ARTERY Abstract

Title: (don't enter authors names	Re-reflection of backward propagating waves leads to amplification of the forward pressure wave in wave separation analysis
Abstract:	**Introduction.** In wave separation analysis, the pressure wave is decomposed into a single forward and backward component, which actually compounds all forward and backward propagating waves. We hypothesize that, in particular in presence of early reflections as in aortic coarctation, re-reflection of backward propagating waves at the ventricular-arterial interface amplifies the forward wave component. **Methods.** We set up a 3D fluid-structure interaction model of the aorta based on MRI scans of a healthy volunteer. With the healthy model as reference, we introduced a 25 mm narrowing section in the descending thoracic aorta to model an aortic coarctation, with coarctation index (CI) 0.65 and 0.5. Inflow and outflow boundary conditions were kept constant to allow studying the isolated effect of the coarctation. Aortic root pressure and flow waveforms were extracted and subjected to wave intensity and wave separation analysis. **Results.** The presence of the coarctation increased systolic pressure by 10 mmHg and 41 mmHg for CI 0.65 and 0.5, respectively. Wave separation analysis indicated that this increase in blood pressure was about equally due to an increase in the amplitude of both the forward and backward pressure wave. Wave intensity analysis - though only after separating into forward and backward wave intensity - revealed that the amplification of the forward pressure wave is caused by re-reflection of backward waves at the level of the aortic valve. **Conclusion.** We conclude that wave separation analysis might overestimate the incident pressure wave component because of re-reflection of backward waves at the aortic valve.