

## **4Dflow imaging with MRI: an automatic method to analyze blood flow features in the aorta**

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Magnetic resonance imaging (MRI) using three-dimensional velocity encoding phase contrast (PC) methods offers the opportunity to quantify time-resolved 3D flow patterns in vivo. As evidenced in the last decade this technique can have a breakthrough impact on the evaluation, risk stratification and surgical planning in hemodynamic-related pathologies e.g. cardiac valve diseases or arterial stenoses. However, its applicability in clinics is limited due to the complex post processing required to extract the information and the difficulty to synthesize the obtained data into clinical useful parameters. In this work an algorithm was developed to automatically identify cross sectional planes by simply selecting points within the vessel and calculate the velocity components, vessel flow rate and extract the main feature of the velocity profile and flow patterns. The method has been applied to a bicuspid aortic valve patient with a stenosed valve and an ascending aorta aneurysm. As expected during systole blood flow is regular and directed parallel to the vessel axis; in diastole, the flow pattern evolves showing coherent swirling features, which progressively disrupt with also evidence of backflow.

Preliminary results so far obtained demonstrate that the presented approach can be used in clinics in order to classify and stratify different valve and/or vessel pathologies.