

Meandering Left Pulmonary Vein: A Case Report

Shadan Alwan¹, Emma Ferguson¹

Department of Diagnostic and Interventional Imaging, The University of Texas Health Science Center, Houston, Texas, USA

Abstract

A meandering pulmonary vein is a rare congenital pulmonary vascular variant. This usually presents as a unilateral pulmonary vein that takes an abnormal and tortuous course within the lungs, eventually draining into the heart. In our case, the patient presents with a finding of a left meandering pulmonary vein which eventually drains into the left atrium on cross-sectional imaging of the chest.

Keywords: Chest, pulmonary, vascular, vein

Introduction

Pulmonary vein anomalies are usually classified as either congenital or acquired processes. Congenital pulmonary vein anomalies include abnormal drainage or connections with other pulmonary vessels. Acquired pulmonary vein anomalies include obstruction/stenosis, hypertension, collateral circulations, calcifications, or thrombosis.¹

To further understand congenital pulmonary vein anomalies, it is imperative to review the embryology related to pulmonary vein formation. The lungs drain into the systemic veins during the first 2 months of fetal development. The common primitive pulmonary vein is formed from the posterior wall of the primitive left atrium. The primitive lungs then join to the common pulmonary vein, which leads to the discontinuation of pulmonary venous return to the systemic veins. The 4 pulmonary veins arise, with 2 veins draining each lung.¹ Normally, the right upper and middle lobes are drained by the right superior pulmonary vein while the left upper lobe and lingula are drained by the left superior pulmonary vein. The right and left lower lobes are each drained by 1 of the 2 inferior pulmonary veins.

Anomalies of the pulmonary veins can arise when there is abnormal resorption of the embryonic structures. Atypical patterns can be found in up to about 38% of the population.¹

Anomalies that involve the diameter of the pulmonary vein include pulmonary vein varix and congenital unilateral pulmonary vein atresia or stenosis. In pulmonary vein varix, the diameter of the pulmonary vein is enlarged without an arterial connection. In congenital unilateral pulmonary vein atresia or

stenosis, there is no incorporation of a common pulmonary vein into the left atrium.²

Drainage anomalies include right- and left-sided partial anomalous pulmonary venous return (PAPVR), Scimitar syndrome, and levoatrial cardinal vein. In right-sided PAPVR, the right pulmonary vein drains into the superior vena cava. In left-sided PAPVR, the left upper pulmonary vein joins the left brachiocephalic vein.^{1,3} Scimitar syndrome presents as a pulmonary vein draining into an inferior vena cava and is usually associated with right pulmonary hypoplasia. The levoatrial cardinal vein is a pulmonary vein that serves as a connection between the left atrium and the systemic venous system.

Connections with the pulmonary arterial tree can result in anomalies as well such as pulmonary arteriovenous malformation. In this condition, abnormal connections are seen between the pulmonary artery and pulmonary vein.

In our case, an anomalous unilateral single pulmonary vein, also known as an meandering pulmonary vein (MPV), is an anomaly in the number of pulmonary veins. In this condition, the single pulmonary vein joins the left atrium after uniting all the pulmonary veins from one lung.

Case Presentation

A 43-year-old male with no known past medical history presents with an abnormal coagulation profile and previous symptoms of chest pain. A computed tomography arterial (CTA) study was ordered as an outpatient study to rule out a pulmonary embolism. An incidental finding of a left-sided anomalous

Cite this article as: Alwan S, Ferguson E. Meandering left pulmonary vein: A case report. *Imaging Interv.* 2022;1(3):76-78.

Corresponding author: Shadan Alwan, email: shadanalwan@gmail.com

Received: February 8, 2022 **Accepted:** March 13, 2022



The journal's content is licensed under a Creative Commons Attribution-Non Commercial (CC BY-NC) 4.0 International License.

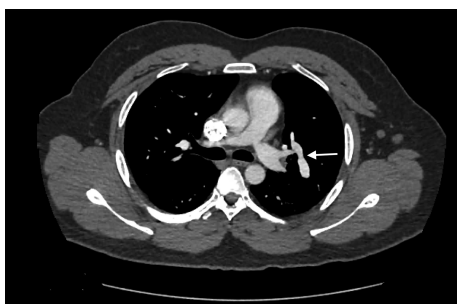


Figure 1. The left MPV drains into the left superior pulmonary vein, eventually draining into the left atrium. MPV, meandering pulmonary vein.



Figure 2. A coronal CT view again demonstrates the left MPV as it approaches the left superior pulmonary vein. CT, computed tomography; MPV, meandering pulmonary vein.



Figure 3. Coronal CT maximum intensity projection image of the left-sided MPV as it joins the left superior pulmonary vein. CT, computed tomography; MPV, meandering pulmonary vein.

pulmonary vein with a tortuous course was found, eventually joining the left atrium.

Imaging Findings

A CTA study shows a dilated pulmonary vein draining the left upper lobe with an intrapulmonary course that crosses the major fissure. This vein then joins the left superior pulmonary vein before entering the left atrium. The finding is most consistent with an incidental vascular variant of anatomy entering

the left pulmonary vein. There were no pathological consequences identified with this finding.

Discussion

An MPV is a rare anomaly with only 20 reported cases.³ Many of these cases reported have been right-sided. With our patient, the MPV was left-sided.

