Case Reports in Oncology

Case Rep Oncol 2024;17:1294–1300
DOI: 10.1159/000542052
Received: August 11, 2024
Accepted: October 14, 2024
Published online: November 12, 2024

Case Report

High-Grade Sarcoma of the Pulmonary Artery That Mimicked a Pulmonary Embolism in a 39-Year-Old Patient with Recurrent Miscarriages: A Case Report

John Corbyn Cravero[a] Laith Wahab[a] Dirk T. Wilson[a] Ali Alani[b] Arthur Bredeweg[b] Roberto Aguirre[a]

[a]Department of Internal Medicine, Baylor Scott & White Medical Center, Temple, TX, USA;
[b]Department of Pathology, Baylor University Medical Center, Dallas, TX, USA

Keywords

Primary pulmonary artery sarcoma · Dyspnea · Pulmonary thromboembolism · Cancer · Intrathoracic sarcomas

Abstract

Introduction: Primary pulmonary artery sarcoma is a rare malignancy with a poor prognosis, undefined treatment guidelines, and is often mistaken for a pulmonary embolism (PE) based on similar clinical presentation and radiographic findings. ***Case Presentation:*** We present a case of a 39-year-old female with a past medical history of recurrent miscarriages who presented with a chief complaint of dyspnea. Due to a history of recurrent miscarriages, a predisposing coagulopathic condition was suspected for a PE. A V/Q scan showed high probability for a PE with bilateral perfusion defects. Subsequent CT angiographic imaging of the chest was read as positive for a massive PE. The patient was transferred to the medical ICU for tPA administration but developed worsening hypoxic respiratory failure and was transferred to an outside hospital for expert surgical consultation and thrombectomy. Intraoperative reports during thrombectomy commented on a mass within the pulmonary artery. Subsequent pathology showed a high-grade sarcoma. The patient was started on adjuvant chemotherapy with doxorubicin, ifosfamide, and MESNA; however, due to multiple comorbidities, the patient ultimately succumbed to her illness. ***Conclusion:*** This case underscores the diagnostic difficulty in distinguishing pulmonary artery sarcomas from a PE, especially in the presence of other confounders and biases.

Correspondence to:
John Corbyn Cravero, john.cravero@bswhealth.org

Case Rep Oncol 2024;17:1294–1300
DOI: 10.1159/000542052

Introduction/Background

Primary pulmonary artery sarcoma (PPAS) is a rare tumor with an estimated prevalence of 0.001–0.003% [1]. Pulmonary artery sarcomas are reported to have an average age of onset of 48 years old and can range from 13 to 86 years old [2]. Prognosis is poor with a median survival of 1.5 months without surgical intervention [3]. A diagnosis of PPAS is complicated by nonspecific presenting symptoms, including dyspnea, cough, hemoptysis, and pleuritic chest pain, which also overlap with presenting symptoms of pulmonary embolism (PE) [4]. A 2013 study reported the frequency of dyspnea and chest pain in pulmonary malignancy varies widely from 3 to 60% and 20–49%, respectively [5]. This issue is compounded by the similarity of radiographic findings between pulmonary artery sarcomas and subacute pulmonary emboli [6]. In fact, 1 case series estimated that 3–4% of patients diagnosed with chronic thromboembolic PE were subsequently diagnosed with PPAS [7]. It is estimated that nearly half (47%) of PPAS were misdiagnosed as PE [8, 9]. To date, there is currently no unified understanding or standard regarding diagnosis and treatment [4].

Case Description

We present the case of a 39-year-old female with a past medical history of recurrent miscarriages, anemia, thrombocytopenia, and IV contrast allergy who presented with a chief complaint of dyspnea that had progressively worsened over a period of 5–6 months prior to her admission. During this time frame, the patient saw multiple outside providers starting with a fertility specialist for recurrent miscarriages. She was found to have thrombocytopenia and was referred to hematology for further evaluation, which included a bone marrow biopsy that was negative for leukemia and lymphoma. The patient was noted to have hemolytic anemia and persistent thrombocytopenia, prompting further evaluation with rheumatology which was negative for autoimmune workup (negative RF, dsDNA, HLA B27, ANCA, anti-Jo-1, CCP, ACE1, Sjogren's antibodies, anti-centromere). For her dyspnea, the patient was evaluated by cardiology with negative stress testing and was treated with metoprolol and verapamil for sinus tachycardia without improvement of her symptoms. Lastly, the patient was evaluated by pulmonology who recommended a CT of the chest without contrast that showed ground-glass opacities of the right lung. Based on her persistent symptoms, pulmonology recommended inpatient admission for further evaluation.

