using ultrasound. This modality can accurately localize many foreign bodies, including wood splinters, plastic, glass, gravel, and metal. Unlike X-ray, ultrasound is relatively harmless at the intensities used diagnostically. Ultrasound provides information about the soft tissues surrounding a foreign body, a distinct advantage over standard radiographs and fluoroscopy.

Nearly all foreign bodies appear brighter than surrounding soft tissues on sonographs. Structures producing relatively bright signals are referred to interchangeably as being echogenic, hyperechoic or hyperechogenic. The degree of brightness is affected by the shape of the object, its surface and material characteristics, and by the angle of sonation (angle of the sound beam to the object). For linear objects, such as splinters, the more perpendicular to the sound beam, the brighter they will appear, whereas rough, rounded objects appear essentially the same from all angles of sonation.

Objects appear hyperechoic because they reflect more ultrasound energy back to the transducer than the surrounding structures. If the hyperechoic object is large enough, little or no ultrasound energy can pass through it, which leads to acoustic shadowing. The way ultrasound produces shadows is essentially the same as how light produces shadows.

Note: OmniBeam™ from Terason sends ultrasound beams out at a variety of angles, which improves image quality and decreases shadowing. Reverberation artifact is also commonly seen behind foreign bodies. This may look like a series of evenly spaced hyperechoic lines, or like a comet's tail.



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In this case, a 29-year old female, who had retained a shrapnel fragment in her leg, seen originally by X-ray, developed pain around the object after becoming pregnant and requested removal of the fragment. To limit radiation, ultrasound was used to localize the fragment and remove it with a stab incision under local anesthesia. A Terason t3200 Ultrasound System with a 15 MHz linear probe was used. The ultrasound image demonstrates the fragment as a hyperechogenic mass in subcutaneous tissue with posterior acoustic shadowing.

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