Visualization and quantification of large coronary fistula with 4D flow MRI

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Coronary artery fistula (CAF) is a rare cardiac malformation connecting a coronary artery to a cardiac chamber or pulmonary arteries. We report a rare case of CAF between circumflex artery and coronary sinus, disclosed with 4D flow MRI. In addition, 4D flow was able to quantify reliably the left to right shunt, by both direct and indirect measurements:

1/ direct evaluation by tracing a region of interest (ROI) perpendicularly to the fistula

2/ Indirect measurement by calculating Qp-Qs.

To the best of our knowledge this is the first case reporting the value of 4D flow in diagnosis of this congenital malformation.

A 71-year-old male was referred to our center with right cardiac insufficiency secondary to atrial fibrillation. Trans thoracic echocardiography (TTE) identified biauricular and bi ventricular dilatation, as well as a paradoxal septum. A moderate mitral regurgitation was also found. Systolic function was slightly impaired (LVEF= 50%).

Left coronary artery and circumflex coronary artery were dilated with continuous flow in coronary sinus.

4D flow Cardiac MRI, performed using a free breathing acquisition and gadolinium injection, detected an abnormal tubular structure between circumflex coronary artery and coronary sinus (Fig. 1). Furthermore, direct estimation of the blood flow through the circumflex coronary artery was performed by tracing a ROI, and shunt was found to be 3,4 L/min. ROIs drawn on the main pulmonary artery and the ascending aorta, above the origin of the left coronary ostium, allowed estimating Qp and Qs at 8,6 L/min and 5,2 L/min respectively. Qp - Qs was 3,4 L/min and Qp/Qs = 1,65.

The patient underwent successfully percutaneous closure with two vascular plugs II of 16 mm. The immediate post procedural and post one-month TTE showed complete occlusion of the defect with no residual shunt, with relief of clinical symptoms.

4D flow appears as a promising noninvasive tool, providing both anatomic visualization and quantification of coronary fistula flow. It appears thus as useful technic for optimal management of patients with such congenital anomaly.
Abstract: Visualization and quantification of large coronary fistula with 4D flow MRI

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1/ direct evaluation by tracing a region of interest (ROI) perpendicularly to the fistula
2/ Indirect measurement by calculating $Q_p - Q_s$.

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