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CONTINUING EDUCATION PROGRAM: EDITORIAL

Elastography: A new modality of ultrasound imaging

Since ancient times, physicians have used palpation to obtain information about the state of the tissues and to detect various diseases associated with changes in tissue elasticity. During the last two decades, this ancient art of palpation has been completely revisited because of the emergence of elastography techniques, which use ultrasound and various technical breakthroughs to measure tissue elasticity. The clinical fields of application of these techniques have become very large (breast, liver, thyroid, prostate, muscle, heart, eye, skin, etc.).

Until the end of the 1980s, tissue biomechanics were always referred to without ever mentioning acoustic and ultrasound waves. It was not until the 1990s when John Ophir who worked with Fung (the great master of biomechanics) introduced the concept of ultrasound elastography. This involved using ultrasounds to measure the deformations of tissue induced by a static mechanical force applied to the patient's skin. This qualitative technique had some success and is offered on many ultrasound diagnostic systems. It does however cause numerous artefacts and it was by investigating more precise ultrasound techniques that researchers returned to Armen Sarvazian's initial idea of measuring tissue elasticity by assessing the propagation velocity of low frequency mechanical shear waves. The first approaches used sinusoidal shear waves produced by vibrators in contact with the skin. This was the sono-elasticity introduced by Parker. Our group then proposed the concept of transient elastography, which provided a more accurate measurement of shear wave velocity using transient excitation. This project led to the FibroScan® which measures liver elasticity.

In parallel with this research, the use of ultrasound radiation force pressure (ARFI) to generate transient shear waves was proposed by the University of Duke. Different ultrasound methods were developed in this content to monitor the propagation of shear waves in tissues. A technical limitation soon emerged with the ARFI technique: the relative slowness of ultrasound imaging rate compared to the propagation velocity of shear waves. It was not until the development of an ultra fast ultrasound device using the principle of time reversal, which could deliver almost 10,000 images per second to monitor the real time propagation of shear waves on a wide scale. This research led to an ultrasound-imaging platform, the AixPlorer®, developed by the French company: Supersonic Imagine. France has played a key role in the development of this new medical imaging modality of ultrasound elastography, and all of the articles in this journal will review the most recent advances in this area.

Disclosure of interest

Mathias Fink is the founder of the Supersonic Imagine Company.

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