During the start of her admission, the patient was found to be tachycardic with heart rate of 118 bpm, tachypneic with a respiration rate of 24, and hypoxic requiring supplemental oxygen. Pertinent initial laboratories obtained included an elevated D-dimer (1.63), moderate thrombocytopenia (88,000), low haptoglobin (<8), and an elevated BNP (181). Due to the patient's history of recurrent miscarriages, a predisposing coagulopathic condition was suspected for a PE. An initial V/Q scan was significant for bilateral perfusion defects (worse on the right) and a high probability of a PE. An echocardiogram showed preserved ejection fraction (>70%), a dilated right ventricle with pressure of 55 mm Hg, with systolic and diastolic flattening of the interventricular septum consistent with right ventricular volume and pressure overload. Based on these findings, a PE was suspected, and the patient underwent CTA of the chest after pretreatment with Benadryl and steroids given her history of IV contrast allergy that was positive for a massive PE with bilateral multi-lobar involvement and right heart strain.

Intervention

The patient was transferred to the medical ICU for administration of tPA; however, she experienced worsening hypoxia from suspected chronic thromboembolic pulmonary hypertension with superimposed acute thrombus. The patient was ultimately cannulated with

Case Rep Oncol 2024;17:1294–1300
DOI: 10.1159/000542052

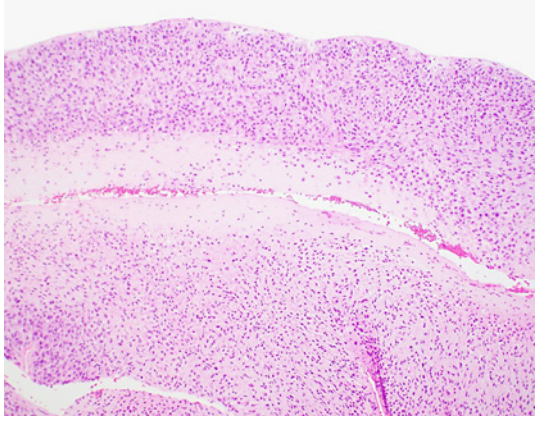

Fig. 1. Undifferentiated pleomorphic sarcoma of the pulmonary artery (×10 power). Intermediate-power view showing hypercellular tumor arising in the wall of a large vessel.

venoarterial ECMO and transferred to an outside hospital for thrombectomy and surgical consultation. The patient underwent thrombectomy via median sternotomy and was found to have a mass in the posterior wall of the pulmonary artery obliterating the right and left cusps with a clot or tumor extending down the right and left main pulmonary artery. Subsequent pathology results of the pulmonary artery mass demonstrated cytologically malignant pleomorphic and spindle cells with enlarged hyperchromatic nuclei and eosinophilic cytoplasm, enmeshed in a collagenous stroma. The tumor showed increased mitotic activity, including those of atypical configuration, and tumor necrosis was identified. Immunohistochemistry showed tumor cells that were positive for smooth muscle actin, focally positive for CD31, focally and faintly positive for ERG, and S100, and negative for desmin, caldesmon, MyoD1, myogenin, CD34, SOX10, CK AE1–3, and CK CAM 5.2. The proliferation rate estimated by the Ki67 nuclear labeling index was approximately 30%. Fluorescence in situ hybridization for amplification of MDM2 was negative. The overall morphologic, cytogenetics, and immunohistochemical results were consistent with undifferentiated pleomorphic sarcoma of the pulmonary artery (Fig. 1, 2). Hematology/oncology was consulted and recommended treatment with doxorubicin plus ifosfamide. MESNA was added 24 h later after a urinalysis was positive for hematuria, concerning for hemorrhagic cystitis secondary to ifosfamide.

