INVESTIGATION OF POST-DIVE ENDOTHELIAL FUNCTIONALITY THROUGH ELECTRICAL IMPEDANCE MEASUREMENTS

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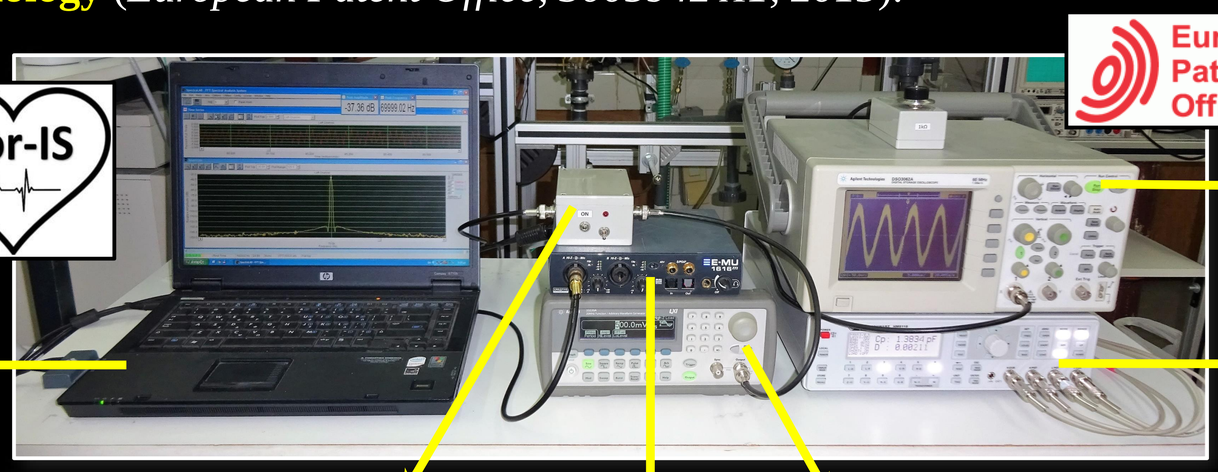
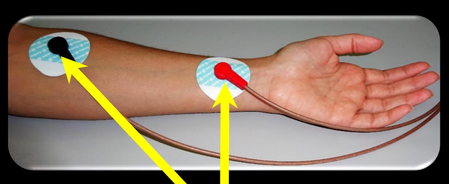
INTRODUCTION

Post-ischemic flow mediated dilation (**FMD**), an indicator of endothelial functionality, seems to decrease after underwater diving. Until now in clinical practice, **FMD** is studied with an ultrasound Doppler method that measures the diameter of brachial artery before and after a five-minute forearm ischemia and subsequent hyperemia, caused by external compression with a blood pressure measurement cuff. This practice has major disadvantages like poor repeatability, extensive fluctuation in the measured values, low imaging resolution and being dependent on ultrasound operator. The aforementioned drawbacks are not present when employing electrical impedance measurements of exceptional high sensitivity and accuracy.

MATERIALS & METHODS

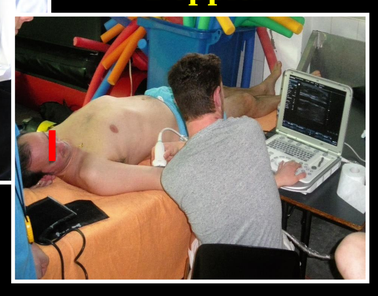
Herein, endothelial functionality is investigated by a novel device (**Cor-IS**) which is based on a **patented electrical impedance spectroscopy technology** (*European Patent Office, 3005942 A1, 2015*).





A test campaign is performed in the **NEMO 33** swimming pool in Brussels, Belgium.

