

COMPUTER ASSISTED EVALUATION OF FLOW MEDIATED DILATION

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Introduction

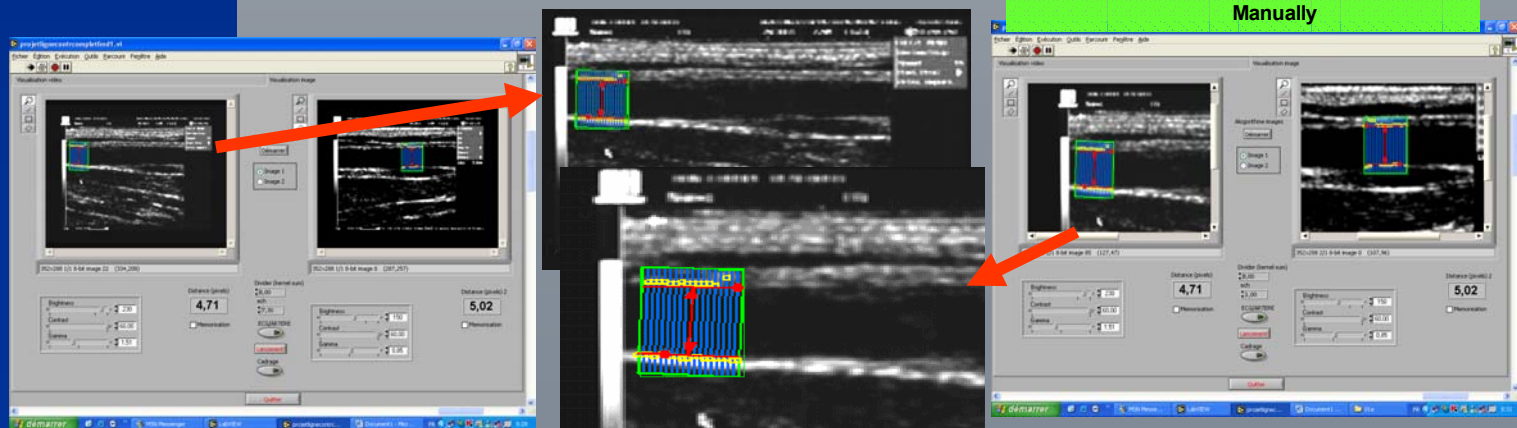
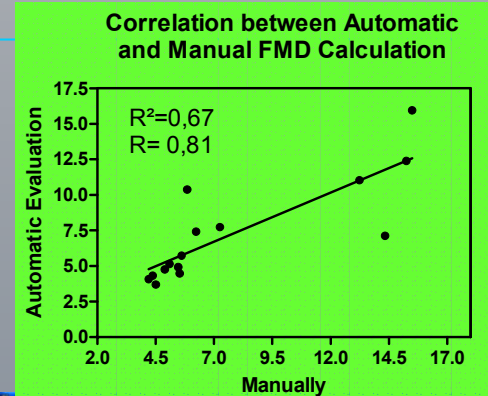
Vascular health is a matter of community health nowadays. In the diving community the vascular reactions to decompression are of growing interest ; the “accepted” method to evaluate vascular function is arterial Flow Mediated Dilation (FMD) (Brubakk *et al.*, 2005). Our purpose is to achieve a computerized system to aid the field researcher to perform a proper FMD measurement. The literature shows that the usual method is based more on the supposed time of appearance of the maximal dilation to freeze the echographic image instead of the actual maximal arterial dilation measured along the time following the arterial occlusion release. This makes the method rather arbitrary and subject to investigator skill differences.

Methods

In order to assist researchers in choosing the actual maximal diameter of the brachial artery and measuring FMD, a computer-assisted method was developed. After real-time digitizing of the echographic images, or conversion of MPEG or DICOM type files, the resulting video file (in AVI format) is imported in LabView software. A representative section of the video files (before and after occlusion) is chosen and converted into individual images (25 per second), in order to allow analysis of single video frames. If a simultaneous electrocardiographic (ECG) trace has been recorded, the software can select those frames where pulsatile arterial dilation is maximal. Then, on the chosen image, it is possible to post-process the image in order to obtain good brightness and contrast. Then, the region of interest (ROI) is defined by the researcher and the measurement is performed automatically in a standardized way. If no ECG trace has been recorded, it is necessary to define the ROI as a first step, and optimize the image if needed. Using this ROI, a software submodule calculates for each image the arterial diameter, and presents each image with its diameter. On the images finally chosen by the researcher, the automatic analysis is performed.

Results

Field tests of the software showed an excellent reproducibility of the measures, as well as several advantages such as speed, ease of use, and archiving of data. We believe this automated method is able to reduce the inter- and intra-observer variability in FMD measurements, giving this method more objectivity when used in diving-related research.



Brubakk, A. O., Duplancic, D., Valic, Z., Palada, I., Obad, A., Bakovic, D., Wisloff, U. & Dujic, Z. (2005). A single air dive reduces arterial endothelial function in man. *J Physiol* 566, 901-906.