Outcome

The patient had a prolonged hospital course that included ECMO de-cannulation with multiple intubations and failed extubation, necessitating tracheostomy placement. One week after initiation of chemotherapy, the patient had an episode of tachypnea and concomitant worsening renal function and metabolic acidosis. Nephrology was consulted and initiated CRRT. Blood cultures obtained during this episode were positive for MSSA bacteremia, and the patient was started on broad spectrum antibiotics. However, due to decompensation and multiple comorbidities, the patient ultimately succumbed to her illness and passed away.

Discussion

This patient's case presentation is significant for several reasons based on the rarity of her diagnosis, delays in diagnosis, and other confounding information. Prior to her admission, the patient was evaluated by several providers for a constellation of symptoms, including anemia, thrombocytopenia, tachycardia, and progressive dyspnea. In hindsight, these findings in conjunction with her presenting laboratories collectively support a diagnosis of pulmonary artery sarcoma. The patient's history of a contrast allergy precluded further angiographic

Case Rep Oncol 2024;17:1294–1300
DOI: 10.1159/000542052

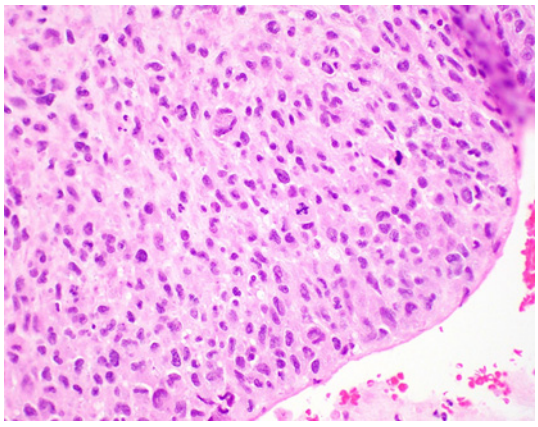

Fig. 2. Undifferentiated pleomorphic sarcoma of the pulmonary artery (×40 power). High-power view showing pleomorphic and spindle cells with enlarged hyperchromatic nuclei and eosinophilic cytoplasm. Multiple mitotic figures are seen.

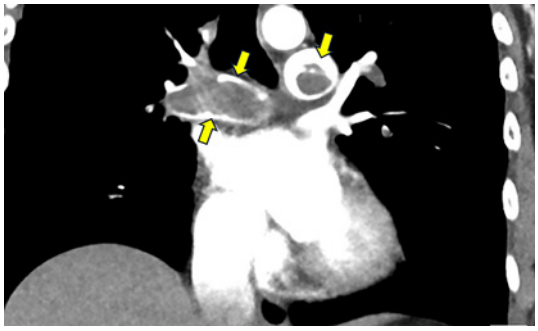

Fig. 3. Coronal CT angiography of the chest. Large heterogenous mass within the right and left pulmonary arteries as denoted by the yellow arrows, demonstrating criteria 1 of wall eclipsing sign.

imaging studies and likely contributed to diagnostic delay. Furthermore, her history of recurrent miscarriages served as a potential bias for her initial diagnosis of presumed PE secondary to a hypercoagulable state, such as antiphospholipid syndrome. However, subsequent hypercoagulable workup was negative for factor V Leiden, anti-cardiolipin IgM/IgG, beta-2 glycoprotein, lupus anticoagulant, and phospholipid-dependent screening. This initial presentation likely served as both a framing and anchoring bias that supported a diagnosis of PE over pulmonary artery sarcoma.

Due to the similarity of initial presenting symptoms, distinguishing a pulmonary artery sarcoma from a PE is extremely difficult. However, there are subtle differences that can help distinguish one from the other. Symptoms for pulmonary artery sarcomas usually present over a longer time period of weeks to months, whereas symptoms for PE present acutely with sudden onset [8]. Radiographic criteria for CT pulmonary angiography have also been proposed. The "wall eclipsing sign" has been considered pathognomonic for pulmonary artery sarcomas and is defined as the presence of the following three findings: (1) almost complete filling of the pulmonary artery and its branches by a low-density mass, (2) protrusion of the proximal end of the mass towards the right ventricular outflow tract, and (3) eclipsing of one or both the walls of the pulmonary trunk or is branches by the lesion [10, 11]. Another single case report proposed radiographic finding includes "hillside sign," referring to the manner in which main lesions interlink and grow into the pulmonary cavity with smooth surfaces at different heights [12]. A review of the patient's initial CT angiography of the chest is consistent with wall eclipsing sign on radiographic images (Fig. 3–5).

