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Case Report

Hemoptysis in Childhood: A Rare Cause and a Diagnostic Challenge

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ABSTRACT

Hemoptysis in children is uncommon and may represent a life-threatening condition. Its rarity and broad differential diagnosis often delay the recognition of potentially serious underlying causes. Awareness of neoplastic etiologies, even in healthy children, is essential in order to avoid diagnostic delay and ensure optimal outcomes.

Keywords: Hemoptysis, carcinoid tumor, bronchoscopy

Introduction

Hemoptysis is rare in the pediatric population and may represent a diagnostic and therapeutic challenge, particularly when it is massive (1). Furthermore, it is not always easy to recognize, as it is often misinterpreted as gastrointestinal, nasopharyngeal or oral bleeding (2).

In most cases, hemoptysis is mild and self-limited, typically associated with respiratory infections. However, the range of potential etiologies is broad, including bronchiectasis, trauma, foreign bodies, pulmonary malformations, vasculitis and tumors, among others (1).

Case Report

We report the case of a 12-year-old girl, with a past medical history of anxiety, attention-deficit hyperactivity disorder and functional dyspepsia, receiving treatment with sertraline and methylphenidate. Her immunizations were up to date according to the national immunization program, including the "Bacille Calmette-Guérin" vaccine.

She was brought to the emergency department after a sudden episode of coughing up a large amount of blood without symptoms suggestive of respiratory infection, weight loss, night sweats, fever or any other complaints. Over

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the preceding six months, she had experienced occasional episodes of small-volume blood-streaked sputum, always interpreted as vascular fragility in the context of upper respiratory tract infections. She described these episodes as a sensation of discomfort in the oropharynx, followed by coughing and bloody expectoration, occurring approximately once per month. There was no known epidemiological context, no history of contact with tuberculosis patients, and no identifiable triggers.

On examination, blood pressure was 117/70 mmHg (P50-90 for sex, age and height), heart rate was 63 beats per minute, oxygen saturation of 99% on room air, and tympanic temperature was 36.5 °C. She appeared visibly anxious and had frequent coughing episodes accompanied by moderate amounts of blood and clots. Her skin and mucous membranes were pink and well hydrated, without rash or signs of bleeding diathesis. Oropharyngeal examination and anterior rhinoscopy revealed no bleeding lesions and the remaining physical exam, including cardiopulmonary auscultation and abdominal palpation, were unremarkable.

Laboratory tests showed that hemoglobin was 12.6 g/dL, mean corpuscular volume was 84.1 fL, mean corpuscular hemoglobin concentration was 32.8 g/dL, red cell distribution width was 16.2%, leukocytes were 9,000/µL and platelets were 328,000/µL. Coagulation studies revealed that prothrombin time was 14.7 seconds, INR was 1.11 and activated partial thromboplastin time was 29.1 seconds. Lactate dehydrogenase was 196 U/L and renal function, electrolytes, and liver enzymes were within normal limits. Chest radiography was unremarkable.

She received tranexamic acid (10 mg/kg) and was transferred to a tertiary care hospital for otorhinolaryngology evaluation, which did not identify any bleeding source. She was admitted for observation and further investigation.

In the following hours, she continued to have episodes of coughing with blood-streaked sputum, followed by another episode of massive hemoptysis (Figure 1). A repeat complete blood count showed a hemoglobin level of 11.6 g/dL. Re-evaluation of the chest radiograph suggested a heterogeneous left retrocardiac opacity (Figure 2). Computed tomography angiography of the chest revealed a solid endobronchial lesion within the lumen of the left lower lobar bronchus, measuring approximately 26×18 mm, with contrast enhancement (Figure 3).

Given the suspicion of a neoplastic lesion, diagnostic flexible bronchoscopy was performed without complications. It revealed a rounded, regular, whitish-gray mass at the origin of the left lower lobar bronchus, almost completely obstructing the lumen, without active bleeding (Figure 4). Biopsy followed by histopathological and immunohistochemical analysis confirmed the diagnosis of a carcinoid tumor (strong immunoexpression of chromogranin, synaptophysin, CD56, and TTF1).

Figure 1. Massive hemoptysis

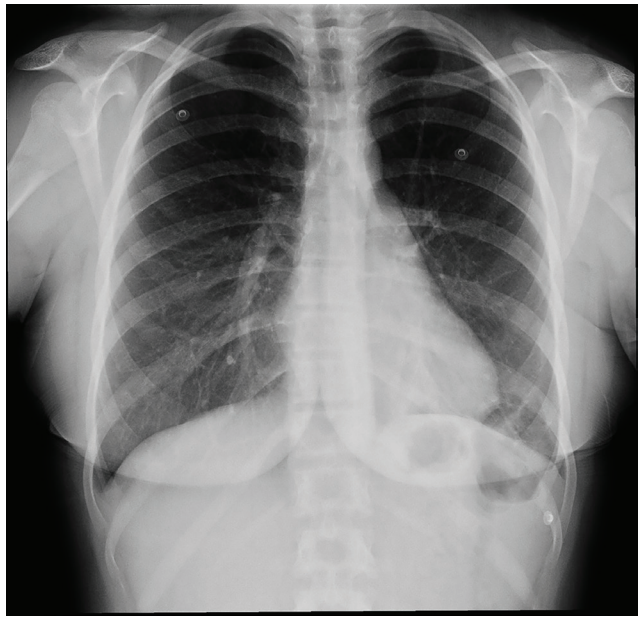

Figure 2. Chest radiograph with a heterogeneous left retrocardiac opacity

Figure 3. Computed tomography angiography of the chest with an endobronchial lesion on the left lower lobar bronchus

