

Effects of imaging technique and pleural line depth on in vitro and in vivo measurements of pleural line thickness

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Abstract

Objective

Determine the effects of patient characteristics and imaging techniques on measured pleural line thickness (PLT).

Methods

Sonograms were performed on a phantom and healthy patients. In vitro, pleural line depth, transducer type (linear vs. phased array), angle of the pleural line relative to transducer, and distance between the pleura line and transducer focal length were explicitly modified. PLT was measured using electronic calipers. Regression equations described the effects of independent variables on PLT. Factors influencing PLT in vitro were tested in vivo.

Results

In vitro (n=250 sonograms): PLT was 3.8 (+/-0.24) mm greater when using the phased array compared to the linear probe (p<.001). For every additional cm of pleural line depth, PLT increased by 0.26 (+/-0.019) mm for the linear (p<.001) and 0.96 (+/-0.081) mm for the phased array probe (p<.001). Neither pleural angle nor focal length altered PLT.

In vivo (n=160 sonograms): PLT was 2.56 (+/-0.06) mm greater when using the phased array (p<.001) compared to the linear probe. PLT increased by 0.25 mm (+/-0.019) with the linear (p<.001) and 0.67 (+/-0.060) mm with the phased array (p<.001) probe for every additional cm between transducer and pleura. These variables explained 93% of PLT variance in vivo (p<.001).

Conclusion

Measurements of PLT are impacted by transducer type and pleural line depth but not focal length or pleural angle. Future studies evaluating PLT as a disease marker should account for confounding by transducer and pleural depth.