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Transient elastography in heterogeneous tissues

Cécile Bastard, Jennifer Oudry, Yassine Mofid and Laurent Sandrin
Echosens, R&D department, 153 avenue d'Italie, 75013 Paris, France

The Fibroscan® (Echosens, Paris, France) is a transient elastography based device used to quantify liver fibrosis by following the propagation of a low frequency shear wave and measuring the mean Young's modulus of the liver. This device has been successfully applied to homogeneous tissues such as liver in patients with chronic hepatitis C. Current developments in transient elastography are now headed toward the characterization of heterogeneous tissues. The estimation of the shear wave velocity can be achieved by solving the elastic wave equation taking into account either the 1D, the 2D or the 3D components of the displacement spatial derivatives. The objective of this study is to characterize focal nodules in human liver and to quantify heterogeneous fibrosis. We present the methods used to estimate the local shear wave velocity and the results of experiments conducted on heterogeneous phantoms and in the liver in vivo.