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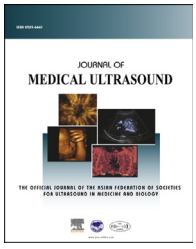

LETTER TO THE EDITOR

Applications of Supersonic Shear Imaging in the Musculoskeletal System

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Dear Editor,

The skeletal muscle is an anisotropic, viscoelastic, and complex passive and active tissue. Therefore, the *in vivo* evaluation of the biomechanical properties of the skeletal muscle is a complex issue. A new ultrasound-based technique, supersonic shear imaging (SSI), can be used to quantify soft tissue stiffness [1]. Supersonic shear imaging is based on the conventional ultrasound probe, which induces an ultrasonic radiation force deep within the muscle. Propagation of the resulting shear waves is then imaged with the same probe at an ultra-fast frame rate. The shear elasticity of a tissue can be mapped quantitatively from this propagation movie. This approach may provide a complete set of quantitative and *in vivo* parameters describing biomechanical properties of the skeletal muscle [2].

Recent studies have shown excellent intra- and inter-observer reliability of the muscle shear elastic modulus measured by SSI [3,4]. Several studies also imply that SSI is a promising tool for evaluating muscle conditions because it may provide an indirect estimation of passive muscle force [5]. It may also provide a more accurate estimation of individual muscle force, compared to surface electromyography [6]. Different pathologies of the skeletal muscle (e.g., muscle fibrosis, muscular dystrophy, and spasticity in upper motor neuron diseases) may change the muscle shear elastic modulus. Thus, SSI may contribute to the improved diagnosis and management of neuromuscular and orthopedic diseases. However, a few considerations should be addressed.

First, all current studies have investigated healthy participants. The diagnostic value of SSI in patients should be further studied. Second, few studies have focused on the tendon in which pathological changes may interfere with muscle function. The tendon has a much higher elastic modulus and smaller volume in comparison to the muscle, which makes SSI challenging for examining tendinopathy. Third, because skeletal muscle is compressible, variations of the probe pressure on the muscle may cause different shear elastic modulus. The higher pressure on the muscle, the higher is shear elastic modulus. A very light contact between the probe and the skin is recommended when examining muscle elasticity. Fourth, the region of interest (ROI) in SSI for obtaining shear elastic modulus is circular. Therefore, its representation of an entire muscle is questionable. A standardized surface landmark and the depth of ROI should be clearly described. The average of the data from multiple ROIs may be calculated to minimize measurement errors.

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Conflicts of interest: The authors declare no conflicts of interest.

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