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Case of variable drainage of the superior branch of the left pulmonary vein with patent foramen ovale

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During routine dissection course we have found abnormal drainage of the superior branch of pulmonary vein. The vein collecting the blood from the superior lobe of the left lung was draining into the left brachiocephalic vein. After that the venous drainage was following its usual way. The inferior lobe of the left lung was drained normally into the left atrium. The two pulmonary veins of the right lung had no variations. During classical dissection of the heart we have found foramen ovale enormous in size. Variation of that type has significant value in performing manipulations and operations of the heart.

Key words: pulmonary venous drainage, lungs, foramen ovale.

Introduction

With the advancing of medicine and performing more complex and invasive methods of examinatoin and treatment of the human heart, like heart catheterization and on-beating heart surgery, detailed knowledge of the veins and arteries is required. Interestingly, Winslow [10] first described anomalous connection of the pulmonary veins of a lung more than 200 years ago in 1739. In the second half of 20th century, numerous reports of different type of pulmonary vein anomalies with or without clinical manifestation have been published. Arthurton [1] published a case report of total anomalous pulmonary drainage into the coronary sinus, a rare case of total pulmonary drainage into the portal vein has been described by Butler [4], Winter et al. [11] described an interesting case about 10-week-old infant with total pulmonary drainage into the right atrium. Choo Yung Suh [9] published two cases of pulmonary venous anomaly, clinically manifested in two young soldiers. Recently, with helical CT Shinozaki et al. [8] have found total pulmonary vein drainage into the superior vena cave in a 41-year-old man without any significant complains in his daily life (except palpitation by atrial flutter) due to patent foramen ovale and absence of pulmonary artery stenosis. In the last few years the MRI made the diagnosis of

those anomalies in infants, children and adults a lot easier. In 2003 Haramati [6] published retrospective CT examination of 29 patients. Seventy-nine per cent (23 of 29 patients) had an anomalous left upper lobe vein connecting to a persistent left vertical vein, draining into the left brachiocephalic vein.

Embryologically the lungs are derived from the foregut with which they share a common blood supply. In early stages the pulmonary veins are derived from the splanchnic plexus and have multiple communications with 2 systems, the cardinal system of veins and the umbilicovitelline system. From the cardinal system the superior vena cava, innominate veins, and coronary sinus are ultimately derived. In the final stages of development the umbilicovitelline system is represented principally by the portal venous system. In this early stage the primordia of the lungs have no direct connection with the heart. Subsequently a direct connection with the heart occurs as a result of the union of these primary lung veins with an outgrowth from the dorsal wall of the sinoatrial region known as the common pulmonary vein. After the lungs acquire a route of drainage directly into the heart, the connections between the pulmonary portion of the splanchnic plexus and the cardinal and umbilicovitelline veins are lost [2].

Case report

During routine dissection course, we dissected a 75-year-old male cadaver at the dissection halls in the Department of Anatomy, Histology and Cytology in Medical University, Pleven and found variation in the drainage of the left pulmonary veins. While we were dissecting the veins of the left side of the neck and the left shoulder region we found a huge venous vessel arising from the upper lobe of the left lung (Fig. 1). That

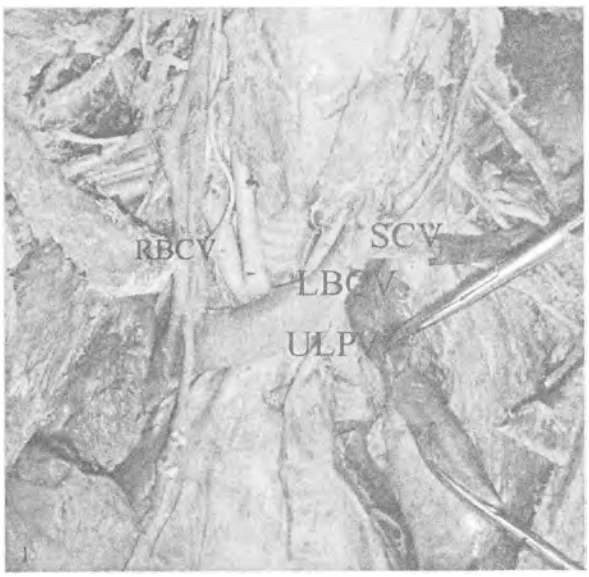

Fig. 1. In situ dissection of the lungs showing the anomalous upper left pulmonary vein (ULPV). Right brachiocephalic vein (RBCV); Left brachiocephalic vein (LBCV); Subclavian vein (SCV)

