

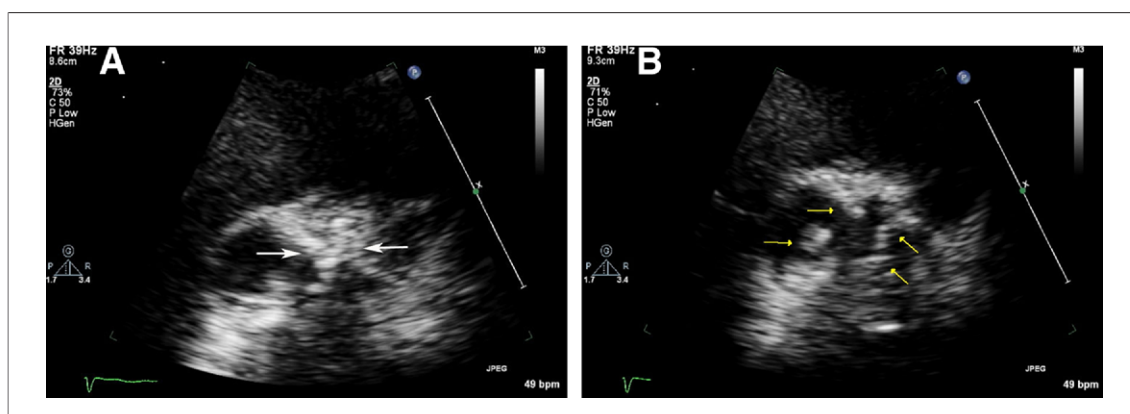
# Percutaneous Transcatheter Heart Valve Implantation in a Bicuspid Aortic Valve

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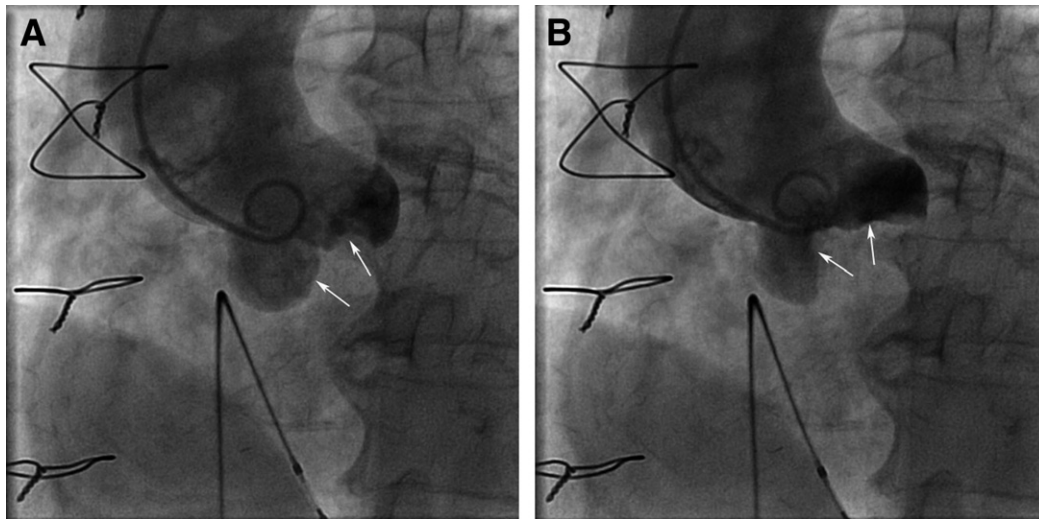
A 77-year-old man presented with increasingly symptomatic severe aortic stenosis (AS). Echocardiogram showed an aortic valve area of 0.6 cm<sup>2</sup> and a mean pressure gradient of 57 mm Hg. It could not be ascertained conclusively if the valve was tricuspid or bicuspid due to heavy calcification (Figs. 1A and 1B). Aortic annulus was 20 mm in diameter. Left ventricular ejection fraction was 40%. At cardiac catheterization, calcified leaflets were seen but it could not be determined if the valve was tricuspid on aortogram (Figs. 2A and 2B). Cardiac computed tomography angiography (CTA), however, conclusively revealed a stenosed bicuspid aortic valve (Figs. 3A to 3C). Due to prohibitive perioperative risk, the patient was declined for surgery. Although bicuspid AS is a contraindication in the ongoing PARTNER (Placement of AoRTic TraNscathetER valves) trial, anecdotal experience suggests that percutaneous valve

