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P2.16 PRESSURE PROFILE ANALYSIS AT HEMODIALYSIS NEEDLE: A NEW METHOD FOR EARLY DETECTION OF VASCULAR ACCESS STENOSIS

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Hemodialysis vascular access stenosis remains a frequent complication. However; early detection is challenging and costly. The aim of this in-vitro study was to assess the value of a new detection method based on pressure profile analysis at the hemodialysis needle.

A silicon model of a radio-cephalic arteriovenous fistula was built (4mm artery connected by an end-to-side anastomosis with a 7mm vein). A water-glycerine mixture was used as blood mimicking fluid. Pressure profiles were measured at the arterial hemodialysis needle (4cm downstream the anastomosis) and in the feeding artery 20cm upstream the anastomosis. Stenoses (50% diameter reduction) were created 10cm upstream the anastomosis. Experiments were conducted at different blood flow (500 to 1200 ml/min) and heart rates (60 to 90 beats/minute) to test this new index over a wide range of hemodynamic conditions.

P2.17 ASSESSMENT OF THE BRACHIAL ARTERY FLOW-MEDIATED DILATION WITHOUT ECG GATING

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The methods commonly used for non-invasive ultrasound assessment of endothelium-dependent Flow-Mediated Dilation (FMD) require an ECG signal in order to synchronize the measurement with the cardiac cycle. In this study, we present a method for assessing FMD which does not require ECG gating. The approach is based on filtering of the diameter-time curve, which is obtained by means of a B-mode image processing system. Since diameter changes due to vasodilation/vasoconstriction mechanisms and diameter changes induced by the cardiac cycle happen at different frequencies (fractions of Hz for the former; more than 1 Hz for the latter), frequency filtering was used to separate the two components and obtain the desired information.

The method was tested on 22 healthy volunteers without cardiovascular risk factors and the measurements obtained with the proposed approach were compared with those obtained with ECG gating. Diameter values computed with the new method were very similar to those obtained with ECG gating (3.90 ± 0.75mm and 3.88 ± 0.75mm respectively). FMD values obtained with the two methods were compared with Bland Altman plot: the bias was negligible (0.02%) and the SD of the difference was 0.24%, a value which is largely acceptable for this measurement.

In conclusion, the new method showed a good agreement with ECG gated measurements. Moreover, since it is based on a larger number of measurements, it provided a higher precision. Further advantages were also found both in terms of simplicity of the measure and the high reliability of the instrumentation.