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Case Report

VARIATION OF RIGHT PULMONARY VEINS

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ABSTRACT

Variation in number and drainage pattern of pulmonary veins is frequent. The present report was observed during routine dissection of 50 year old male cadaver in Anatomy department of our institution. In this case a single right pulmonary vein was found to be draining all right pulmonary segments and connects to the left atrium. Where as in the left lung two separate pulmonary veins were draining the respective pulmonary segments to left atrium. An anomalous right sided single pulmonary vein with single ostium is rare in literature. Incidence of a single ostium of right pulmonary vein is 3.33%. Knowledge of these variations is valuable in cardiothoracic surgeries for pulmonary lobectomy, cardiac valve replacements and radiological procedures such as radiofrequency ablations in atrial fibrillations.

KEY WORDS: Pulmonary, Veins, Left atrium, Ostium.

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INTRODUCTION

Pulmonary veins carry oxygenated blood from lungs to the left atrium of the heart. Pulmonary veins begin from the capillary plexus and terminates directly into left atrium. Usually four pulmonary veins two (one is superior and other is inferior pulmonary vein) from each lung return oxygenated blood to the left atrium and open into posterolateral surface of left atrium via 2 separate pulmonary ostia on each side [1]. In right lung superior pulmonary vein drains upper and middle lobe while in left lung it drains upper lobe. The inferior pulmonary vein drains lower lobe of both the lungs. This normal pattern occurs in 82% of population [2]. The most common variation of the number of pulmonary veins is the presence of a common pulmonary vein on either the right or left side with an incidence of 23.9% [3]. Incidence of a single ostium of right pulmonary vein is 3.33% [4].

CASE REPORT

The present case was observed during routine cadaveric dissection in the department of anatomy of our institution. In this case a single right pulmonary vein was found to be draining

all right pulmonary segments and open to the left atrium. This pulmonary vein lies inferior to the pulmonary artery and principal bronchus (Fig 1b). Whereas in the left lung we found two separate pulmonary veins draining respective pulmonary segments and connects to the left atrium (Fig.1c). In left lung superior pulmonary vein was anterior to pulmonary artery and bronchus. Inferior pulmonary vein was inferior to Pulmonary artery and bronchus. On the other hand left atrium was having three openings (Fig 1a) one from right pulmonary vein and two from superior and inferior pulmonary veins respectively.

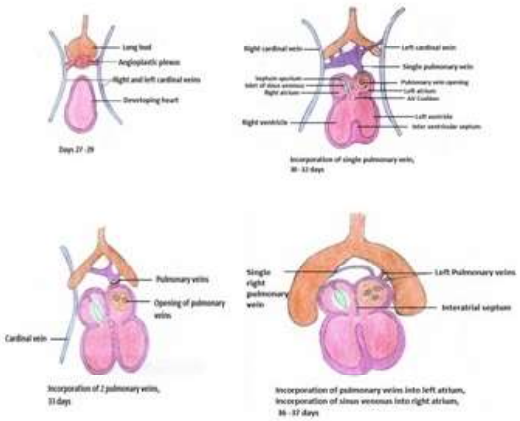
Embryological basis: During the first two months of fetal development, the lungs drain into the systemic veins. The common primitive pulmonary vein forms from a pouch in the dorsal wall of the primitive left atrium. When the primitive lungs are fused to the common pulmonary vein, the connections that allow pulmonary venous return to the systemic veins are obliterated. The single vein divides into two branches, one from each lung. Each lung subdivides into upper and lower branches. Thus the four branches are incorporated to form the wall of left atrium. Abnormal resorption of the embryonic structure can lead to alteration in the diameter or the number of pulmonary veins (Fig 2) and abnormal drainage to the systemic vein or the right atrium [3,5].

Fig. 1a: Showing Openings in posterolateral wall of left atrium.

Fig. 1b: Showing Right Lung having single opening.

Fig. 1c: Showing Left Lung having two openings.

Fig. 2: Showing different stages of development of pulmonary veins.



DISCUSSION

Drainage pattern of pulmonary vein on right side is: the most common drainage pattern - two ostia (90.33%), three to five ostia (6.33%) and a single ostium (3.33%) while on the left side, only two patterns are seen; a single venous ostium (59%) and two ostia (41%).[4] A single bilateral pulmonary venous ostium is seen only in 1.6% [4]. Presence of a common pulmonary vein on either the right or left side with an incidence of 23.9% is the most common variation followed by an additional vessel called the right middle lobe pulmonary vein having a prevalence of 1.6% [3]. The most common variation of right pulmonary veins is three pulmonary veins with two ostia and the most common variation of left pulmonary veins is a single ostium [6]. Marom et al reported 28% had 3-5 ostia on right side which were due to one or two separate middle lobe vein, 2% had a single venous ostium on right side [7]. An anomalous right sided single pulmonary vein with single ostium is rare in literature. Shukla et al done study on 29 hearts. They found different drainage pattern in 13 hearts and they suggested classification of drainage pattern of PV, based on number of PV and PO [6].

Table 1: Showing the Different types drainage pattern of Pulmonary vein.

Right/Left	Type
Type I	1 PV with 1 Ostium
Type II A	2 PV with 2 Ostia
Type II B	2 PV with 1 Ostium
Type III A	3 PV with 3 Ostia
Type III B	3 PV with less than 3 ostia
Type IV A	4 PV with 4 Ostia
Type IV B	4 PV with less than 4 ostia
Type V A	5 PV with 5 Ostia
Type V B	5 PV with less than 5 ostia

Clinical significance: The knowledge about this variation is useful while performing cardiac surgeries on left atrium. This variation gains significance in isolation for radiofrequency ablation as a treatment for atrial fibrillation. This knowledge is significantly important for interventional radiologists and thoracic surgeons before performing procedures which directly or indirectly involve the pulmonary veins. A flexible classification system that clearly describes these variations in pulmonary anatomy is useful for better understanding and for proper planning and management for clinicians. Embryological significance in studying the congenital malformations associated.

ABBREVIATIONS

PV - Pulmonary vein
PO - Pulmonary ostium

Conflicts of Interests: None

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