Cor-IS

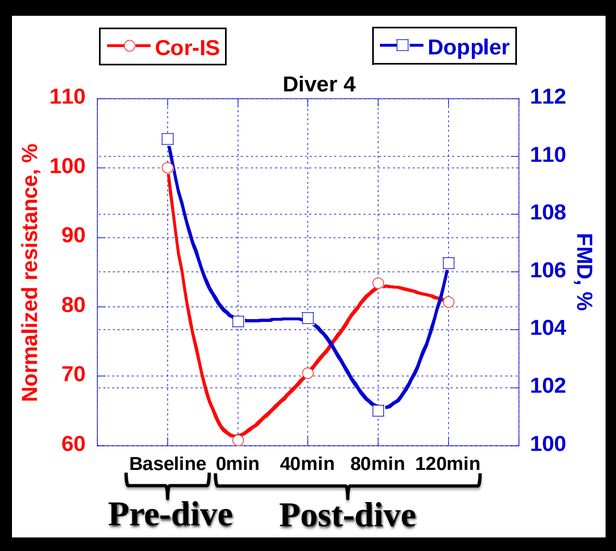


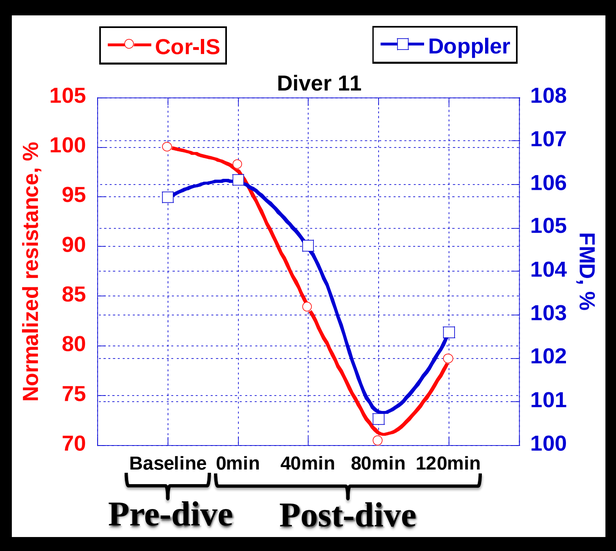
Doppler

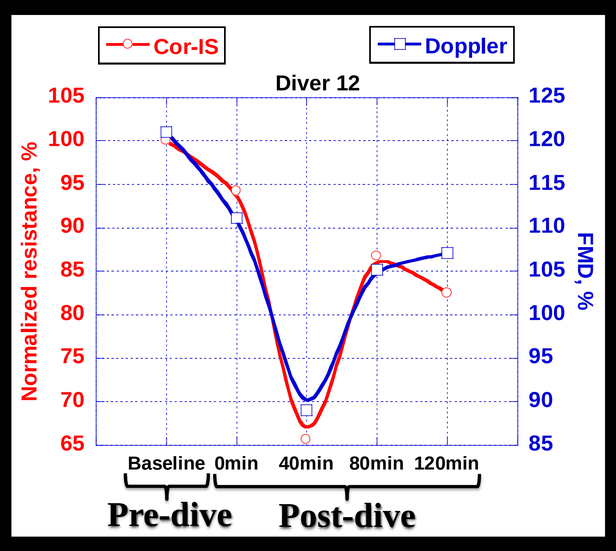
- ***17*** volunteer divers
- Well-defined dive profile: depth: ***33m*** / duration: ***20min*** / T_{water}: ***31ºC***
- ***2h*** post-dive study of endothelial functionality
- Electrical measurements are conducted applying ***self-adhesive ECG pads***
- Validation against ultrasound (***Doppler***) measurements

RESULTS

Post-dive endothelial dysfunction (**FMD value decrease**) is validated by both ultrasound (**Doppler**) and electrical (**Cor-IS**) measurements.







DISCUSSION

- **Cor-IS** measurements seem to be in fair agreement with the ultrasound ones as concerns post-dive endothelial dysfunction detection.
- Electrical impedance signals' frequency component **0.5-10Hz** carries crucial information about endothelial functionality.
- Cutting-edge algorithms (such as **waveletes** & **HHT**) are currently employed for further processing of the acquired electrical impedance signals in an effort to classify obtained results.

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