Pulmonary Artery Aneurysm/Pseudoaneurysm, a Delayed Complication of Lung Abscess: A Case Report

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Background: Massive hemoptysis mostly arises from the bronchial arteries; however, bleeding can also occur from a lesion in injured pulmonary arteries, such as pulmonary artery aneurysm/pseudoaneurysm (PAA/PAP), during pulmonary infection.
Case report: A 66-year-old man was admitted with a diagnosis of lung abscess in the right lower lobe that was complicated with pyothorax. Intravenous administration of antibiotics and thoracic drainage successfully controlled the infection and inflammation until day 16, when the patient began to exhibit hemoptysis and bloody pleural effusion. Enhanced computed tomography (CT) with multi-planer reconstruction (MPR) images showed a highly enhanced mass inside the abscess fed by the pulmonary artery, suggesting PAA/PAP. Pulmonary angiography confirmed PAA/PAP, and embolization with coils successfully stopped both the bleeding into the sputum and pleural effusion, with a collapsed aneurysm visible on chest CT scan.
Conclusion: Clinicians should consider the possibility of PAA/PAP in the differential diagnosis of hemoptysis during the treatment of patients with lung abscess. MPR CT is helpful for the diagnosis of PAA/PAP and its feeding vessels.

Key words: pulmonary artery aneurysm, lung abscess, coil embolization, multi-planer reconstruction images

INTRODUCTION

Massive hemoptysis typically arises from the bronchial arteries [1], and its mortality rate is greater than 50% if not appropriately treated [2]. Bronchial artery embolization (BAE) is highly efficacious and therefore is the first line of treatment for massive hemoptysis [3]. There are, however, several exceptions in the efficacy of BAE, such as massive bleeding from cavitary lesions of tuberculosis in which the hemorrhaging is derived from injured pulmonary arteries, known as Rasmussen aneurysms. The incidence of Rasmussen aneurysms has decreased due to advancements in therapy for tuberculosis [4]; however, pulmonary artery aneurysm/pseudoaneurysm (PAA/PAP) can also be found in other infectious diseases [5].

We report herein a case of lung abscess complicated with PAA/PAP, which developed in the resolving phase of infection and inflammation with the treatment of antibiotics but was immediately diagnosed with computed tomography (CT) angiography with multi-planer reconstruction (MPR) images and successfully treated with coil embolization of the pulmonary artery.

CASE REPORT

A 66-year-old man with a history of oropharyngeal cancer was referred to our hospital due to purulent sputum that had persisted for the past 2 weeks and an abnormal shadow in the lower field of the right lung on a chest radiograph (Fig. 1A). Chest CT showed a 5-cm diameter mass with distinct areas of low attenuation inside (Fig. 1B). The level of C-reactive protein was elevated (10.2 mg/dL). The patient was admitted with the diagnosis of lung abscess and treated with the intravenous administration of ampicillin/sulbactam. On the 7th hospital day, his body temperature was elevated, and pleural effusion and atelectasis of the right lower lobe was observed (Fig. 1C). Thoracic drainage showed purulent effusion. *Pseudomonas aeruginosa* was identified in the sputum culture, and antibiotics were changed to the combination of tazobactam/piperacillin and amikacin. On the 16th hospital day, the patient was afebrile with decreased serum C-reactive protein levels of 2.78 mg/dL; however, he started to expectorate hemosputum, and his pleural effusion became bloody. Enhanced thoracic CT scan taken on the 29th hospital day showed a highly enhanced mass inside the abscess in the right lower lobe (Fig. 2A). CT using MPR images and volume renderings demonstrated that the enhanced mass inside the lung abscess was fed by the pulmonary artery, suggesting PAA/PAP (Figs. 2B and 2C). Because of his poor condition, the patient was considered unfit for surgical resection; therefore, non-invasive embolization of the pulmonary artery was performed on the 40th hospital day. Pulmonary angiography demonstrated the PAA/PAP in the right lower

