

# Isolated Bicuspid Pulmonary Valve: An Unusual Finding

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Whilst the pulmonary valve is a tricuspid valve, very few reports exist of bicuspid pulmonary valves, the majority of which are associated with congenital heart disease. Isolated bicuspid valves not associated with congenital abnormalities are even more rare. Herein, the case is described of a 65-year-old man

The pulmonary valve is a cardiac semilunar valve, and is usually characterized by the presence of three leaflets. The normal pulmonary complex is organized around three sinuses, three leaflets, and three inter-leaflet triangles. There is significant evidence from animal and human studies that this is the normal anatomy of the pulmonary valve in mammals (1,2).

Congenital abnormalities of the pulmonary valve are uncommon. The abnormal pulmonary valve is usually seen in patients with congenital heart disease (mostly tetralogy of Fallot), there being an incidence of 58% for bicuspid valves, as reported previously by Altrichter et al. (3). Pulmonary valve stenosis, patent ductus arteriosus, transposition of the great arteries and ventricular septal defect are other associated congenital defects (3-5). Bicuspid pulmonary valve is otherwise diagnosed during post-mortem examination, and in the absence of congenital heart disease.

Very few reports exist of bicuspid pulmonary valve in individuals without congenital heart disease (6-10). The present case report was based on an incidental observation made during cardiac harvesting for homograft procurement.

## Case report

A 64-year-old man with hypertension, diabetes, aortic stenosis and a past history of smoking was admit-

ted to a community hospital because of stroke. Two days after admission he presented with ventricular arrhythmia from which he could not be resuscitated. He was therefore not considered for multiorgan donation, but was accepted as a potential tissue donor. The heart, cornea and long bones were harvested according to a previously published protocol (11).

The Journal of Heart Valve Disease 2004;13:521-522

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In the laboratory, the aortic valve and ascending aorta were found to be heavily calcified and thus were discarded. Upon examination of the pulmonary complex, the main pulmonary artery and branches were grossly normal, with diameters of 28 and 26 mm, respectively. There was no gross evidence of a raphe in either leaflet. The sinus arrangement appeared normal on examination, and the valve was found to be bicuspid (Fig. 1). There were neither fenestrations nor calcifications present. The valve diameter was sized at 30 mm using a Hegar dilator. Because of this abnormality, the valve was also not considered for human implantation. Functional information from an echocardiographic study performed at the referring institution was limited to the aortic valve, though no other evidence was present of pulmonary stenosis considering the size of the valve at examination.

## Discussion

Although the pulmonary valve is a tricuspid semilunar valve, it is known to occur in bicuspid form in congenital heart disease. Indeed, approximately 7% of pulmonary stenosis cases are associated with a bicuspid pulmonary valve (4). It is rare, however, for a bicuspid pulmonary valve to occur as an isolated incidental finding in clinical practice (5,7). Studies con-

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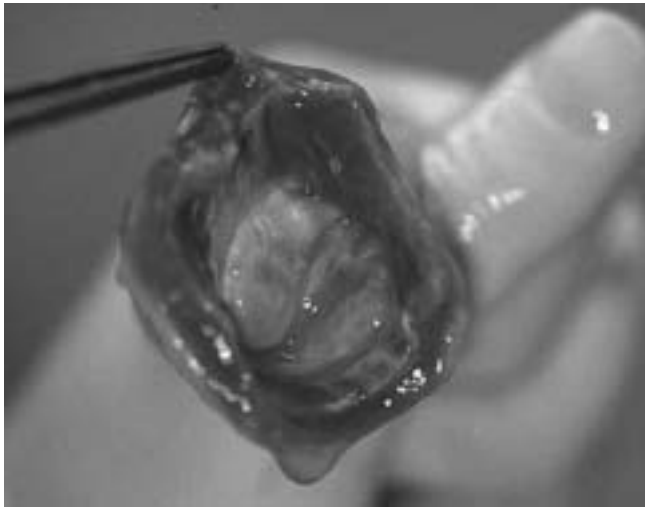


Figure 1: Pulmonary root dissection of the bicuspid pulmonary valve.

ducted in animals have confirmed the potential for the semilunar valves to become anatomically malformed, with an estimated incidence of 23% in specific subsets of hamsters (2). In any case, congenital abnormalities of the pulmonary valve such as quadricuspid or bicuspid pulmonary valves are of little clinical significance. On the other hand, congenital abnormalities of the aortic valve have important and well-recognized clinical implications.

In the present patient, who had no past history of congenital heart disease and who had died from a stroke, the pulmonary valve was found to be bicuspid. The most interesting aspect here was the incidental finding of such a valve during a tissue donation protocol, as only three reports have been made of bicuspid pulmonary valve not associated with congenital heart disease.

Tissue donation may be considered as a form of post-mortem examination, and the present finding underlines the need to follow a strict protocol for the quality control in this procedure (11). The decision was made to reject this valve, based on the assumption that a bicuspid semilunar valve might behave similarly to a bicuspid aortic valve. Although no evidence exists to suggest that this might eventually occur in the pulmonary valve, a recent study reported the use of a bicuspid pulmonary valve for the arterial switch operation (12). Another question would be whether this valve would eventually be suitable for heart transplantation, considering the preliminary experience with transposition. The present authors believe that no evidence has been presented to recommend this in a regular case of heart transplantation. However, as approximately 30% of heart transplantations are performed on an emergency basis, with the patient on intra-aortic balloon pump or with a ventricular assist

device implanted, the surgery would most likely be continued in this situation, with the heart being transplanted with a bicuspid pulmonary valve if no echocardiographic evidence was available of valve dysfunction.

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