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CASE REPORT

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A rare case of Rosai–Dorfman disease presenting as a pulmonary artery mass in a 33-year-old female with hypoxia

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Abstract

Rosai–Dorfman disease (RDD) is a rare form of non-Langerhans histiocytosis. It is often idiopathic in etiology, but has been associated with viral, autoimmune, and malignant disease. Adequate diagnosis of RDD requires a combination of clinical symptoms, radiography, and histology. Most commonly, patients with RDD present with cervical lymphadenopathy. We describe a case of a young female who was initially thought to have a pulmonary embolism at the time of a COVID-19 infection but was noted to have a rare occurrence of RDD presenting as a pulmonary artery mass upon further evaluation of radiology and histology. Though RDD is frequently benign, extranodal involvement can progress to end organ damage and must be recognized appropriately.

KEYWORDS
extranodal involvement, non-Langerhans cell histiocytosis, pulmonary artery filling defect

CASE DESCRIPTION

A 33-year-old female with 1 week of dyspnea, myalgias, and chills was admitted for COVID-19 pneumonia and acute hypoxic respiratory failure requiring 2 L of supplemental oxygen. The physical exam was benign and without lymphadenopathy. D-dimer was elevated to 1.26 μg/mL (0.0–0.44 μg/mL) and C-reactive protein was elevated to 14.6 mg/dL (0.0–0.8 mg/dL). In the context of her active COVID-19 infection and elevated D-dimer, computed tomography (CT) pulmonary angiography was performed to evaluate for pulmonary embolism. The study demonstrated a well-circumscribed 23 mm × 21 mm eccentric filling defect (Figure 1) concerning for pulmonary embolism versus a vascular mass.

She had normal troponin and brain natriuretic peptide levels. Echocardiogram showed normal left ventricular ejection fraction and right ventricular size and systolic

function. There was mild tricuspid regurgitation and right ventricular systolic pressure was not estimated. Lower extremity dopplers were negative for acute deep venous thrombosis. Given the well-circumscribed nature of the lesion and unusual location for thrombus, a cardiac magnetic resonance imaging (MRI) was performed to better characterize the lesion. The scan redemonstrated the distinct mass in the proximal main pulmonary artery superior to the pulmonic valve without any evidence of movement from the previous CT pulmonary angiography; the main pulmonary artery was dilated to 30 mm.

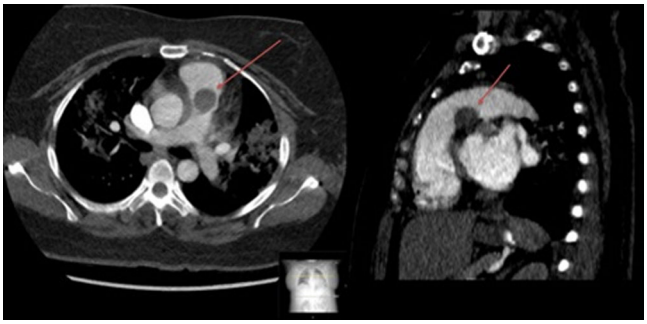

FIGURE 1 Axial and sagittal reconstructed images of a CT pulmonary angiography with incidentally noted eccentric, ovoid filling defect in the posterior aspect of the pulmonary trunk (red arrows). CT, computed tomography.

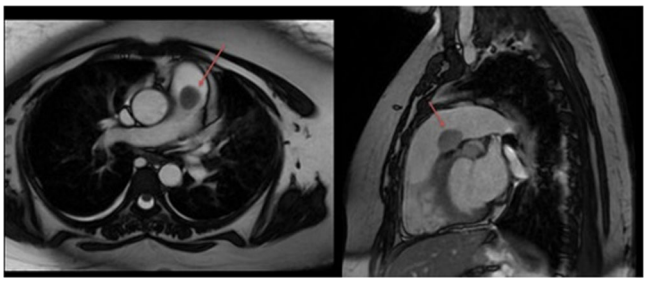

FIGURE 2 Axial and sagittal T2-weighted sequences of a cardiac MRI demonstrating a hypointense ovoid lesion in the posterior aspect of the pulmonary trunk (red arrows). MRI, magnetic resonance imaging.