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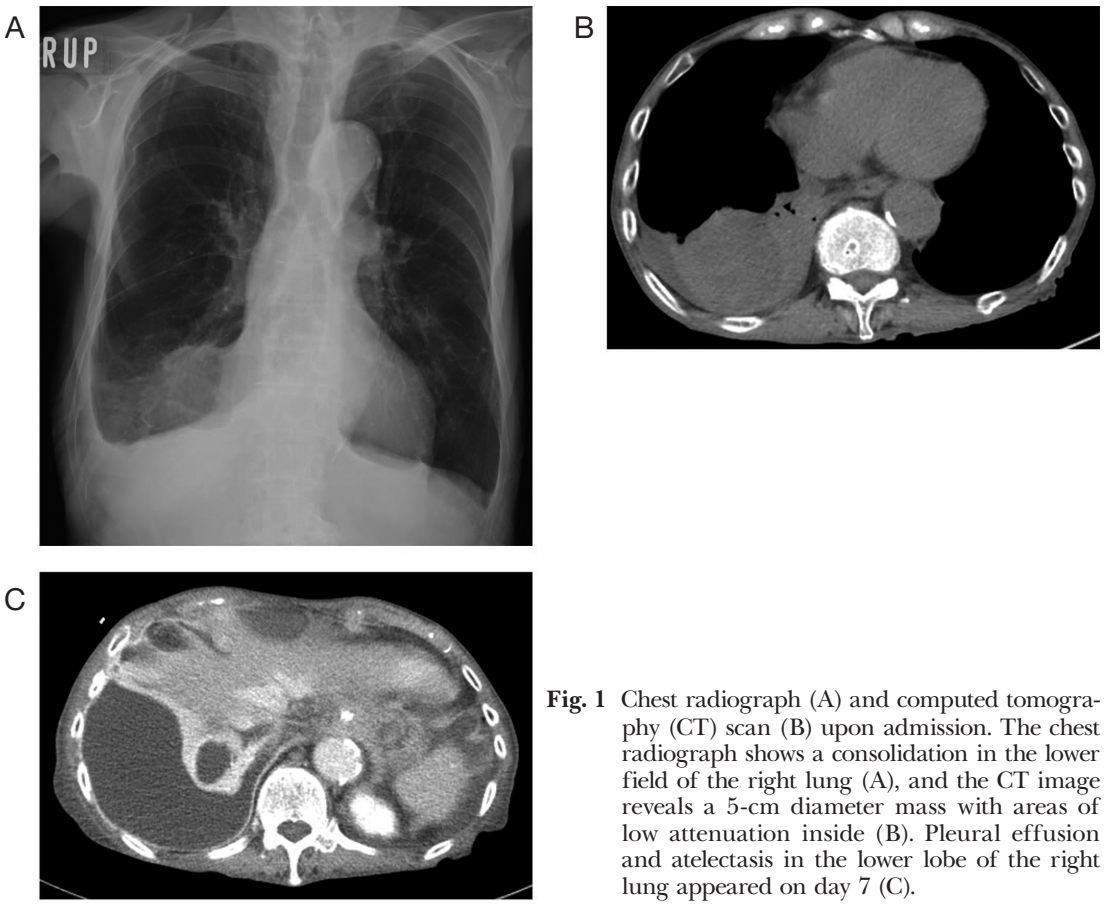

Fig. 1 Chest radiograph (A) and computed tomography (CT) scan (B) upon admission. The chest radiograph shows a consolidation in the lower field of the right lung (A), and the CT image reveals a 5-cm diameter mass with areas of low attenuation inside (B). Pleural effusion and atelectasis in the lower lobe of the right lung appeared on day 7 (C).

