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PITFALLS IN BREAST ULTRASOUND

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ABSTRACT
The pitfalls associated with breast ultrasonography are important to recognize because these may prompt biopsy of a benign lesion or result in failure to recognize breast cancer. The important categories of pitfalls are anatomical, technical, and professional. The true cause of pseudo lesions is more evident at real-time imaging. Appropriate machine setting, knowledge of breast anatomy, and scanning in two planes are essential.

Keywords: *Breast; Ultrasonography; Pitfalls*

The pitfalls associated with breast sonography are essential to recognize because these may prompt biopsy of a benign lesion or result in failure to detect breast cancer. The primary reason screening ultrasound does not have a widespread endorsement from medical organizations is its high rates of false-positive findings that lead to unnecessary procedures and anxiety to patients. The important categories of pitfalls are anatomical, technical, and professional.

The cartilaginous portion of a rib may result resemble a breast mass. Apparent oval, circumscribed, markedly hypoechoic mass with posterior acoustic shadowing mimics a solid breast mass. The transducer rotated perpendicular to its original position confirms the identity of rib with elongated structure.

An inverted nipple may mimic a solid breast mass as the lesion projects beneath the skin surface with the appearance of ill-defined markedly hypoechoic mass. The dense connective tissue and sloth muscle bundles give posterior acoustic attenuation, and awareness of the precise location of the transducer relative to the nipple or angulation of the transducer is required to eliminate this.

Acoustic shadowing behind a nipple may suggest a retro areolar mass. Refractive edge shadowing around a curved edge of a mass can cause an appearance of a mass at the interface of a fat lobule. Normal fat

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lobule can mimic an isoechoic solid mass. Rotating the transducer in an antiradical plane until the apparent mass merges with surrounding fat tissue confirm the identity of the structure as a fat lobule. Normally, a lactiferous duct measures up to 3mm in diameter. Ecstatic ducts can dilate significantly. Normal caliber ducts can mimic a cyst if imaged in a cross-section. The suspicious lesion should be imaged in both radial and antiradical planes.

Acoustic shadowing from Cooper's suspensory ligament can mimic breast lesions. The shadowing is normally faint and narrow which usually resolves with mild increased pressure on the transducer or by changing the angle of insonation. Short echogenic parallel lines at fixed intervals starting at the skin and leading to the acoustic shadowing are pathognomonic for poor skin contact. Extensive acoustic attenuation at the site of prior lumpectomy indicates scar formation.

The grayscale settings determine the amplitude of the returning sonographic signal; a high gain setting will produce spurious echoes in the simple cyst to mimic complex cyst or even solid mass, while dynamic range settings determine the range of echo amplitudes detected by the sonographic system. A dynamic range is a ratio of highest to lowest displayed amplitudes in decibels. The optimal value for breast is 55-60 decibels. It affects the contrast resolution. The too low setting will cause low-level echoes in solid mass to be displayed as black pixels mimics as a simple cyst. Too high a setting hinders the differentiation of fat lobules from subtle masses. The focal zone should be set to match the depth of the object being imaged. The resolution and beam width deteriorate outside the focal zone.

The improper gain setting influences the image. If too high, falsely produced internal echoes make cyst appear solid. If too low, the solid mass appears cystic. Improper dynamic range leads to fewer shades of gray. If too high, the cyst appears hypoechoic instead of anechoic. If too low, image details are reduced.

Reverberation artifacts are a series of bright echoes paralleling an interface with large differences in acoustic impedance. The ultrasound beam on its way back to the transducer is reflected on the wall of the lesion, insonates the tissues a second time. The sound waves take longer to return to the transducer. The anterior wall of cysts or silicone implants gives rise to this artifact. Edge shadowing caused by absorption and refraction along the mass border is seen in cyst as well as a solid mass.

A simple cyst may be mistaken for a complex cyst because of apparent internal echoes. Curvilinear echogenic lines parallel to the anterior wall due to multiple reflections of the acoustic beam are caused by an impedance mismatch between breast tissue and cyst. Change in the angle of insonation will remove these reverberation artifacts.

Posterior enhancement with the increased transmission is due to the absorption of sound in a lesion. It occurs in cysts. Invasive ductal carcinoma, metastatic nodule, lymphoma can also exhibit posterior enhancement. Posterior shadowing with decreased retransmission occurs in the malignant lesion. Hyaluronic fibroadenoma and focal stromal fibrosis can cause also posterior shadowing. A confluence of free injected silicone with fibrotic reaction may mimic a mass as silicoma.

Ring down artifacts is echogenic bands, perpendicular to the transducer as from air collection at the tip of a needle. Specular reflection artifacts as bright linear echoes are formed as sound bounces back from the edge of the structure. Volume averaging artifact is due to the superimposition of adjacent structures. The biopsy needle may appear within the lesion when it is only nearby. Colour Doppler artifact is due to any movement

in respiratory motion. The echogenic line resulting from residual air in the needle track mimics the needle remaining in the mass. The introduction of air can be limited by purging air from the syringe. Curvilinear echogenic lines paralleling the posterior margin are due to extracapsular silicone. Snowstorm artifacts are caused by extracapsular silicone or free silicone injection in the breast and appear as acoustic scatter. The sound waves travel slower in silicone. Thickness and height of implant appear increased.

A detailed patient medical history is required to avoid misinterpretation of images. Scanning in different planes with a change of angle of insonation is suggested. Increased pressure during scanning should be avoided. The use of Doppler, harmonic imaging, compound imaging, and precision imaging reduce machine-related artifacts. The true cause of pseudo lesions is more evident at real-time imaging. Available mammograms should be reviewed in association with breast sonography. Appropriate machine setting, knowledge of breast anatomy, and scanning in two planes are essential.

CONFLICT OF INTEREST
None

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