A noninvasive multimodal Magnetic Resonance Imaging (MRI) application for predictive assessment of Peripheral Artheropathy (Diabetic Foot disease)

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The proposed study is based on a non-conventional use of advanced methods of MRI with the acquisition of a time series of ultrafast images with contrast weighted on dynamic blood oxygen level. A continuous acquisition is performed before, during and after the application of a standardized stimulus produced by a dedicated external mechanical device acting on the upper part of the ankle of the foot under investigation. The simultaneous use of MRI compatible Near Infrared Spectroscopy (NIRS) detectors, placed on a given distance and position from the mechanical action and on the limb surface can be used to standardize the stimulus by controlling the oxy/deoxy hemoglobin ratio on a tissue volume below the NIRS detector. A dedicated analysis procedure to extract the time course of one or more regions of interest on the acquired MRI foot images, allows identifying the mechanical action phase on each related graph obtained. The curve is characterized by a flat portion for basal condition, a descending tract in correspondence of the onset of mechanical stimulus and of a recovery tract immediately after stimulus cessation. A suitable curve fitting of this recovery portion will provide a characteristic time constant directly representative, in its magnitude, of the possible incoming disease and if so, a powerful diagnostic noninvasive tool can be realized not only in disease grade assessing but also for the follow-up, for example, to evaluate benefits after drug therapies studies. Preliminary results on health subjects support the feasibility of this investigation procedure.

Biography
Girolamo Garreffa was born in Genova (IT) in May 1959, in the 80s/90s he achieved the Master in Physics and a Professional Doctorate in Health/Medical Physics. Since 2001 to 2012 he was Senior Scientist in MR Physics and Leader of the project Magnetic Resonance and Brain Function at Centro di Studio e RicercaE. Fermi in Rome. In the same period and up to now he covered roles as MR Scientist and MRI Physicist in Hospital and Research Institutions among them: NEUROMED (Ischia, IT) Medical Imaging and Neurosurgery Departments; Santalucia Foundation (Rome, IT) Neuro Imaging Dept.; National Research Council (Cosenza, IT) Dept. of Neurological Sciences, University of Tor Vergata (Rome, IT) and Sapienza Univ. of Rome as Professor of Medical and Applied Physics. Currently he is also MR Scientist at Fondazione Potito (Campobasso, IT), MR Scientist at ME.DI. Center (Napoli) and Head of Applied Physics Section at I.E.ME.S.T.(Palermo, IT).

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