The mass had low T1 and intermediate T2 signals with post-contrast enhancement, which was consistent with a benign cardiac tumor (Figure 2).

The patient was discharged and underwent sternotomy and excision of the mass 1 week later. The mass grossly appeared as a firm yellow nodule measuring 23 mm in greatest dimension (Figure 3a). Histologic examination of the resected mass showed prominent histiocytes with round nuclei and abundant cytoplasm showing inflammatory cell emperipolesis, which is defined as a complete and functional cell within the cytoplasm of another cell (Figure 3b,c). These histiocytes were positive for CD68 and S100, and negative for CD1a, cytokeratin AE1/AE3, CD45, CD30, Desmin, Myoglobin. This immunohistochemical (IHC) profile was consistent with extranodal RDD.

Postoperatively the patient developed recurrent fevers without a clear etiology. CT scans of the chest, abdomen, and pelvis were performed to further evaluate the cause of fever. A focal area of osteolysis of the L5 vertebrae was incidentally found. MRI of the entire spine and brain was performed and showed bony lesions in the L5 vertebrae, maxilla, and skull base. CT-guided biopsy of the bone marrow and L5 vertebrae were performed to exclude concurrent malignant process. Biopsy of the L5 lesion showed focal aggregates of cells with a similar histological and IHC profile as the index lesion. The bone marrow biopsy was performed in the setting of severe anemia showed normal trilineage hematopoiesis with no disease involvement.

The patient's presentation was consistent with multifocal extranodal disease, and she was treated with a course of Prednisone 60 mg with a 12-week taper. The patient's fevers defervesced after steroids, and she has remained asymptomatic.

DISCUSSION

RDD is a rare non-Langerhans cell histiocytosis with approximately 1000 cases reported since its initial discovery in 1969.[1] It is thought to be idiopathic, but

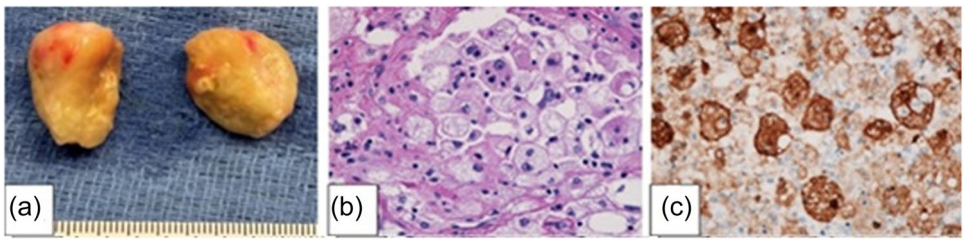

FIGURE 3 (a) Gross specimen following surgical resection. (b) H&E ×40 magnification showing prominent histiocytes with round nuclei and voluminous cytoplasm with emperipolesis. (c) S100 expressing cells at ×40. H&E, hematoxylin and eosin.

there are reports of association with viral, autoimmune, and malignant disease. There have been no reported cases of association with the COVID-19 virus. It is a nonmalignant lymphohistiocytic proliferative disorder that most commonly involves cervical lymphadenopathy. Concurrent nodal and extranodal involvement has been reported in 43% of cases, while isolated extranodal involvement has been reported in 23% of cases. Common extranodal sites include the skin, soft tissue, upper respiratory tract, bone, and central nervous system.[2] Patients can present with constitutional symptoms, location-specific symptoms, or remain asymptomatic.

