

## A Bicuspid Construction of the Pulmonary Valve of the Heart

*A. Petrova*

*Department of Anatomy, Histology and Embriology,  
Medical University of Varna, Varna*

A case of congenital bicuspid pulmonary valve was found in a cadaver of a male in the age of about 70 years. The valve was found closed and the valve sinuses were filled with blood. So, the heart had been fixed in the phase of diastolic closure of the pulmonary valve. The valve described shows a normal position of an outflow valve of the right ventricle. The right leaflet of the valve is smaller than the left one. There is no evidence for valve incompetence. The biophysical analysis shows that in this moment both cusps are overloaded — the pressure on them is to be 50% more than on the normal tricuspid pulmonary valve. Evidently, this is the reason for strongly manifested fibrosis of the cusps.

*Key words:* pulmonary valve, bicuspid construction, male.

### Introduction

In the literature during recent time are to be found only a few cases of bicuspid pulmonary valve in humans without any other damage of the heart [5, 1]. E m u r a et al. [2] describe in a men without heart failure a pulmonary valve consisted of two leaflets - the right one is smaller than the left one. In major cases the bicuspid pulmonary valve was in coexistence of Fallot's tetralogy or ventricular septal defect [4]. K a d r i et al. [3] describe pulmonary incompetence in an adult due to the congenital absence of anterior leaflet of the pulmonary valve.

An exceptional case of congenital bicuspid pulmonary valve in the heart of a male was observed. The valve is not combined with other lesions of the heart.

### Material and Methods

The heart was discovered during dissecting practice at Medical University of Varna (Petrova, 2000) in a 70-year-old male. The pulmonary valve was examined macroscopically. Both leaflets were cut into histological slides and stained with hematoxylin-eosin (HE), orcein, Azan.

## Results and Discussion

The valve was found closed and the valve sinuses were filled with blood. So, the heart had been fixed in the phase of diastolic closure of the pulmonary valve. No evidence of heart failure was found.

The valve described shows a normal position of an outflow valve of the right ventricle. As regard the construction, it differs greatly from normal tricuspid pulmonary valve. The cusps are right (RC) and left (LC), intercusp commissures are anterior and posterior. The cusps are attached by their convex margins to double-scalloped fibrous thickening in the wall of pulmonary trunk at its junction with the ventricle. In the region of the valve there are two prominent dilatations of the vessel wall - sinuses (S), corresponding to the cusps. The upper margin of each sinus is limited by well-defined supra-valval ridge, situated considerably beyond the level of the free border of the cusps.



Fig. 1. Bicuspid pulmonary valve  
RC — right leaflet; LC — left leaflet; S — sinuses

The right leaflet of the valve described is smaller than the left one. The concave free border (FB) is 5.4 vs. 5.9 cm long and 2.0 vs. 2.7 cm high (vertical size in the middle of the leaflet). The anterior half of the free border of the right leaflet is unevenly thickened; the posterior half is thin and smooth. As a whole the anterior part of the leaflet is thicker than that of the posterior one. In the central part of the leaflet at a distance of 3 — 4 mm from the free border there is a fibrous nodular formation (NF). The left leaflet of the valve, which is bigger than the right one shows similar morphological features, but the thickenings of the free border and the leaflet as a whole are better expressed. A strongly prominent central thickening (fibroma — F) is located at a distance of 8 mm from the free border. In the rest of the leaflet small protuberances are seen.