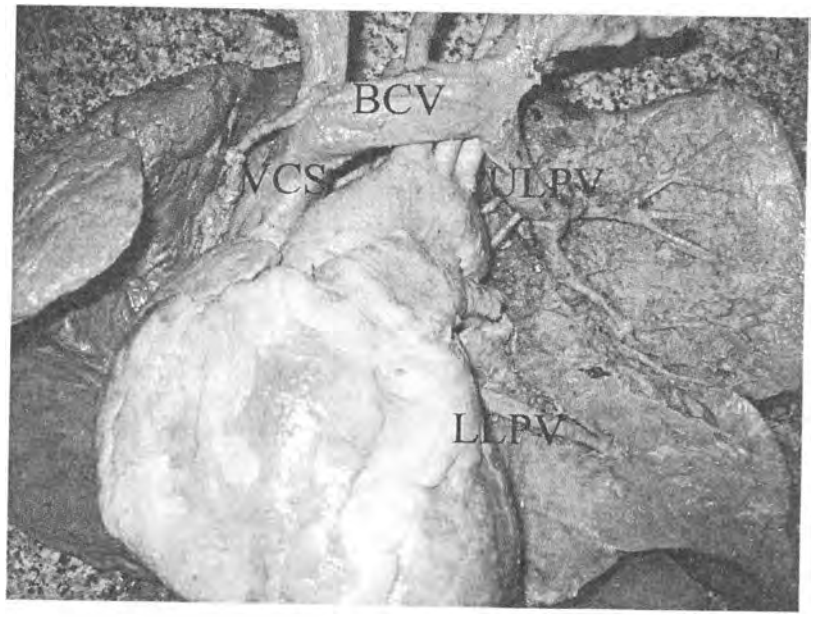

Fig. 2. Eviscerated heart and lungs showing the anomalous upper left pulmonary vein (ULPV) and partially dissected left lung. Left brachiocephalic vein (BCV); Vena cava superior (VCS); Lower left pulmonary vein (LLPV)

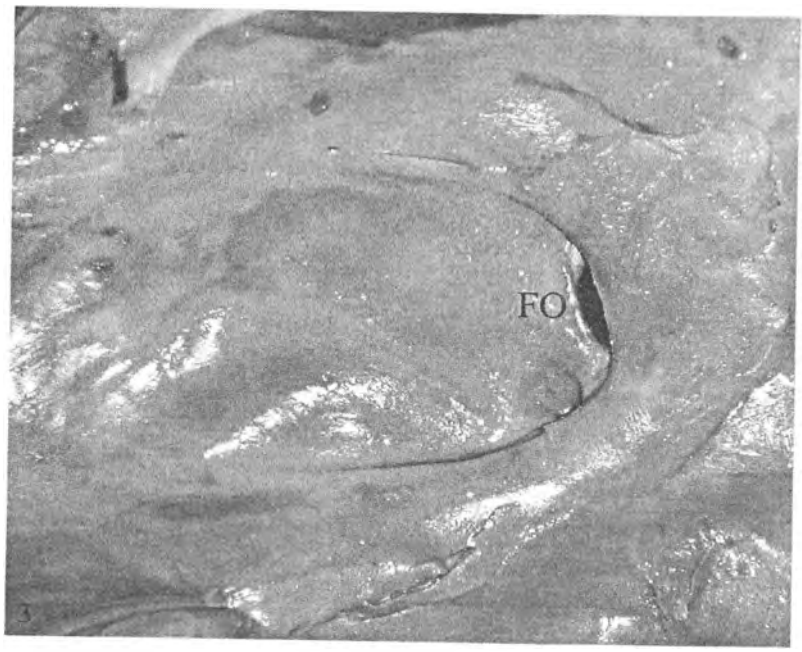

Fig. 3. Classic dissection of the cadaver heart revealing foramen ovale apertum (FO)

vessel had entered the left innominant vein under the clavicle near to the top of the left lung. While dissecting in situ the hilus of the left lung we found normal drainage of the left lower pulmonary vein. After precise dissection of the vessels in the thoracic cavity, neck and the shoulder region we eviscerated the heart and the lungs (Fig. 2). At first sight we did not find any other external anomalies of the drainage of the vessels except the pulmonary vein draining blood from the upper lobe of the left lung into the left brachiocephalic vein by vertical vein. The other three pulmonary veins drained into the left atrium. We made classical anatomical dissection of the heart and we found large fossa ovalis and patent foramen ovale (Fig. 3). There were no pathological aberrations of the thickness of the myocardium.

Discussion

We found PAPVD (Partial anomalous pulmonary venous drainage) with patent foramen ovale in 75-year-old male cadaver. In the literature it is described as an anomally without any clear clinical symptoms. Until the end of the dissection course we did not find any macroscopic pathology in the heart besides patent foramen ovale. The lungs and the other internal organs were intact which showed us that this particular type of anomaly (PAPVD with patent foramen ovale) was not clinically manifested and it was not the direct reason for the death of the man.

According to Edwards [5] the cause in most examples of anomalous pulmonary venous connection is either 1) failure of connection of the atrial portion of the heart with the pulmonary portion of the splanchnic plexus or 2) secondary obliteration of normally developed comnmnunications between the atrial portion of the heart and the pulmonary portion of the splanchnic plexus. In either event that portion of the pulmonary tissue that fails to make direct connection with the heart has no route for drainage other than the primitive connection between the splanchnic plexus or umbilicovitelline system of veins.

In a study of cases Brody [3] stated that, there are two major types of anomalous drainage, i.e. total and partial anomalous drainage. The case that we have described belongs to the second group which usually survives to adult life. At present it is recognized that anomalous drainage of a portion of one or both lungs is relatively common and frequently accompanies atrial septal defect.

In 1953 Muir [7] published detailed summary of the different types of anomalous pulmonary drainage, total and partial, found under different circumstances. Most of the patients with total anomalous pulmonary drainage had patent foramen ovale or other cardiac anomaly and have survived several months, rarely years after birth. The cases with partial anomalous pulmonary drainage were found mostly after necropsy or accidently during different examinations [7], like the case we represent — found during routine dissection course.

Conclusion

The described cases of anomalous pulmonary drainage after necropsy, angiography, heart catheterizations, CT and MRI are of great importance for the medical practice. Some of them are found accidentlally by doctors, performing routine heart examination, while others have been found because of different complains like dyspnoea, palpitation, pulmonary edema and various types of rhythm disorders. Also another type of this anomaly exists, the one without any clinical manifestation because

of the patent foramen ovale which compensates the venous pressure and prevents the pulmonary hypertension.

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