At present, there are no guidelines regarding treatment of pulmonary artery sarcoma. For patients who are hemodynamically stable, surgical resection has been shown to significantly improve mortality when compared to no definitive surgery [8]. Adjuvant

Case Rep Oncol 2024;17:1294–1300
DOI: 10.1159/000542052

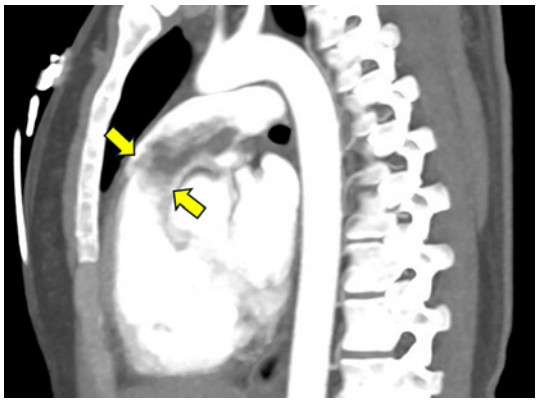

Fig. 4. Sagittal CT angiography of the chest. Protrusion of the proximal end of the mass within the pulmonary artery toward to the right ventricular outflow tract, demonstrating criteria 2 of wall eclipsing sign.

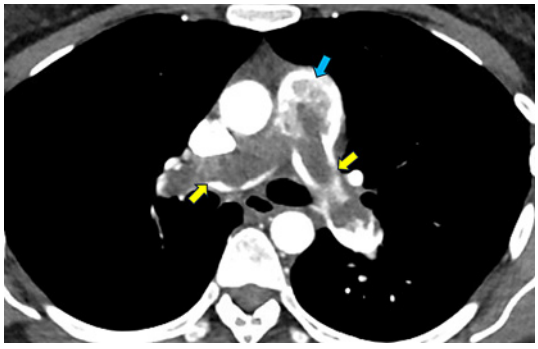

Fig. 5. Transverse CT angiography of the chest. Eclipsing of the pulmonary artery denoted by the turquoise arrow as well as the right and left pulmonary arteries denoted by the yellow arrows that is worse on the right, demonstrating criteria 3 of wall eclipsing sign.

chemotherapy agents have also been utilized, typically with an anthracycline agent (doxorubicin, epirubicin) with or without an alkylating agent (ifosfamide, cyclophosphamide) [8, 13]. Other proposed agents include vincristine, paclitaxel, gemcitabine, etoposide, interleukin 2, mitomycin, methotrexate, and sunitinib [13]. Based on a single retrospective observational analysis in 2020, patients who underwent surgical resection with adjuvant therapy improved survival and occurrence of distant metastasis but did not affect local recurrence [8].

Conclusion

PPAS is a rare malignancy with a poor prognosis and undefined treatment guidelines. PPAS is often mistaken for a PE based on clinical presentation and radiographic imaging findings. Providers should be cognoscente of the subtle differences between the two regarding history (acute vs. chronic) and image findings (eclipsing and hillside sign) in order to prevent delays in diagnosis and subsequent treatment.

Statement of Ethics

The authors of this manuscript maintain their professional and academic integrity throughout the process of composing this manuscript. This retrospective review of patient data did not require ethical approval in accordance with local/national guidelines. Written informed consent was obtained from the patient for publication of the details of their medical

case and any accompanying images. Written consent was obtained from the patient's spouse prior to publication. A copy of the consent form is available upon request. The CARE checklist has been utilized in preparation of this manuscript and is available as a separate document as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000542052).

Conflict of Interest Statement

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or nonfinancial interest (such as personal or professional relationships, affiliations, knowledge, or beliefs) in the subject matter or materials discussed in this manuscript.

