

sions represent the most “basic” and general case used to investigate overarching lesion parameters such as overall size of the lesion and the depth at which it is placed. In order to compare the investigated modalities, a cross-section of the data centred around a lesion with radius of 10 mm at a depth of 4 cm is shown in Fig. 6.1. In Fig. 6.1, it is clear to see that shear wave speed quantification is by far the most accurate of the three detection modalities with its characterization curve representing an almost ideal one-to-one mapping of measured stiffness to true stiffness. Quasi-static elastography and ARFI imaging resulted in less detection sensitivity and were not substantially different from each other.

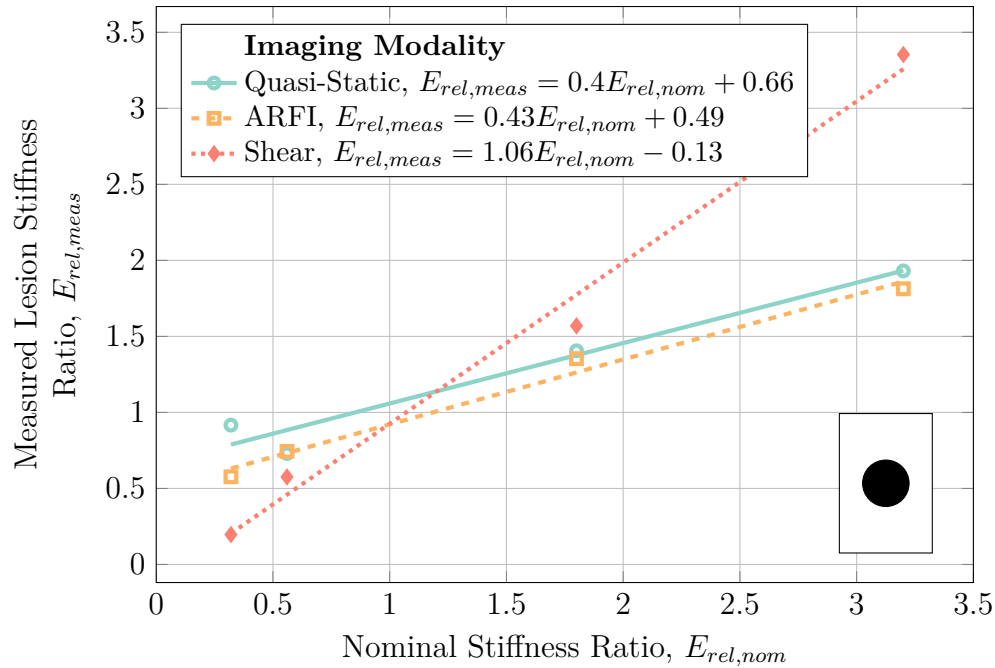


Fig. 6.1: Detection sensitivities of hard-boundaried spherical lesions with radii of 10 mm at a depth of 4 cm using quasi-static elastography, ARFI imaging, and shear wave speed quantification.

To further examine the error introduced by the various detection modalities, the percent difference between the expected true values of lesion stiffness

and the measured lesion stiffness for the results seen in Fig. 6.1 are shown in Fig. 6.2. Fig. 6.2 shows that in across all lesion stiffnesses, shear wave speed quantification results in the least amount of error between the true and measured lesion stiffness. Errors across all the modalities were greatest for the least stiff lesions—those with stiffness ratios of 0.32. Errors involved with ARFI imaging were slightly greater than for quasi-static imaging across the remaining investigated stiffness ratios. It is likely however that the slight increase in error associated with ARFI imaging may be worth the added benefit of increased reliability and repeatability. Beyond this, shear wave speed quantification is certainly recommended for detecting lesions if at all possible not only due to its nature of fully quantifying tissue stiffness rather than simply estimating it but also due to it's superior accuracy over quasi-static elastography and ARFI imaging.

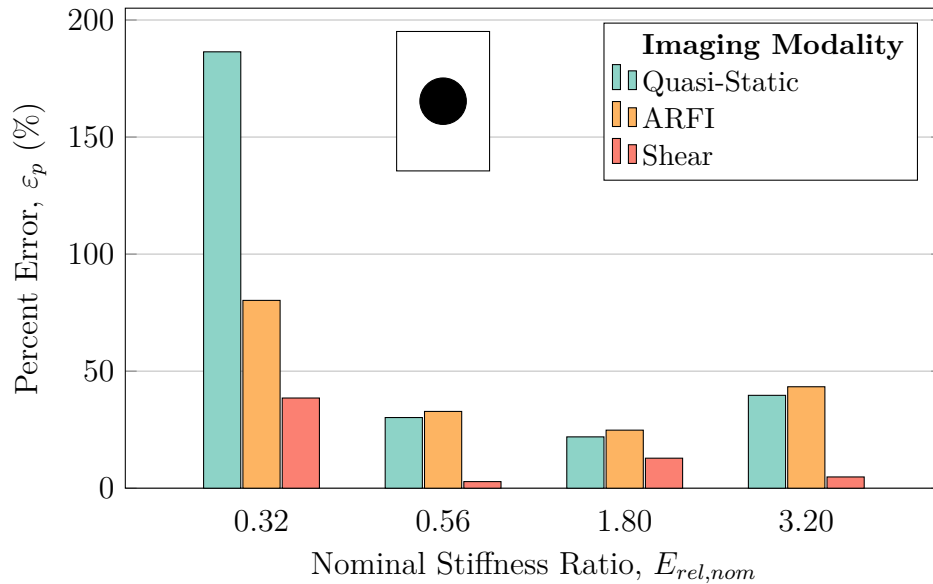


Fig. 6.2: Percent error of measured stiffness ratios for spherical lesions with radii of 10 mm at a depth of 4 cm across the three investigated modalities.

Since it is highly unlikely that real-world lesions will present as perfectly