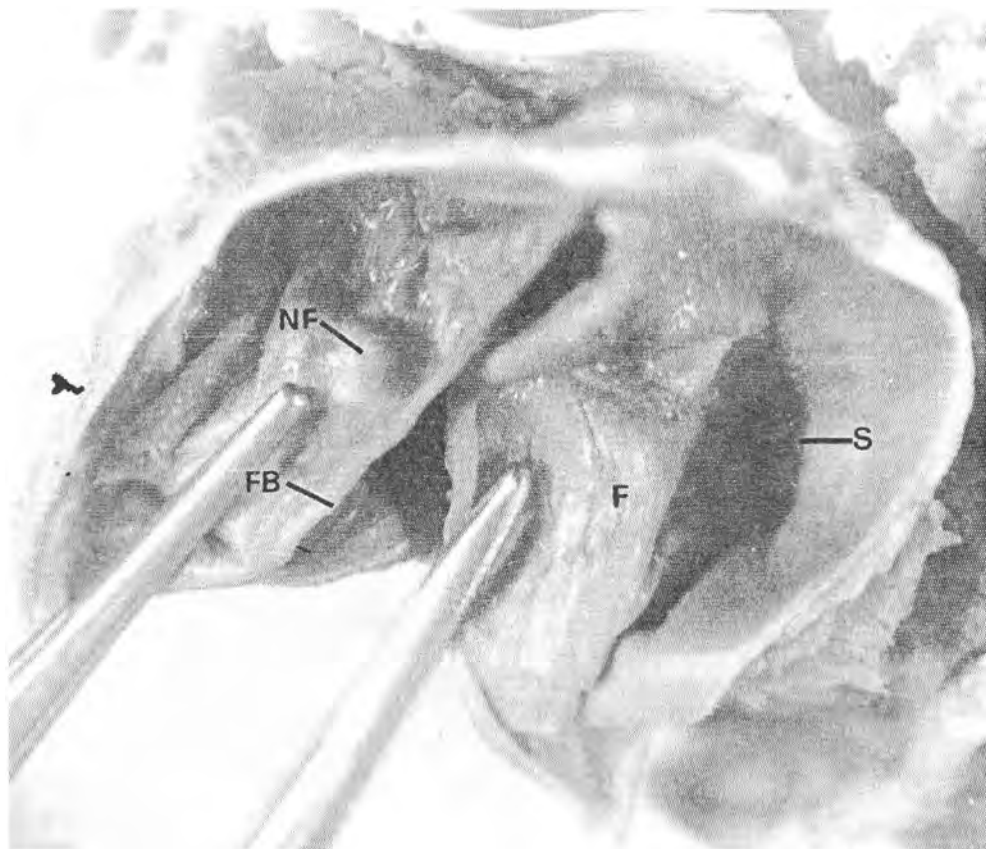


Fig. 2. Bicuspid pulmonary valve  
FB — free border; NF — nodular formation; F — fibroma

In spite of that, there is no evidence for valve incompetence; the size of the right ventricle (RV) as regard to the left ventricle (LV) and the thickness of their walls are approximately normal.

Aortic valve of the heart was a normal tricuspid valve.

Histological investigation shows that the layers of the leaflets are unevenly developed from place to place. In the thickenings, especially in the central tuberal ones, stratum

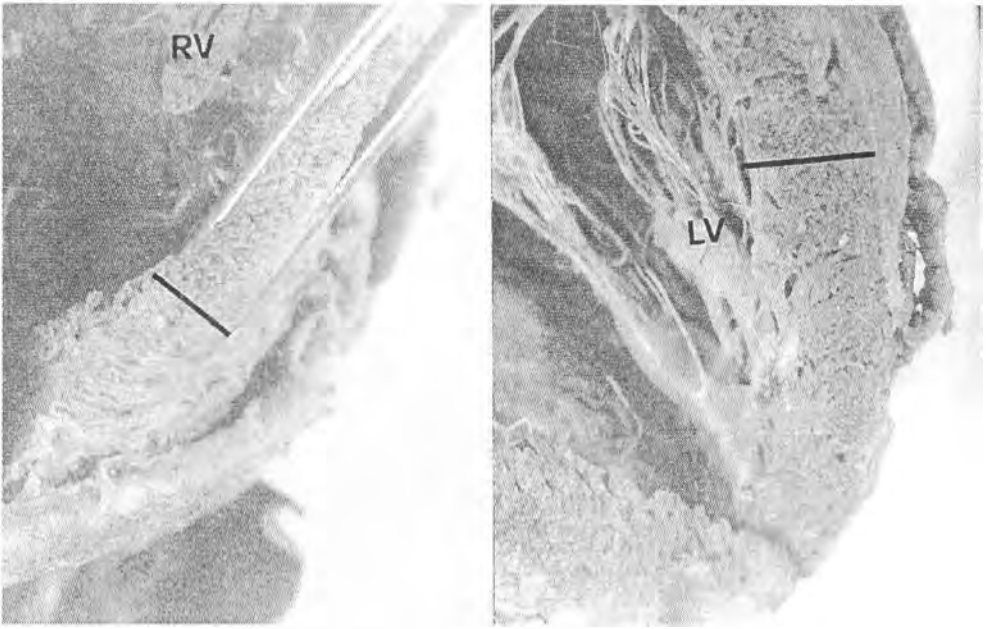


Fig. 3. Right ventricale (RV), left ventricale (LV)

ventriculare is better developed, stratum fibrosum is degeneratively altered, stratum spongiosum is with fibrosis. Homogenisation of the structural components and subsequent hyalinisation are seen.

