Case Report

Transcatheter Proximal Coil Blocking with n-Butyl-2-Cyanoacrylate Injection via the Pulmonary Artery Alone for Rasmussen’s Aneurysm

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Rasmussen’s aneurysm is a peripheral pulmonary artery pseudoaneurysm (PAP) within a tuberculosis cavity. Because it can be perfused from the bronchial and pulmonary arterial circulations, combined embolization via the bronchial and pulmonary arteries is sometimes required. Herein, we present case of a 51-year-old man with Rasmussen’s aneurysm that was successfully treated by proximal coil blocking with n-butyl-2-cyanoacrylate (NBCA) injection via the pulmonary artery alone. Our treatment approach may be safe and effective for infectious lung disease-related PAP, which has to be treated from the pulmonary artery side.

1. Introduction

Tuberculosis is not a disease of the past and remains a serious threat. Hemoptysis in patients with pulmonary tuberculosis can result from various etiologies, including bronchiolitis, bronchiectasis, aspergilloma, or vascular complications. For such cases, bronchial artery embolization (BAE) has become the standard treatment because the hemoptysis usually originates from the bronchial artery or, less frequently, from a nonbronchial systemic artery [1].

On the other hand, Rasmussen’s aneurysm, which is a peripheral pulmonary artery pseudoaneurysm (PAP) within a tuberculosis cavity, will sometimes require combined embolization via the bronchial and pulmonary arteries. This is because infectious lung disease-related PAP can be perfused through the bronchial and pulmonary arterial circulations, resulting in recurrent hemoptysis despite BAE [2, 3]. Herein, we present a case of Rasmussen’s aneurysm that was successfully treated by proximal coil blocking with n-butyl-2-cyanoacrylate (NBCA) injection via the pulmonary artery alone.

2. Case Report

A 51-year-old man was referred to our hospital for treatment of hemoptysis. One week before, he presented with coughing up of approximately 1 cup of bright red blood, which was diagnosed as active pulmonary tuberculosis. He had poorly controlled diabetes mellitus.

When he arrived at our hospital, hemodynamic status was stable, and there were no abnormal signs or symptoms, except for low-grade fever and mildly elevated C-reactive protein. Contrast-enhanced computed tomography (CT) revealed a 7 mm round pseudoaneurysm within a cavitary lesion in the left upper lobe of the lung (Figure 1). The pseudoaneurysm was thought to originate from a branch of the left superior
The tapering was in the branch that was suspected as the parent artery of the aneurysm on CT (Figure 4). Based on these findings, we were able to identify the parent artery and reach the aneurysm using the microcatheter.

Two microcatheters were placed in the aneurysm and pulmonary artery proximal to the aneurysm. A 1.7-Fr microcatheter (Echelon, ev3, Irvine, California, USA) and a 1.9-Fr microcatheter (Carnelian Marvel, Tokai Medical Products, Aichi, Japan) were inserted in parallel through a guiding catheter. The 1.7-Fr microcatheter was positioned proximal to the aneurysm, whereas the 1.9-Fr microcatheter was advanced into the aneurysm. Because we decided to choose NBCA for embolization, we first performed proximal superior segmental pulmonary artery embolization proximal to the aneurysm using the 1.7-Fr microcatheter, with 3 coils measuring 3 mm × 6 cm, 2.5 mm × 6 cm, and 2 mm × 8 cm (ED COIL10 ExtraSoft Type R, Kaneka Medix, Osaka, Japan) to prevent unintended reflux of the NBCA. Thereafter, a 0.8 mL mixture of NBCA and iodized oil (Lipiodol, Guerbet Japan, Tokyo, Japan) (NBCA:Lipiodol = 1:3) was retrogradely injected into the aneurysm through the remaining 1.9-Fr microcatheter. The aneurysm was filled with the mixture of the NBCA and iodized oil, but the feeding artery could not be embolized retrogradely (Figure 5). Although postembolization bronchial angiography could not be performed due to the subintimal injury in the left bronchial artery, postembolization pulmonary angiography did not show the residual aneurysm (Figure 6).