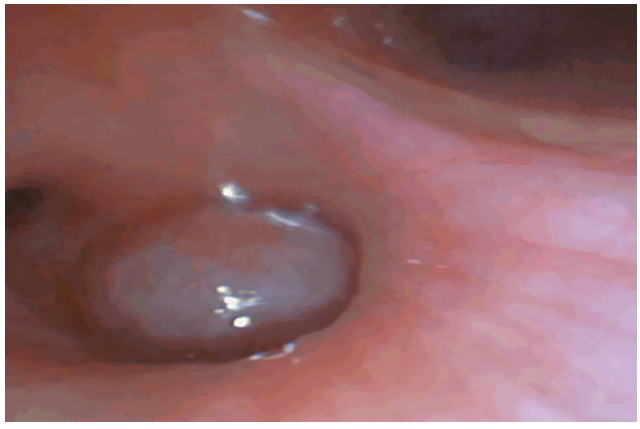

Figure 4. Bronchoscopy showing a whitish-gray mass at the origin of the left lower lobar bronchus

Neuron-specific enolase was 13 ng/mL (reference <15.0), and chromogranin A was 25.8 ng/mL (reference <85.0). Positron emission tomography with a somatostatin analogue (^{68}Ga-DOTANOC) showed an uptake consistent with a left endobronchial carcinoid tumor, without evidence of nodal or distant metastasis.

Video-assisted thoracoscopic surgery with left lower lobectomy and mediastinal lymphadenectomy was performed. Histological examination confirmed a typical carcinoid tumor (carcinoid morphology, <2 mitosis/mm^2, no necrosis and Ki-67 <5%). Lymph node examination revealed no tumor involvement.

Following the surgery, the patient was asymptomatic and without limitations in daily activities. Follow-up imaging at 6 months was scheduled, along with an evaluation by the genetics team.

Discussion

Although rare in the pediatric population, neoplasms can underlie cases of hemoptysis (1). Pulmonary neuroendocrine tumors include carcinoid tumors, large cell neuroendocrine carcinoma and small cell lung carcinoma, the last two being poorly differentiated and high-grade (3). Carcinoid tumors are generally well differentiated and associated with a favorable prognosis. Although most cases are diagnosed between the fourth and sixth decades of life, in children they represent the most common primary malignant lung tumor, accounting for 63-80% of all cases (3,4).

Bronchial carcinoid tumors bleed easily because they are highly vascular neoplasms with a rich submucosal capillary network and fragile tumor vasculature which is prone to disruption. In addition, these tumors typically arise in the central airways, where their endobronchial location exposes them to mechanical trauma from coughing, instrumentation or even spontaneous rupture, leading to bleeding into the bronchial lumen (5,6), as may have occurred in this case.

Given their rarity and frequent presentation with nonspecific respiratory symptoms such as cough, chest pain, or wheezing, alternative diagnoses are often initially assumed (4) leading to delays in tumor identification. In the present case, the patient had minor hemoptysis for 6 months before the diagnosis was established, culminating in an episode of massive hemoptysis (defined as >100 mL of expectorated blood within 24 hours) (7).

The differential diagnosis of pediatric hemoptysis may require computed tomography with angiography (8) which should not be delayed, particularly in cases of recurrent or massive hemoptysis. Nevertheless, a definitive diagnosis relies on histological analysis, for which bronchoscopy plays a key role in obtaining biopsy samples (4,9). Following histological confirmation, accurate staging is essential in order to define the therapeutic strategy, and ^{68}Ga-DOTA-Tyr^3-octreotate (DOTATATE) PET imaging is currently the modality of choice, given its strong uptake in typical carcinoid tumors (10). In this case, PET imaging confirmed findings consistent with an endobronchial carcinoid tumor.

When localized and of primary bronchial origin, these tumors are usually amenable to surgical resection, which remains the treatment of choice (4). As lymphatic spread occurs in up to 20% of pediatric patients, mediastinal

lymph node dissection is recommended for both staging and therapeutic purposes (4). Accordingly, lobectomy with mediastinal lymphadenectomy was performed, and although there was no evidence of nodal or distant disease, follow-up will be maintained.

As carcinoid tumors are rare in pediatric patients, most treatment recommendations are extrapolated from adult guidelines (4). The development of pediatric-specific management protocols is therefore essential in order to ensure optimal care in this population.

Ethics

Informed Consent: The teenager and her mother gave us consent for the publication of the images.

Footnotes

Authorship Contributions

Surgical and Medical Practices: R.P., T.R.S., N.L., J.L., R.P., I.R.L., A.D., M.F., Concept: M.S.S., R.P., M.F., Design: M.S.S., R.P., M.F., Data Collection or Processing: M.S.S., Analysis or Interpretation: M.S.S., R.P., T.R.S., N.L., J.L., R.P., I.R.L., A.D., M.F., Literature Search: M.S.S., F.S., A.M.S., Writing: M.S.S., F.S., A.M.S.

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