CASE REPORT

Infectious Pulmonary Artery Pseudoaneurysm That Resolved with Conservative Treatment

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Abstract:
Pulmonary artery pseudoaneurysms (PAPs) are rare but can cause massive hemoptysis if they rupture. Infectious PAPs are often treated by surgery or transcatheter embolization and are rarely treated conservatively with antibiotics. We herein report a case of PAP treated conservatively in a 21-year-old woman with lung abscess. Except for one massive hemoptysis early in the course, the patient responded well to the empirical therapy with ampicillin/sulbactam and systemic hemostatic agents. After six weeks of antibiotics, the pseudoaneurysm disappeared. Conservative therapy with careful observation can be considered in small infectious PAPs when there is a good clinical response to initial conservative therapy.

Key words: hemoptysis, lung abscess, false aneurysm, surgery, therapeutic embolization, conservative treatment

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Introduction

Pulmonary artery pseudoaneurysms (PAPs) are rare, serious vascular abnormalities, caused by trauma, iatrogenesis (related to Swan-Ganz catheter), and infections (1). They may be incidentally discovered on imaging or following massive hemoptysis if they rupture, with mortality rates over 50% (1). Infectious PAPs secondary to tuberculosis are common and are called Rasmussen’s pseudoaneurysms; however, PAPs secondary to lung abscesses are rare (2).

Surgery and transcatheter embolization are the main treatment modalities for PAPs, and there are only a few reports of successful conservative management of infectious PAPs (3, 4). We herein report a case of PAP treated conservatively in a young woman with lung abscess.

Case Report

A 21-year-old woman with a history of depression and episodes of drug overdose and self-harm presented to the referring hospital with hemosputum. One month before admission, she had removed approximately 800 mL of her own blood at home with an 18-gauge hypodermic needle. She had been bedridden for two weeks with confusion, a fever, cough, and hemoptysis. Worsening symptoms prompted her to visit the referring hospital. She had smoked for eight pack-years, did not have a history of intravenous drug use, and was not in an immunocompromised state.

At the referring hospital, plain chest computed tomography (CT) showed consolidation with air bronchogram in the left lower lobe (Fig. 1). Laboratory studies revealed a white blood cell count of 13,000/μL (3,300-8,600) and a C-reactive protein level of 16.89 mg/dL (0.00-0.14). She was diagnosed with left lung abscess and hospitalized for antibiotic treatment. Tuberculosis and fungal infections were later excluded based on sputum and serum antigen test results. On day 5 of hospitalization, she experienced massive hemoptysis, approximately 500 mL in volume. It persisted the following day, and her hemoglobin level decreased from 11.0 g/dL to 7.3 g/dL. During blood transfusion, emergency gastroscopy was performed; however, there was no evidence of gastrointestinal bleeding. She was referred to our hospital for further treatment.

At the time of referral, the patient’s symptoms included dyspnea on exertion and small amounts of hemoptysis of up...
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Figure 1. Chest CT images obtained at the referring hospital. (a) Chest CT (lung window) before initiation of antibiotics therapy. (b) Chest CT (mediastinal window) before initiation of antibiotics therapy. CT: computed tomography

Figure 2. Images of chest radiography. (a) Chest radiograph at admission. Consolidation was detected behind the cardiac silhouette. (b) Chest radiograph on day 22 of antibiotic therapy. The consolidation reduced in size, and pulmonary vascularity became distinct behind the cardiac silhouette.

to 20 mL/day. On a clinical examination, she was afebrile with a blood pressure of 110/58 mmHg, heart rate of 61 beats/min, and oxygen saturation of 98% on room air. Auscultation revealed decreased breath sounds at the base of the left lung. A dental examination found no decayed teeth.

Laboratory studies revealed a hemoglobin concentration of 9.7 g/dL (11.6-14.8), a normal white blood cell and platelet count, and a C-reactive protein level of 0.99 mg/dL (0.00-0.14). Coagulation screen [prothrombin time-international normalized ratio of 0.91 (0.90-1.10) and activated partial prothrombin time of 28 seconds (25-35)] was normal. Sputum cultures at the referring hospital found α-Streptococcus (1+) and Corynebacterium species (1+). Blood culture was not done at the referring hospital before starting antibiotics.

