Original article

The cadaveric study of pulmonary veins and its variations

Dr.. C.Adline Misba

Department of Anatomy,
Name of the Institute/college: Govt.Stanley Medical College
Corresponding author :D.J.K.Raja

Abstract:

Background: Pulmonary veins carry oxygenated blood from the lungs to left atrium. The drainage pattern of pulmonary veins knowledge is essential to carry out procedures involving pulmonary veins. This study aims to find out the variations in the number of right and left pulmonary veins which drains into the left atrium.

Methods: The present study was done on embalmed 60 human cadavers' hearts during the first year MBBS dissection period of Govt.Stanley Medical College, Chennai

Results: In 12 out of 60 hearts shows 2 pulmonary veins on right and 1 pulmonary vein on left(20%), 2 hearts shows 1 on the right and 1 on the left(3.3%) and 1 heart shows 4 on the right and 3 on the left(1.6%). Totally 25 hearts out of 60 hearts showed variations(41.6%).

Conclusion: The knowledge of variations of the pulmonary veins is helpful for the cardiologists and cardiovascular surgeons and radiologists to do the surgical and radiological procedures of left atrium.

Keywords: pulmonary veins, pulmonary embolism, left atrium, atrial fibrillation, radiofrequency ablation.

Introduction:

The left atrium lies posteriorly and forms the base of the heart. It is positioned behind and to the left of right atrium[1]. Pulmonary veins are usually four in number, two on superior and two on inferior in the left atrium. They originate from capillary networks in alveolar walls and return oxygenated blood to left atrium. Pulmonary veins, two from each lung carry oxygenated blood from the lung to the left atrium. The pulmonary veins are devoid of valves[2]. A small amount of blood is also drained from the lungs by the bronchial veins. The knowledge of variations are much importance to cardiovascular surgeons during thoracotomy, pneumonectomy, pulmonary lobectomy and in radiological procedures.

Pulmonary veins have been known to play an important role as the triggering focus of the electrical activity in atrial fibrillation .The successful treatment of atrial fibrillation by radiofrequency ablation of the ectopic foci can be made possible only by having accurate knowledge on the normal anatomy of pulmonary veins. The study is to find out the variations in the number of right and left pulmonary veins which drained into the left atrium. It has been found that variations in pulmonary venous anatomy were seen in 36% of patients according to Marcom et al.[3] Electrophysiologically , the left atrium is just as likely as the right atrium to contribute for the perpetuation of the fibrillatory process[4].

www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

Material and Methods:

The present study was done on 60 embalmed hearts which were seen during the routine cadaveric dissection of the first year MBBS from govt. Stanley medical college, Tamilnadu, the Department of Anatomy. Left atria of these hearts were studied from external aspect, for the variations in the number of pulmonary veins which drained into it. Left atrium were opened by making a lateral wall incision along the whole length of the left atrium and upto the interatrial septum and the number of pulmonary veins which opened into the left atrium were identified and documented. Each left atrium was inspected for its variations of the number of the pulmonary veins and its ostium.

Observations and Results:

TABLE 1-Shows the pulmonary veins draining into left atrium in the present study

Sl.no.	No. Of pulmonary vein		No. Of pulmonary ostium		No. Of hearts	Percentage
	Right	Left	Right	Left		
1	2	2	2	1	12	20
2	1	1	1	1	2	3.3
3	4	3	4	3	1	1.7
4	2	2	2	2	35	58.3
5	2	2	1	2	10	16.7

1.7 % of the cadaveric human hearts has showed variations present on right and left pulmonary veins only in the present study and 23.3percentage shows single left pulmonary ostium in this study.

Discussion:

Approximately 70% of the general population has four pulmonary veins: right superior and inferior and left superior and inferior pulmonary veins, with four independent ostia [3]. Marom EM et al., divided the pulmonary vein and its drainage orifices into 6 patterns on the right side and 2 patterns on the left side [5]. According to his study, the most common drainage pattern was two pulmonary veins, each on right and left side, with two separate ostia. The next common drainage pattern on the right side was three pulmonary veins with three ostia (24%) and on the left side, they noticed a single pulmonary vein with a single ostium in14% of specimens. Earlier, it was found that, variations in the right pulmonary vein drainage were more common than those on the left [5]. Lovesh et al in his study states that there were no abnormalities simultaneously present on both the sides of pulmonary veins[6] . But in the present study, about 1.7% of hearts showed variable pulmonary veins on the right side and showed variations on the left pulmonary veins.