This case demonstrates RDD involving the main pulmonary artery and bones. It is important to note that while pulmonary embolism is the most common filling defect on CT pulmonary angiography, there is a vast differential of other causes including tumor, amniotic fluid, air, inorganic material, ImmunoglobulinG4-related disease, and other vasculitides.[3]

On imaging, RDD manifests as enhancing, hypermetabolic masses. It is seen as hyperdense masses on non-contrast CT and as diffuse, homogeneous enhancement on contrast-enhanced studies. MRI typically shows iso or hypointense signal on T1 and T2-weighted images, with diffuse and usually homogeneous enhancement on post-contrast T1-weighted sequences. Active lesions will show increased uptake on PET/CT, which can decrease in activity on follow-up studies after treatment.[1] Many of these radiologic findings are nonspecific and lead to a broad differential diagnosis. Biopsy and histologic analysis are often necessary for differentiation.

The histology of RDD is notable for sinus expansion of large histiocytes with emperipolesis (lymphocytes and other inflammatory cells within the cytoplasm of the histocytes). With extranodal cases, there is a predominance of fibrosis and few histiocytes. Immunostaining is essential to distinguish from other histiocytosis, including Erdheim-Chester disease, Langerhans cell histiocytosis, lymphoma, and IgG4-related interstitial lung disease. RDD is uniquely characterized by positive S100 and CD68 and negative CD1a.[1]

Pulmonary artery involvement is rare with RDD, and there are only a few cases reported.[4–7] These cases include a 41-year-old female with RDD invading the pulmonary trunk and aorta who required surgical resection and reconstruction due to impending right ventricular failure, a 22-year-old female with RDD causing nearly complete obstruction of the main pulmonary artery resulting in severe pulmonary hypertension and heart failure who required debulking, and a 48-year-old female with dyspnea and incidental PET avid mass that was surgically removed and found to be consistent with RDD.

Per the American Society of Hematology, patients with uncomplicated adenopathy and asymptomatic cutaneous RDD can be observed without intervention. However, those with multifocal extranodal disease should be treated with corticosteroids. Surgical resection is recommended for unifocal extranodal disease leading to end-organ dysfunction and symptomatic cranial, sinus, or airway disease. Radiotherapy, chemotherapy and immunomodulatory therapy are reserved for forms of severe or refractory disease.[1]

Our case demonstrates the value of recognizing the broad differential of a pulmonary artery filling defect including RDD. While RDD frequently remains benign, in some cases, a missed diagnosis could lead to rapid end organ damage including right heart failure. Thus, these types of cases should be approached with a multidisciplinary collaboration to ensure adequate and timely management.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS STATEMENT

The patient gave written informed consent for this case report and published images.

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REFERENCES

1. Abla O, Jacobsen E, Picarsic J, Krenova Z, Jaffe R, Emile JF, Durham BH, Braier J, Charlotte F, Donadieu J, Cohen-Aubart F, Rodriguez-Galindo C, Allen C, Whitlock JA, Weitzman S, McClain KL, Haroche J, Diamond EL. Consensus recommendations for the diagnosis and clinical management of Rosai-Dorfman-Destombes disease. Blood. 2018;131(26):2877–90.
2. Gaitonde S. Multifocal, extranodal sinus histiocytosis with massive lymphadenopathy: an overview. Arch Pathol Lab Med. 2007;131(7):1117–21.
3. 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.
4. Prendes BL, Brinkman WT, Sengupta AL, Bavaria JE. Atypical presentation of extranodal Rosai-Dorfman disease. Ann Thorac Surg. 2009;87(2):616–8.
5. Walters DM, Dunnington GH, Dustin SM, Frierson HF, Peeler BB, Kozower BD, Ailawadi G, Jones DR, Lau CL.

Rosai-Dorfman disease presenting as a pulmonary artery mass. Ann Thorac Surg. 2010;89(1):300–2.
6. Hou G, Chen K, Jiang Y, Cheng W, Li F. Rosai-Dorfman disease presenting as a pulmonary artery mass on FDG PET/CT. Clin Nucl Med. 2020;45(5):392–3.
7. Orr AR, Lefler D, Deshpande C, Kumar P. Extranodal Rosai–Dorfman disease presenting as a mediastinal mass with pulmonary artery invasion. Case Rep Hematol. 2018; 2018:1–5.

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