implantation is feasible (J. Webb, personal communication, February 2009). After balloon valvuloplasty, a 23-mm Sapien transcatheter heart valve (THV) (Edwards Lifesciences, Irvine, California) was successfully deployed via the transfemoral route. The patient was well at 6 months with marked improvement in functional status. Echocardiogram showed left ventricular ejection fraction of 46%, mean pressure gradient of 20 mm Hg across the aortic valve, and trivial paravalvular leak. Both the echocardiogram and cardiac CTA revealed a circular, well-expanded prosthesis (Figs. 4A and 4B). This case illustrates the utility of cardiac CTA in determining the bicuspid nature of the aortic valve when both echocardiography and aortography were inconclusive. It also demonstrates that the THV can achieve full and circular expansion in a bicuspid aortic valve. However, as a previous study documented frequent



**Figure 1.** Parasternal Short-Axis Views of the Aortic Valve

(A) Parasternal short-axis view showing the valve in diastole (arrows indicate the leaflets). (B) Parasternal short-axis view showing the aortic valve in systole (arrows indicate the leaflets). Due to the heavy calcification, it could not be determined if this was a bicuspid valve or if 1 of the commissures was heavily fused.



**Figure 2. Aortogram Images of the Valve**

(A) Aortogram showing the valve (**arrows**) in diastole. (B) Aortogram showing the valve (**arrows**) in systole. Two leaflets are seen, and it was uncertain if there was a third leaflet.

incomplete and asymmetric THV expansion in bicuspid valves (1), more data are required to guide clinical practice. Whether a self-expandable stent design (which may continue to gradually expand against the annulus) or balloon-expandable stent design (with its very high initial radial force) would achieve better expansion in such cases remains to be determined. Thus at present, THV implantation in

bicuspid AS should be considered only in very select patients, particularly those with contraindications to surgery.

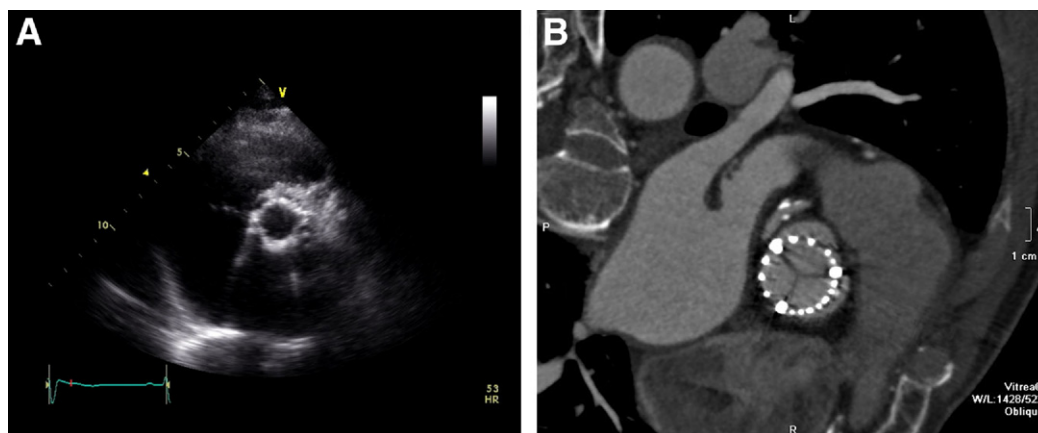
#### Acknowledgment

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**Figure 3. Cardiac CTA of Aortic Valve and Origin of Coronary Ostia**

(A) Cardiac computed tomography angiography (CTA) showing the aortic valve in diastole. The 2 leaflets (**arrows**) are clearly seen. (B) Cardiac CTA showing the valve in systole. (C) Cardiac CTA showing the origin of the coronary ostia. The right coronary artery arises from the right coronary cusp (**arrow**) and the left coronary artery (**arrowhead**) originates more posteriorly from the left coronary cusp. This is normally the region of the noncoronary cusp, confirming that there is only a right and a left, and no noncoronary cusp.



**Figure 4.** Parasternal Short-Axis View and CTA Image of THV Post-Implantation

(A) Parasternal short-axis view showing near circular expansion of the transcatheter heart valve (THV). The prosthetic leaflets were not well visualized. (B) Cardiac computed tomography angiography (CTA) showing symmetric and circular expansion of the THV. The trileaflet nature of the prosthesis is clearly demonstrated.

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#### REFERENCE

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