

# Comprehensive Evaluation of Culture- Negative Endocarditis

with Use of Cardiac and 4-Dimensional-Flow  
Magnetic Resonance Imaging

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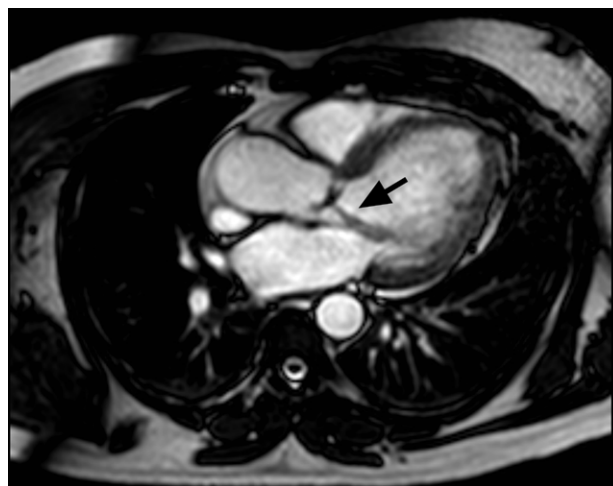
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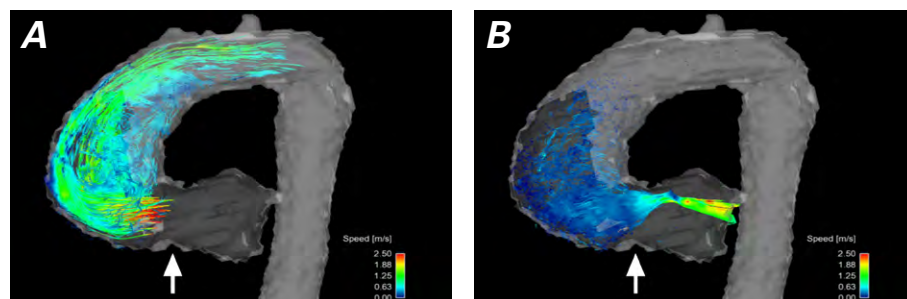
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**A** 42-year-old, otherwise healthy man with exposure to domesticated buffalo presented with a 3-day history of intermittent headaches and word-finding difficulties. Magnetic resonance images (MRI) revealed an ischemic infarct in the left temporal lobe. A high-pitched, intense, pandsystolic murmur was detected at the right upper sternal border. A transthoracic echocardiogram showed moderate-to-severe aortic insufficiency. A transesophageal echocardiogram (TEE) showed a bicuspid aortic valve with possible leaflet perforation. Cardiac magnetic resonance (CMR) images confirmed regurgitation through a perforated bicuspid leaflet, excluded an abscess, and revealed a dilated ascending thoracic aorta (Fig. 1). The eccentric regurgitant jet and asymmetric aortic dilation were best seen by means of time-resolved, 3-dimensional, phase-contrast MRI (4-dimensional [4D]-flow MRI), with use of instantaneous streamline and dynamic pathline views of blood flow (Fig. 2). The



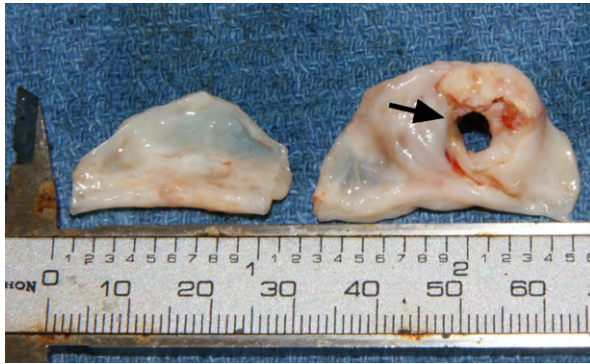
**Fig. 1** Cardiac magnetic resonance image shows the dilated ascending aorta, and significant aortic regurgitation (arrow) through the perforated bicuspid aortic valve leaflet.

[Supplemental motion image is available for Figure 1.](#)



**Fig. 2** Four-dimensional-flow magnetic resonance imaging of the thoracic aorta. Streamlines are color-coded for velocity and reveal instantaneous flow across the aortic valve (arrow) and in the aorta during **A**) systole and **B**) diastole.

[Supplemental motion image is available for Figure 2.](#)



**Fig. 3** Photograph shows surgical specimen of the infected, bicuspid aortic valve with leaflet perforation (arrow).

patient's blood cultures remained negative; however, serologic studies subsequently were positive for *Coxiella burnetii*, suggesting a chronic, active infection. The patient was treated with doxycycline and hydroxychloroquine and underwent successful surgical aortic root and valve replacement (Fig. 3).

### Comment

*Coxiella burnetii* (Q Fever) endocarditis is a rare form of endocarditis that can sometimes present as a stroke.<sup>1</sup> Most cases of Q fever occur in individuals who have been exposed to farm animals, including buffalo. Bicuspid aortic valve, the most common congenital heart defect, is often associated with substantial morbidity, including endocarditis and aortic dilation.<sup>2</sup> Although echocardiography, particularly TEE, typically yields adequate views of a bicuspid aortic valve and aortic root

dilation, CMR affords better spatial and contrast resolution and the ability to obtain images of the entire aorta. In conventional CMR, blood flow is measured by using velocities in 2 spatial dimensions, in individual slices at specific anatomic locations.<sup>3</sup> Using the emerging technique of 4D-flow MRI, one can view the entire 3-dimensional volume of the aorta and evaluate the complex forward and regurgitant flow jets, color-coded by velocity, over time.<sup>3,4</sup> High-velocity, eccentric blood flow in an area of asymmetric aortic dilation or aneurysm suggests increased wall shear stress with high potential for rupture. This combination of complete anatomic visualization and evaluation of pathologic hemodynamic conditions is not feasible with echocardiography or conventional CMR. Accordingly, 4D-flow MRI might best identify those patients who are in need of urgent intervention.<sup>4</sup> As in our patient's case, difficult clinical presentations often require multiple imaging methods for effective management.

### References

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