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A team of experts at your service

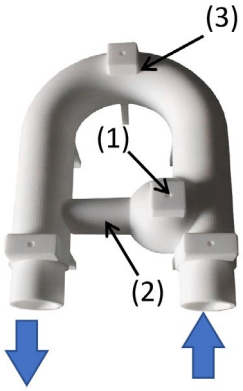
Quality control in 4D Flow MRI

4D Flow MRI is a volumetric MRI sequence that allows for the measurement of the **velocity field in all three spatial planes and over time.**

A key advantage in **clinical practice** is the ability to **retrospectively analyze multiple hemodynamic biomarkers,** such as pressure and wall shear stress, which are derived from the velocity field data. To ensure the reliability of these hemodynamic markers, it is necessary to **quantify the errors** associated with the velocity measurement.

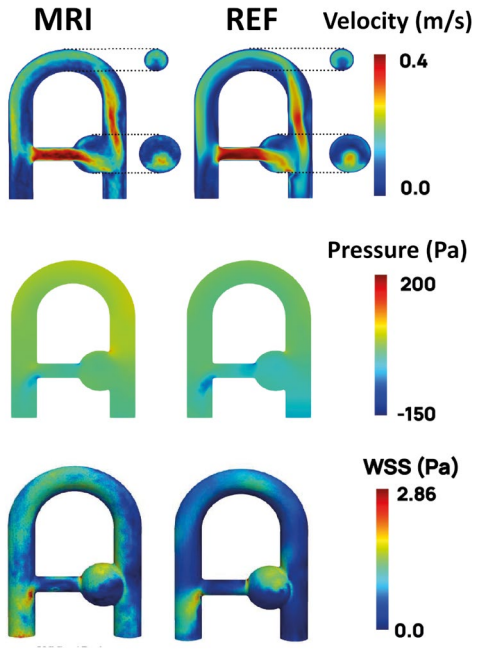
CardioFlowQA phantom

The CardioFlowQA phantom **accurately reproduces the main complexities** observed in cardiovascular flows (aneurysm, collateral, bend). For these flow structures to exist, a programmable pump delivers a fluid with rheology similar to blood with a pulsatile flow rate within the phantom.



Characteristics

- Physical phantom designed to reproduce cardiovascular flows
- Validated [1] and patented* quality control methodology
- Evaluation of various biomarkers (flow rate, wall shear stress, relative pressure, etc.)
- High resolution post-processing to optimize image quality in routine practice



Hemodynamic analysis

The developed methodology allows for the **quantification of measurement distortions in the velocity field** obtained by 4D flow MRI. A multitude of **hemodynamic markers** used in clinical practice (volumetric flow rates, mass conservation, wall shear stress, etc.) are considered as quality indicators.

To do this, the MRI measurements are compared to a **reference solution** previously validated in this configuration [1] and obtained by computational fluid dynamics.

Several **post-processing methods** are proposed and evaluated to optimize the quality of the measurements (incompressibility constraint, off-resonance effects correction, phase unwrapping, rigid walls).

*Patent FR3080761A1/WO2019211556A1

[1]: Puiseux T, et al. Reconciling PC-MRI and CFD: An in-vitro study. NMR in Biomedicine, 2019.

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A question? A specific request?
Contact us!