In the right pulmonary vein, the frequency of each branching type differed greatly from that of previous reports [7].L.C. Prasanna et al had found that by confluence of either superior pulmonary veins or both inferior pulmonary veins, or of the superior and inferior pulmonary veins on one side. The latter appeared as a single ostium and it is present in 12–25% of the general population, which is commonly seen on the left side, as was seen in his study[8] (single left pulmonary ostium seen in 23.3% cadavers in the present study).

The ectopic beats arise from these anomalous veins. This greater variability in pulmonary venous anatomy than expected could substantially alter the success rate of radiofrequency ablation, as ectopic foci may go untreated in variant veins[5]. Pulmonary veins play a critical role in the pathophysiology of atrial fibrillation. Knowledge

www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

of normal pulmonary venous anatomy is essential for preablation planning and for evaluation of postablation complication[7]. Surgeons usually ligate and divide the right inferior pulmonary vein (PV) without meticulous attention to its tributaries when performing right lower lobectomy because the former generally consists of the right lower lobe vein only[9].

Variations in pulmonary venous anatomy was reported in 36% of patients[10] and ectopic beats can arise from these anomalous veins[11]. Lovesh et al has suggested a classification of the number of pulmonary veins and pulmonary ostium on right and left separately which will be helpful for the cardiothoracic surgeons and radiological procedures[6] .

Conclusion:

Hence, the knowledge about the variations in the pulmonary veins is required for the cardiologists and cardiothoracic surgeons to do surgical procedures like pulmonary lobectomy, pneumonectomy, thoracotomy, treating atrial fibrillation and especially for cardiovascular procedures and radiological procedures as there are variations even in the present cadaveric study at a considerable percentage.

FIG 1 SHOWS LEFT SIDE ONE PULMONARY VEIN WITH TWO PULMONARY OSTIUM AND RIGHT SIDE TWO PULMONARY VEINS

Fig 2 shows left pulmonary vein with one ostium and right side 2 pulmonary veins

www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858


Three
L.Pulmonary
veins
L.Atrium

References:

1. G. J. Romanes, Blood Vessels of Lungs, Cunningham's Manual of Practical Anatomy, Oxford University, London, UK, 15th edition, 1986.
2. Gray's Anatomy.The Anatomical basis of clinical practice. 40th edition,Susan Standring.Elseiver Chruchchill Livingstone, 2008,p997.
3. Teckbas G, Gumus H, Onder H, Ekici F, Hamjidi C, Tckbasi E.Evaluation of pulmonary vein variations and anomalies with 64 slice multi detector computed tomography. Wien Klin Wochenschr. 2012;124(1-2):3–10.
4. Konings KTS. Kirchhof CJHJ. Smeets JRLM. et al: High-density mapping of electrically induced atrial fibrillation in humans. Circulation 1994:89:1665-1680.
5. Marom EM, Herndon JE, Kim YH, McAdams HP. Radiol. 2004;230:824–9.
6. 6. Lovesh Shukla, Neha Gaur, Gargi Soni ,Usha Dhall. Variations in number and drainage pattern of pulmonary veins draining into the left atrium. J.Anat.Soc.India 2012;61(1):5-8.
7. 7.T. H. Hauser, D. C. Peters, J. V. Wylie, and W. J. Manning, "Evaluating the left atrium by magnetic resonance imaging," EP Eurospace, vol. 10, supplement 3, pp. iii22–iii27, 2008.
8. L C Prasanna, R P, D'Souza AS, Bhat KM. Variations in the pulmonary venous ostium in the left atrium and its clinical importance. *J Clin Diagn Res*. 2014;8(2):10-1.
9. 9 Sabiston DC Jr. Neoplasm of the lung. In: Sabiston DC Jr, Spencer FC, eds. Gibbon's surgery of the chest. Philadelphia: WB Saunders Co, 1983:453–538.
10. 10.Manghat NE, Mathias HC, Kakani N, Hamilton MCK, Morghan-Hughes G, Roobottom CA. Pulmonary venous evaluation using echocardiogram-gated 64-detector row cardiac CT. British J Radiol. 2012;85:965–71.
11. Tsao LM, Wu MH, Yu WC,Tai CT, Lin YK ,Hseih MK et al. Role of right middle pulmonary vein in patients with paroxysmal atrial fibrillation. J Cardiovasc Electrophysio 2001;12:13537.

www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858