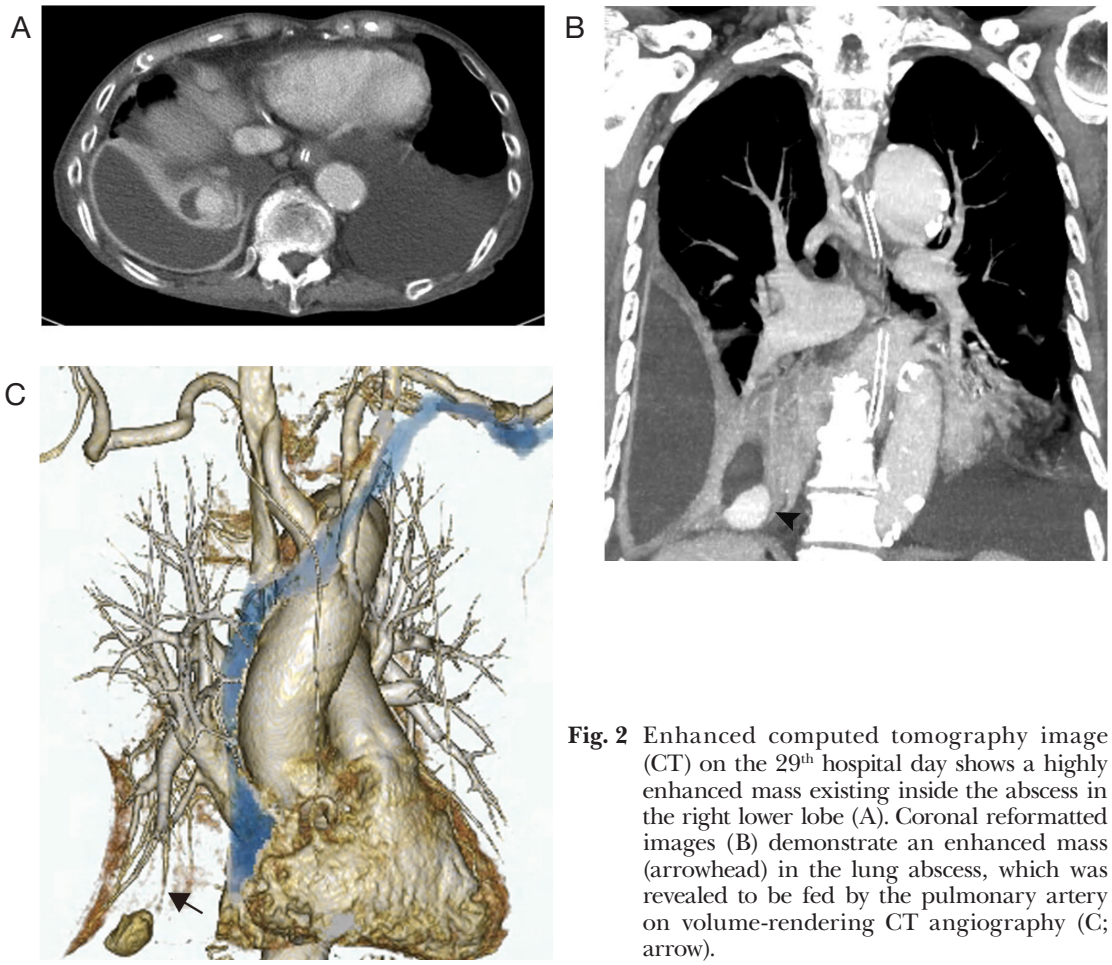

Fig. 2 Enhanced computed tomography image (CT) on the 29th hospital day shows a highly enhanced mass existing inside the abscess in the right lower lobe (A). Coronal reformatted images (B) demonstrate an enhanced mass (arrowhead) in the lung abscess, which was revealed to be fed by the pulmonary artery on volume-rendering CT angiography (C; arrow).

Fig. 3 Pulmonary angiography image shows the pulmonary artery aneurysm/pseudoaneurysm (PAA/PAP) of the right lower lobe (A) and the embolization coils in the proximal part of the feeding artery of the PAA/PAP (B). Chest CT image obtained 2 days after the embolization shows a thrombosed aneurysm (C and D).

lobe of the lung (Fig. 3A). The embolization was performed with 4 total Interlock™ detachable coils (Boston Scientific Corp., Natick, MA, USA) in the proximal part of the right A8 portion as the feeding artery of the PAA/PAP (Fig. 3B). Because no other feeding artery was identified, proximal embolization of the single feeding artery was thought to be sufficient; total packing of the aneurysm was not recommended. Two days after the embolization, a collapsed aneurysm in the right lower lobe was confirmed on CT scan (Figs. 3C and 3D). After the coil embolization, both the patient's bloody sputum and pleural effusion had disappeared until he died one month later due to an incidental aspiration.

DISCUSSION

In this case, there are two important clinical issues in the diagnosis of hemoptysis when it develops in patients with lung abscess; first, airway bleeding can occur not only from the bronchial artery but also from a lesion in the pulmonary artery, such as PAA/PAP; CT with MPR images and volume renderings is useful for the differential diagnosis. Second, PAA/PAP does not develop in the acute phase of infection and inflammation but instead during its resolving phase.

Most cases of massive hemoptysis arise from a lesion in the bronchial arteries [1], but clinicians should be aware of the possibility of PAA/PAP, which

is observed in 8–11% of patients with hemoptysis [5, 6]. Undiagnosed PAA/PAP could be lethal if treated with bronchial artery embolization [5, 6]. Most cases of PAA/PAP occur in the trunk or major branches of the pulmonary artery due to pulmonary hypertension, congenital heart anomalies, endocarditis, or cardiac surgery [7]. The peripheral type of PAA/PAP is less common but often found in association with iatrogenic vascular injuries by Swan-Ganz catheters or infectious diseases, such as tuberculosis, bronchiectasis, or lung abscess [5, 8]. Pulmonary angiography has been considered the gold standard for the diagnosis of PAA/PAP [8]; however, peripheral PAA/PAP may not be detectable with pulmonary angiography in some cases [1]. As in the present case, CT along with an additional type of reconstruction technology, such as MPR or volume rendering, can demonstrate PAA/PAP as an enhanced mass with a feeding artery [9–11].

