



Bi-dimensional variational mode decomposition of laser speckle contrast imaging data: a clinical approach to critical limb ischemia?

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Mots-clés Laser speckle contrast imaging [4], Multiresolution decomposition [5], Peripheral arterial occlusive disease [6], Transcutaneous pressure oxygen [7], Variational mode decomposition [8]

Résumé en anglais The number of patients suffering from peripheral arterial occlusive disease (PAOD) is growing worldwide. PAOD corresponds to an impairment of perfusion in the distal portion of some arteries that can generate critical limb ischemia. For some patients, the pathology leads to the necessity of amputation. PAOD may be diagnosed and studied with transcutaneous oxygen (tcpO₂) measurements. However, the tcpO₂ technique is a contact technique: probes have to be positioned on the limb, which may be impossible in case of ulcers and can lead to infection risks. We therefore herein propose to study if the laser speckle contrast imaging (LSCI) technique, an optical contactless technique, could be of interest in studying limb ischemia. For this purpose, tcpO₂ and LSCI data were recorded in 48 persons suffering or not from PAOD (different levels of criticality). The LSCI data were then processed with the recently introduced bi-dimensional variational mode decomposition (2D-VMD). 2D-VMD leads to band-limited intrinsic mode functions (LSCI 2D-BLIMFs in our case). From these LSCI 2D-BLIMFs, we propose a new index. Our results show that this index and the tcpO₂ values have a Pearson's r correlation coefficient of [Math Eq]. Moreover, the Bland-Altman graph shows that the LSCI 2D-BLIMFs-based index and the tcpO₂ values are consistent. LSCI might therefore be of interest for a contactless study of limb ischemia.

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Liens

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