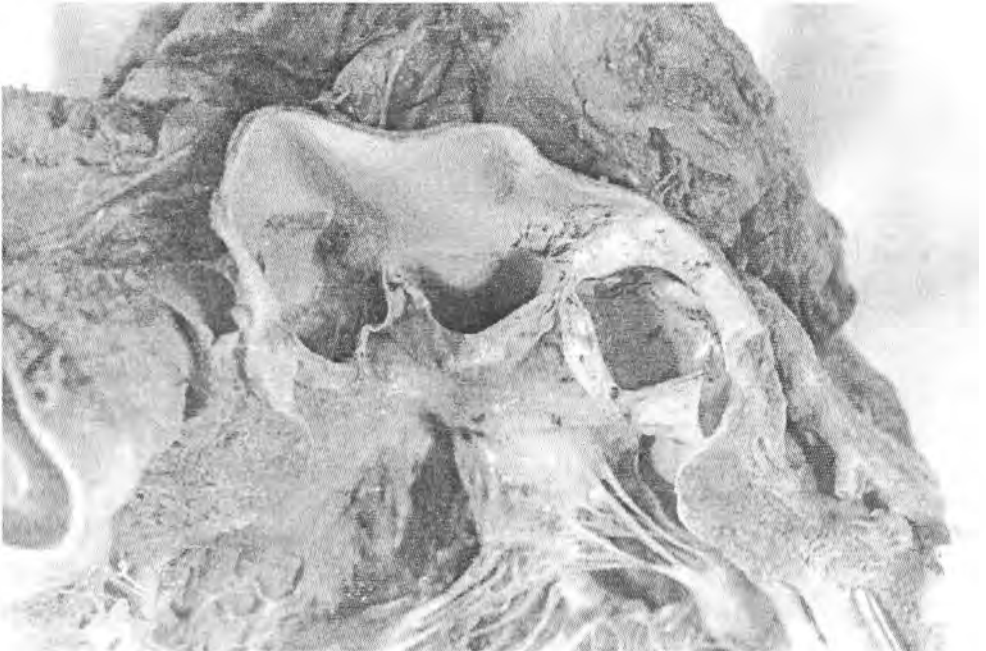


Fig. 4. Aortic valve

The construction of the bicuspid pulmonary valve described shows that during the ejection phase of the right ventricular systole both cusps are moved to the wall by the ejected blood; during the diastolic closure both valvular pockets are filled with blood and

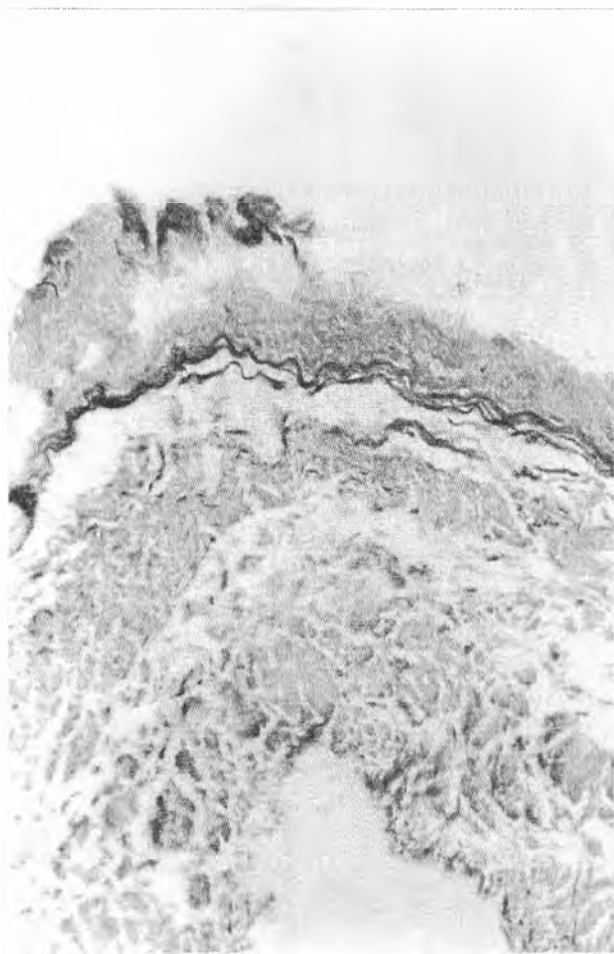


Fig. 5. Leaflet of the pulmonary valve. Hematoxylin-eosin ( $\times 200$ )

the free borders of the cusps are tightly apposed to each other. The biophysical analysis shows that in this moment both cusps are overloaded - the pressure on them is to be 50% more than that on the cusps of the normal tricuspid pulmonary valve. Evidently, this is the reason for strongly manifested fibrosis of the cusps.

## References

1. Bigotti, A., F. Leonardo. Bicuspid pulmonary valve. – *Minerva Cardioangiol.*, **12**, 1976, 873-880.
2. Emura, S., S. Shoumura, M. Utsumi, H. Chen, T. Yamahira. A case of congenital bicuspid pulmonary valve. – *Kaibogaku Zasshi*, **65**, 1990, 381-382.
3. Kadri, M., R. Lazzara, B. McLellan. Repair of congenital pulmonary incompetence by bicuspidization of the pulmonary valve. – *Ann. Thorac Surg.*, **63**, 1997, 1482-1483.
4. Romero-Cardenas, A., M. Villgas, M. Rylarsdam, F. Attie, C. Keirns, R. DeLong. Two dimensional and Doppler echocardiographic diagnosis of bicuspid pulmonary valve. – *Arq. Bras. Cardiol.*, **57**, 1991, 245-247.
5. Shimada, Y. 2 cases of pulmonary valve anomaly. – *Kaibogaku Zasshi*, **50**, 1975, 138-140.