Meandering pulmonary vein is usually asymptomatic with an abnormal course, eventually draining into the left atrium. This condition is usually confused with Scimitar syndrome in which anomalous pulmonary drainage of the right lung goes to the IVC.⁴ Scimitar syndrome can be associated with right lung hypoplasia, cardiac malformations, and dextrocardia.^{3,5}

Disruption of normal embryological formation of the pulmonary veins can lead to MPV. This disruption particularly occurs during the primitive splanchnic capillary stage of development. The splanchnic plexus includes the cardinal veins, the umbilicovitelline veins, and the common pulmonary vein which drains the immature lung.⁶ The cardinal veins and umbilicovitelline veins eventually regress while the common pulmonary vein joins the left atrium and forms the pulmonary veins. If there is atresia of one of the pulmonary veins before pulmonary segmentation but after splanchnic circulation is separated, an MPV may arise.^{6,7}

The discovery of MPVs is usually incidental findings in imaging studies with an asymptomatic presentation. This discovery is typically reported in most cases as an isolated finding, unlike Scimitar syndrome. It is imperative to differentiate MPV from other pulmonary anomalies given that MPV is an isolated finding with no surgical intervention needed. Although MPVs can occur bilaterally, most cases have been reported to be right-sided rather than left-sided. In our case, the patient was asymptomatic with an incidental and isolated finding of a left-sided MPV coursing tortuously and eventually joining the left atrium.

Informed Consent: Informed consent is not required for this case report because there is no identifiable patient information.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – S.A., E.F.; Design – S.A.; Supervision – E.F.; Materials – S.A.; Data Collection and/or Processing – S.A.; Analysis and/or Interpretation – S.A.; Literature Review – S.A.; Writing – S.A.; Critical Review – S.A., E.F.

Acknowledgments: Special thanks to Cihan Duran, MD for guidance in imaging resources.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: This study received no funding.

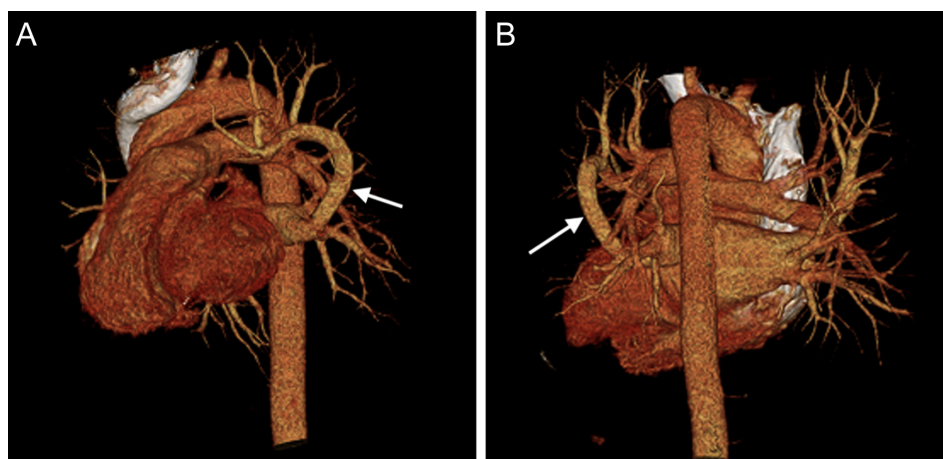


Figure 4. Three-dimensional reconstruction images portraying the left MPV in both (A) anterolateral and (B) posterior views. MPV, meandering pulmonary vein.

References

1. Porres DV, Morenza OP, Pallisa E, Roque A, Andreu J, Martinez M. Learning from the pulmonary veins. *RadioGraphics*. 2013;33(4):999-1022. [\[CrossRef\]](#)
2. Castañer E, Gallardo X, Rimola J, et al. Congenital and acquired pulmonary artery anomalies in the adult: radiologic overview. *RadioGraphics*. 2006;26(2):349-371. [\[CrossRef\]](#)
3. Gavazzi E, Ravanelli M, Farina D, Chiari ME, Maroldi R. Scimitar syndrome: comprehensive, noninvasive assessment with cardiovascular magnetic resonance imaging. *Circulation*. 2008;118(3):e63-e64. [\[CrossRef\]](#)
4. Agarwal PP, Seely JM, Matzinger FR. MDCT of anomalous unilateral single pulmonary vein. *AJR Am J Roentgenol*. 2004;183(5):1241-1243. [\[CrossRef\]](#)
5. Rodrigues MA, Ritchie G, Murchison JT. Incidental meandering right pulmonary vein, literature review and proposed nomenclature revision. *World J Radiol*. 2013;5(5):215-219. [\[CrossRef\]](#)
6. Sneha Harish C, Dixit R, Agarwal A, Garg A. Meandering pulmonary vein: A case report. *J Rad Case Rep*. 2020;14(3):7-13. [\[CrossRef\]](#)
7. Lee M, Jeon KN, Park MJ, Bae K. Meandering pulmonary veins: two case reports. *Medicine*. 2020;99(16):e19815. [\[CrossRef\]](#)
8. Aygun MS, Çalık M, Çalık SG. Meandering pulmonary vein: very rare incidental finding. *Eurasian J Pulmonol*. 2018;20(1):43-45. [\[CrossRef\]](#)