In our case, hemoptysis due to PAA/PAP developed more than two weeks after the introduction of antibiotic treatment when the inflammation had already started to resolve. Several other reports have also demonstrated that PAA/PAP arises in the chronic phase of lung abscess [10–12]. The actual mechanisms of the late development in PAA/PAP are still unknown; however, one possible explanation is that increased focal tissue pressure due to the edema and exudates during the acute phase of inflammation decreases or halts the resolving phase and eventually causes the dilation of vessels that have already been injured in the acute phase.

CONCLUSION

Early and aggressive intervention against PAA/PAP in the case of lung abscess is required to avoid lethal hemoptysis due to the high incidence of ruptures of PAA/PAP and mortality [13, 14]. Therefore, clinicians should consider the possibility of PAA/PAP in the differential diagnosis of hemoptysis during the treatment of lung abscess and perform bolus injection CT including MPR images and volume renderings for the diagnosis of PAA/PAP.

REFERENCES

1) Shin TB, Yoon SK, Lee KN, Choi JS, Kim YH, Sung CG, *et al*. The role of pulmonary CT angiography and selective pulmonary angiography in endovascular management of pulmonary artery pseudoaneurysms associated with infectious lung diseases. J Vasc Interv Radiol 2007; 18: 882–7.
2) Fernando HC, Stein M, Benfield JR, Link DP. Role of bronchial artery embolization in the management of hemoptysis. Arch Surg 1998; 133: 862–6.
3) Bookstein JJ, Moser KM, Kalafer ME, Higgins CB, Davis GB, James WS. The role of bronchial arteriography and therapeutic embolization in hemoptysis. Chest 1977; 72: 658–61.
4) Chung CW, Doherty JU, Kotler R, Finkelstein A, Dresdale A. Pulmonary artery aneurysm presenting as a lung mass. Chest 1995; 108: 1164–6.
5) Sbano H, Mitchell AW, Ind PW, Jackson JE. Peripheral pulmonary artery pseudoaneurysms and massive hemoptysis. AJR Am J Roentgenol 2005; 184: 1253–9.
6) Remy J, Lemaitre L, Lafitte JJ, Vilain MO, Saint Michel J, Steenhouwer F. Massive hemoptysis of pulmonary arterial origin: diagnosis and treatment. AJR Am J Roentgenol 1984; 143: 963–9.
7) Deterling RA, Clagett OT. Aneurysm of the pulmonary artery: review of the literature and report of a case. Am Heart J 1947; 34: 471–99.
8) Poplausky MR, Rozenblit G, Rundback JH, Crea G, Maddineni S, Leonardo R. Swan-Ganz catheter-induced pulmonary artery pseudoaneurysm formation: three case reports and a review of the literature. Chest 2001; 120: 2105–11.
9) Restrepo CS, Carswell AP. Aneurysms and pseudoaneurysms of the pulmonary vasculature. Semin Ultrasound CT MR 2012; 33: 552–66.
10) Saruki H, Ogata N, Kawasaki T, Oka Y, Koga I, Fujimori S, *et al*. Type 2 diabetes mellitus with hemoptysis suspiciously caused by infectious pulmonary artery aneurysm associated with pneumonia. Nihon Naika Gakkai Zasshi 2009; 98: 2885–7.
11) Haranaga S, Teruya H, Nakamura H, Higa F, Tateyama M, Fujita J. Pulmonary artery pseudoaneurysm secondary to lung abscess. Intern Med 2009; 48: 2159–60.
12) Kobayashi H, Kiyokawa M, Fukuoka M, Tanaka M, Fukuno Y, Aragane N, *et al*. A case of pulmonary artery pseudoaneurysm secondary to lung abscess. Nihon Kokyuki Gakkai Zasshi 2007; 45: 627–30.
13) Matsumura Y, Shiono S, Saito K, Sato T. Pulmonary artery pseudoaneurysm after lung resection successfully treated by coil embolization. Interact Cardiovasc Thorac Surg 2010; 11: 364–5.
14) Akpinar E, Turkbey B, Canyigit M, Peynircioglu B, Hazirolan T, Pamuk AG, *et al*. Bleeding pulmonary artery pseudoaneurysm secondary to squamous cell lung cancer: computed tomography findings and endovascular management. Acta Radiol 2006; 47: 944–6.