Transsthoracic echocardiography was negative for infectious endocarditis. Chest radiograph and CT were again performed on admission to our hospital. Chest radiograph revealed consolidation in the left lower lobe behind the heart (Fig. 2a). Chest CT revealed non-uniform consolidation with air bronchogram at segments 9 and 10, similar to the findings of chest CT performed at the referring hospital. An enhanced nodule 6 mm in diameter was observed inside the abscess. The nodule was communicating with the A10 branch of the left pulmonary artery, compatible with a PAP (Fig. 3a-e). There were no extravasations and no anomalous blood supply from the aorta, such as pulmonary sequestration. These findings led to the diagnosis of a left lung abscess complicated by an infectious pseudoaneurysm of the left pulmonary artery.

For the treatment of the PAP, conservative management, including antibiotics (intravenous ampicillin/sulbactam) and systemic hemostatic agents (intravenous carbazochrome sodium sulfonate hydrate and tranexamic acid), and careful observation were selected. The patient’s wish and the following points were the reasons behind this decision: First, the patient responded well to the antibiotic management. On admission to our hospital, the patient was afebrile without
tachycardia, and the serum inflammatory markers had decreased to nearly normal levels. Furthermore, her hemoglobin level increased by 2.4 g/dL in 2 days, and the amount of hemoptysis per day (20 mL) was significantly lower than the initial 500 mL, suggesting that her hemoptysis could be managed with transfusion without surgical or transcatheter intervention. Second, the pseudoaneurysm was too small to obtain dense packing via coil embolization. Third, coil embolization at the time of early infection might have led to persistent infection.

The clinical course was uneventful. The amount of hemoptysis decreased, and the consolidation reduced in size on chest radiograph (Fig. 2b). Contrast-enhanced chest CT performed on day 16 of hospitalization at our hospital (day 22 of antibiotic therapy) revealed that the consolidation had decreased in size, and the pseudoaneurysm at A10 had disappeared (Fig. 3f).

The patient was discharged on day 17 of hospitalization. Antibiotic therapy spanned a total of 6 weeks, including intravenous and oral administration for 17 (during hospitalization) and 25 (post discharge) days, respectively. The disappearance of the consolidation on follow-up chest CT (Fig. 3g), combined with a lack of episodes of hemoptysis, confirmed complete recovery from the lung abscess.

**Discussion**

PAP is very rare and potentially fatal. A retrospective study from a large teaching hospital reported there had been only 24 cases of PAPs at their hospital over 14 years (5). The most commonly identified causes of the pseudoaneurysm in their report were infection (33%), traumatic injury (17%), and neoplasm (12.5%). The most common causative organisms for infectious aneurysms were reported to be *Staphylococcus aureus* (45%), *Salmonella* species (30%), and *Streptococci* (10%), all of which can cause bacteremia (6). The pathophysiology of the pseudoaneurysm formation in this case is unknown, as it disappeared without surgical interventions, but previous reports revealed that vessel walls could be damaged by severe inflammation around the vessels according to a pathological analysis of surgically resected specimens (7, 8). Our patient was not an intravenous drug user or in an immunocompromised state, but she had had an episode of self-phlebotomy one month before admission that was presumably a risk factor for bloodstream infection.

Peripheral PAPs are rarely self-limiting and are associated with a poor prognosis, especially because of the high rate of massive hemoptysis. Monchik et al. reported that 21 out of 35 cases of peripheral PAPs died of massive hemoptysis due to rupture of the aneurysm (9). Therefore, such cases always require adequate treatment. A systematic literature search identified over 100 reports of infectious PAPs. The previous cases were treated by surgery (lobectomy or ligation of the pseudoaneurysm), transcatheter embolization, or conservative therapy (antibiotics and systemic hemostatic agents). There is no conclusive guideline defining the optimal treatment modality based on the size of the pseudoaneurysm. Surgery seems curative and had been the main treatment modality given the high mortality rate in previous years, especially in cases with a persistent fever or high inflammatory response;
however, intrathoracic adhesions around the infected tissues are expected. In addition, surgery may exacerbate the condition of patients who already have a poor pulmonary reserve due to infectious PAPs (2) and may lead to fatal conditions. Recent technological advances have made transcatheter embolization the mainstream treatment for infectious PAP. Transcatheter embolization is less invasive than surgery; however, abscess formation around the area of coil placement has been reported (10) and may lead to persistent infection, especially in those with active bacteremia. Furthermore, bronchial migration of pulmonary artery coils has been reported, with some cases requiring lobectomy for coils retrieval (11). Conservative treatment is mainly applied to non-urgent, asymptomatic cases and may be inadequate in preventing growth or rupture in complex cases (1). In addition, smaller pseudoaneurysms tend to heal by fibrosis on their own (12), and conservative management has been reported to be successful in such cases (3, 4, 13-20). Systemic hemostatic agents may also be effective in decreasing the severity of hemoptysis and possibly reducing the in-hospital mortality of patients with hemoptysis (21, 22). Our literature search identified 11 reports of infectious PAPs treated with antibiotics, including our own case, and most cases achieved a hospital survival (Table). Systemic hemostatic agents were used in two of five cases with hemoptysis. In infectious PAPs with hemoptysis, as in this case, treatment with systemic hemostatic agents and antibiotics may be effective. However, we should keep in mind that there is always a risk of rupture unless remission of the pseudoaneurysm is achieved.

