

IMAGES IN CARDIOLOGY

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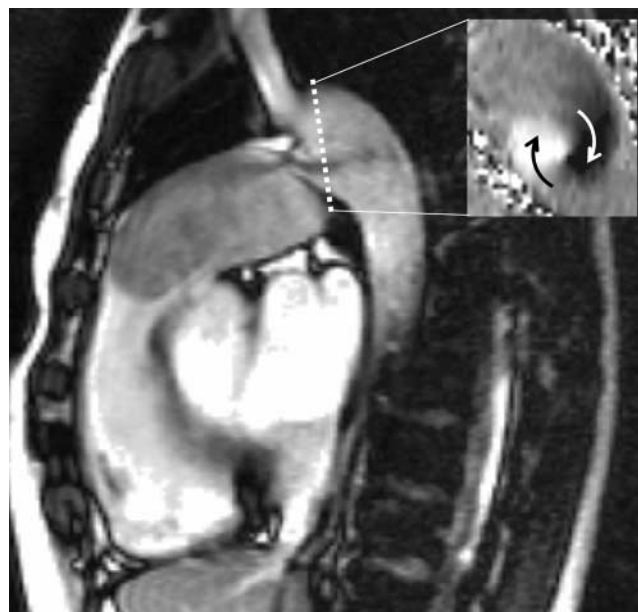
Aortic tornado

The figure shows cardiovascular magnetic resonance visualisation of flow through a patent ductus arteriosus (PDA). The study also showed evidence of a type of flow familiar at the outlet of a bath or in atmospheric storms, but which may not have been detected inside the body before: a converging, tornado-like vortex.

A 21 year old woman with a continuous murmur and pulmonary artery and left ventricular dilatation on echocardiography was imaged. An appropriately aligned cine acquisition showed a dark streak indicative of a jet from the PDA in the upper part of the pulmonary trunk (main panel). Surprisingly, however, a dark streak of signal loss also extended back from the duct into the aortic lumen during systole.

We had seen this phenomenon in a previous PDA patient and suspected the aortic signal loss was caused by gradients of velocity in the "eye" of a converging vortex. In the current patient, therefore, we performed phase contrast velocity mapping, encoded head-to-foot, in a plane transecting the presumed vortex, as indicated by the dotted line. The velocity map showed rotation or vorticity of flow in the aorta, clockwise as viewed from the front (inset). The highest velocities in this plane were close to the centre of rotation.

Our interpretation is that the vortex develops as flow converges on the duct from blood that has already gained rotational momentum after passing through curvatures of the arch. The rotating flow spins faster as it is drawn into the eye of the vortex towards the PDA.



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