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● *Letter to the Editor-in-Chief*

A NOVEL METHOD FOR MEASURING ELECTROMECHANICAL DELAY ON THE VASTUS MEDIALIS OBLIQUUS AND VASTUS LATERALIS

To the editor: We read with great interest the original contribution by Chen et al. reporting a novel method for measuring electromechanical delay (EMD) of the vastus medialis obliquus (VMO) and vastus lateralis (VL). EMD has been considered to be influenced by several structures and mechanisms such as: (i) the propagation of the action potential and the excitation–contraction coupling processes and (ii) the stretching of the series elastic component (SEC) by the contractile element (Cavanagh and Komi 1979). In this way, EMD has been shown to be modified during a fatiguing task (Paasuke et al. 1999) in response to a training program (Linford et al. 2006) after ligament reconstruction (Kaneko et al. 2002), in case of neuropathies (Granata et al. 2000) or myopathies (Orizio et al. 1997). The original method proposed by Chen et al. could enable researchers/clinicians to perform a better assessment of EMD and could therefore be interesting to follow the alterations in EMD in these situations.

However, in some cases, changes in EMD are very weak (*e.g.*, about 6% [Linford et al. (2006)]; about 15% [Kaneto et al. (2002)]. Despite a higher frame rate than conventional echographic devices, the frame rate (200 Hz) used in the study of Chen et al. induced a temporal resolution of 5 ms, representing about 27% and 20% of the measured delay for VMO and VL, respectively. Therefore, as discussed by the authors, this frame rate limits the accuracy of their measurements and is probably insufficient to accurately monitor changes in EMD, excluding its use in clinical practice or for research purposes.

A solution to this drawback exists. It was reported many times in the literature but is absent in the present paper. Ultrafast echographic devices (frame rate up to 5 kHz) has recently been used to follow the contraction of the muscle (Deffieux et al. 2006, 2008) and earlier to perform elastographic measurements (*e.g.*, Bercoff et al. 2003). The high frame rate of these devices would permit a precise detection of the onset time corresponding to the initial tendon motion and thus would be useful for improving the accuracy of the method reported by Chen et al.

Furthermore, a more complete characterization of the EMD using ultrafast echographic device—including the detection of the onset of muscle and tendon motion—would give more information about the structures and mechanisms (*e.g.*, E-C coupling, aponeurosis, tendon, muscle, tendon stifness, muscle stiffness) implied in the EMD. For instance, it would permit to quantify the delay between: (i) EMG onset and fascicles motion onset, (ii) fascicles motion onset and proximal tendon motion onset and (iii) proximal tendon motion onset and distal tendon motion onset. This original information would provide a better fundamental understanding of the EMD and of muscle force transmission processes.

In conclusion, the main drawback of the method proposed by Chen et al. could easily be overcome using high frame rate echographic devices, not referenced in the paper. It would also help to study more in depth the physiological mechanisms related to the EMD.

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