In the present case, there were episodes of hemoptysis, but conservative management and careful observation were chosen based on the patient’s wishes, her good clinical response to the initial conservative treatment, the relatively small size of the pseudoaneurysm, and concern about persistent infection caused by coil embolization. Coils are foreign bodies and therefore can provide an ideal surface for bacterial colonization (23). Fortunately, the pseudoaneurysm was small enough to be cured by antibiotic treatment alone with careful observation and adequate informed consent.

In conclusion, small infectious PAPs with a good clinical response to antibiotic therapy can be treated with antibiotics and systemic hemostatic agents alone, as long as close follow-up and repeated contrast-enhanced CT are performed until the infectious PAPs resolve.

Written consent for publication of the case and images was obtained from the patient.

The authors state that they have no Conflict of Interest (COI).

All authors contributed equally to this article.

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Table. Summary of Infectious Pulmonary Artery Pseudoaneurysms Treated Conservatively.

| Reference | Age, sex | Diameter (mm) | Hemoptysis | Blood cultures | Other cultures (site) | Antibiotics | Systemic hemostatic agents use | Hospital survival | Comorbidity |
|-----------|----------|---------------|------------|----------------|-----------------------|------------|-------------------------------|------------------|------------|
| (3)       | 28, M    | 10            | No         | S. aureus      | NR                    | CTRX       | MRSA                          | NR Yes           | Pneumonia  |
| (4)       | 49, F    | 27            | NR         | S. aureus      | NR                    | CTRX       | MRSA                          | NR Yes           | Pneumonia  |
| (13)      | 22, F    | 20            | No         | S. aureus      | NR                    | CTRX       | MRSA                          | NR Yes           | Pneumonia  |
| (14)      | 48, M    | 5             | Yes        | Negative       | NR                    | CTRX       | MRSA                          | NR Yes           | Pneumonia  |
| (15)      | 90, M    | NR            | Yes        | NR             | NR                    | CTX, ABPC/SBT | MRSA                          | NR Yes           | Pneumonia  |
| (16)      | 7, F     | NR            | Yes        | Candida species | NR                    | Cephalosporins | MRSA                          | NR No            | IE         |
| (17)      | 52, M    | NR            | Yes        | Klebsiella pneumonia (BAL) | CTRX       | MRSA                          | NR Yes           | Lung abscess |
| (18)      | 57, F    | 13            | Yes        | MRSA (sputum)  | NR                    | CTRX       | MRSA                          | NR Yes           | Pneumonia  |
| (19)      | 0, F     | 20            | NR         | MRSA           | NR                    | VCM, GM, PAPM/BP | MRSA                          | NR Yes           | IE         |
| (20)      | 24, M    | NR            | NR         | MSSA           | NR                    | ABPC/SBT   | CTRX                          | NR Yes           | Lung abscess |
| Present case | 21, F | 6             | Yes        | α-Streptococcus, corynebacterium (sputum) | ABPC/SBT   | CTRX                          | NR Yes           | Lung abscess |

ABPC/SBT: ampicillin/sulbactam, BAL: bronchoalveolar lavage, CTRX: ceftriaxone, CTX: cefotaxime, CXN: cloxacillin, GM: gentamicin, IE: infectious endocarditis, MRSA: methicillin-resistant Staphylococcus aureus, MSSA: methicillin-sensitive Staphylococcus aureus, NR: not reported, PAPM/BP: panipenem/betamipron, S. aureus: Staphylococcus aureus, VCM: vancomycin.
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