After treatment, he remained stable without further hemoptysis, and there were no other side effects or complications. Follow-up CT performed 2 months later confirmed successful embolization of the aneurysm (Figure 7).

3. Discussion

Pulmonary tuberculosis has a significantly lower incidence in developed countries than in developing countries. In developed countries, diabetes mellitus is one of the common risk factors for tuberculosis [4]. The source of the vascular…
Figure 3: Bronchial angiography. (a) The early phase depicts the aneurysm (arrow) via small and tortuous anastomoses (arrowheads) from the left bronchial artery. (b) The delayed phase shows the parent pulmonary artery of the aneurysm (arrow) via a shunt from the left bronchial artery.

Figure 4: Comparison between pulmonary angiography and computed tomography image. (a) Left segmental pulmonary angiography shows abrupt tapering of the arterial branch (arrow), which indicates retrograde flow from the bronchial to the pulmonary artery. (b) Contrast-enhanced coronal computed tomography image shows the aneurysm (arrow) and the parent artery of the aneurysm (arrowhead). The parent artery corresponds to the abrupt tapering of the arterial branch, which was seen in the left segmental pulmonary angiography.

Complications underlying massive hemoptyisis in tuberculosis is most commonly the bronchial arteries, and only less than 10% is from the pulmonary artery [5, 6]. Rasmussen’s aneurysm is a rare complication of pulmonary tuberculosis. A previous report indicated that pseudoaneurysm was present in 4% of patients with tuberculous cavities on autopsy [7]. Rasmussen’s aneurysm rupture has a reported incidence of 84% and mortality rate above 80% [7, 8]. Death is usually secondary to aspiration of blood and the consequent asphyxiation. Therefore, it should be treated immediately upon diagnosis.

Endovascular treatment and surgical lobectomy are the treatment options for Rasmussen’s aneurysm. Because surgical lobectomy for patients with massive hemoptyisis poses a high risk, endovascular treatment has become a widespread initial therapy. However, Rasmussen’s aneurysm requires special diagnostic and therapeutic care, owing to its characteristic hemodynamics. The inflammation from infectious lung disease-related PAP can induce bronchial to pulmonary arterial shunt; the flow direction in this shunt is determined by the pressure gradient from the bronchial to the pulmonary artery [9]. The resulting hypoperfusion in the diseased pulmonary segment can affect visualization of the aneurysm on pulmonary angiography [10].

Shin et al. classified infectious lung disease-related PAPs into 4 types, based on bronchial and pulmonary angiographic findings. Type A PAPs can be visualized on nonselective pulmonary angiography, whereas type B PAPs can be visualized
Figure 5: Embolization of the aneurysm. (a) Two microcatheters are placed in the aneurysm and pulmonary artery proximal to the aneurysm. One microcatheter is used for proximal segmental pulmonary artery coil blocking proximal to the aneurysm (arrow); the other microcatheter is positioned into the aneurysm (arrowhead) before injecting a mixture of NBCA and iodized oil. (b) Complete filling of the aneurysm with the mixture of NBCA and iodized oil (arrow) is performed using the other microcatheter. NBCA, n-butyl-2-cyanoacrylate.

Figure 6: Postembolization assessment. There is no residual aneurysm on pulmonary angiography.

Figure 7: Non-contrast-enhanced axial computed tomography image. Two months after the treatment, the aneurysm is filled with the mixture of n-butyl-2-cyanoacrylate and iodized oil (arrow).
In conclusion, we presented a case of Rasmussen’s aneurysm embolization. (a) Via the bronchial artery, only proximal embolization may be achieved because the inflow artery is small and tortuous. (b) Using the conventional approach via the pulmonary artery, selective catheterization of the aneurysm may be easy, but an unintended reflux of the NBCA cast and subsequent incomplete embolization of the aneurysm may occur with the retrograde flow. (c) Using our approach, proximal coil blocking via the pulmonary artery prevents unintended reflux of the NBCA cast and allows continuous retrograde retention of the NBCA in the aneurysm, as well as in the inflow and outflow arteries. NBCA, n-butyl-2-cyanoacrylate.

Conflicts of Interest
None of the authors have any direct or indirect conflicts of interest, financial or otherwise, related to the subject matter contained in this report.

References