Funding Sources

The authors of this manuscript do not have any funding to declare. The authors of this manuscript wrote and prepared this manuscript as physicians of their own volition.

Author Contributions

Each physician contributed to the manuscript as follows: Dr. Dirk T. Wilson (background), Dr. Laith Wahab (case report), Dr. John Corbyn Cravero (general editor, abstract, discussion). Drs. Ali Alani and Arthur Bredeweg were faculty staff in pathology and assisted with the pathologic slides and descriptions. Dr. Roberto Aguirre was the attending staff who oversaw all aspects of the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

References

1 Rabbani M, Hafiz A, Algadheeb M, Tugaleva E, Bergin ML, Ray Guo LR. Pulmonary artery intimal sarcoma: a deadly diagnosis in disguise. CJC Open. 2020;2(6):711–5. https://doi.org/10.1016/j.cjco.2020.07.008
2 Assi T, Kattan J, Rassy E, Moussa T, Nassereddine H, Honore C, et al. A comprehensive review on the diagnosis and management of intimal sarcoma of the pulmonary artery. Crit Rev Oncol Hematol. 2020;147:102889. https://doi.org/10.1016/j.critrevonc.2020.102889
3 Zhang S, Zhang Y, Liu M, Tao X, Xie W, Wan J, et al. Radiological, histopathological findings, and clinical outcome of pulmonary artery sarcoma. Pulm Circ. 2021;11(1):2045894020940537–9. https://doi.org/10.1177/2045894020940537
4 Liu X, Liu X, Li R, Zhang W. Primary pulmonary artery tumors easily misdiagnosed as pulmonary embolism: a review. Medicine. 2023;102(14):E33337. https://doi.org/10.1097/MD.0000000000033337
5 Ost D, Jim Yeung S-C, Tanoue LT, Gould M. Clinical and organizational factors in the initial evaluation of patients with lung cancer: diagnosis and management of lung cancer. Chest. 2013;143(5 Suppl):e121S–41S. https://doi.org/10.1378/chest.12-2352

6 Lashari BH, Kumaran M, Aneja A, Bull T, Rali P. Beyond clots in the pulmonary circulation: pulmonary artery tumors mimicking pulmonary embolism. Chest. 2022;161(6):1642–50. https://doi.org/10.1016/j.chest.2022.01.013
7 Jamieson SW, Auger WR, Fedullo PF, Channick RN, Kriett JM, Tarazi RY, et al. Experience and results with 150 pulmonary thromboendarterectomy operations over a 29-month period. J Thorac Cardiovasc Surg. 1993;106(1):116–27. https://doi.org/10.1016/s0022-5223(19)33748-1
8 Bandyopadhyay D, Panchabhai TS, Bajaj NS, Patil PD, Bunte MC. Primary pulmonary artery sarcoma: a close associate of pulmonary embolism—20-year observational analysis. J Thorac Dis. 2016;8(9):2592–601. https://doi.org/10.21037/jtd.2016.08.89
9 Bai X, Ruan L. A case report of primary pulmonary artery intimal sarcoma. Eur J Med Res. 2021;26(1):89. https://doi.org/10.1186/s40001-021-00568-w
10 Moguillansky NI, Verma N, Shah P, Knapik J, Mohammed TL. Pulmonary artery sarcoma: case report and review of the literature. Respir Med Case Rep. 2019;27:100857. https://doi.org/10.1016/j.rmcr.2019.100857
11 Kronzer E, Robinson SI, Collins DA, McBane RD. Primary pulmonary artery sarcoma versus pulmonary thromboembolism: a multimodal imaging comparison. J Thromb Thrombolysis. 2021;52(4):1129–32. https://doi.org/10.1007/s11239-021-02464-w
12 Ma J, Zhang W, Huang Y, Wang L, Wang J, Yuan L, et al. Radiologic findings of primary pulmonary angiosarcoma: a case report. Medicine. 2018;97(25):e11105. https://doi.org/10.1097/md.0000000000011105
13 Vanni F, Scheggi V, Marchionni N, Stefàno PL. A new-onset pulmonary artery stenosis in a young man: case report. Eur Hear J Case Rep. 2021;5(4):ytab118. https://doi.org/10.1093/ehjcr/ytab118