Received: 20 December 2023 | Accepted: 5 June 2024

DOI: 10.1002/rcr2.1405

CASE REPORT

Official Case Reports Journal of the Asian Pacific Society of Respirology
Respirology Case Reports OPEN ACCESS APSR WILEY

Bronchial occlusion with endobronchial Watanabe spigots using a two-scope technique for massive haemoptysis

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Associate Editor: Cameron Sullivan

Abstract

Massive haemoptysis is a life-threatening condition whose cause needs to be identified rapidly so that prompt interventions can ensue. Bronchial occlusion with endobronchial Watanabe spigots (EWSs) may be useful when endovascular treatment or surgery proves to be difficult. An 84-year-old woman developed massive haemoptysis during percutaneous mitral valve repair for refractory heart failure due to severe mitral regurgitation (MR). Interventional radiology (IVR) and surgery were contraindicated, and bronchial occlusion with EWSs was attempted to control bleeding. The bleeding was so persistent that it was difficult to secure the visual field without aspiration with a bronchoscope. Herein, we report a two-scope technique, also used in cryobiopsy of peripheral lung lesions, to control bleeding and perform bronchial occlusion with EWSs.

KEYWORDS

bronchial occlusion, endobronchial Watanabe spigot, massive haemoptysis, two-scope technique

INTRODUCTION

Massive haemoptysis is one of the most challenging clinical manifestations. It requires prompt identification of its aetiology and appropriate management.[1,2] The approach to massive haemoptysis depends on the cause and severity of the haemoptysis in addition to available resources such as access to surgeons, interventional pulmonologists and interventional radiologists. The flexible bronchoscopy is instrumental in identifying the source of bleeding,[3] and bronchial occlusion with endobronchial Watanabe spigots (EWSs) has been reported as an option, and at times, definitive treatment for massive haemoptysis unfit for interventional radiology (IVR) and surgery.[4]

Although it is critical to maintain a clear field of vision when performing bronchial occlusion with EWSs, the extent of bleeding can make this hard to achieve, which lead to place silicone spigots to the target bronchus difficulty.[5,6] Bronchial occlusion with EWSs has been avoided in cases of haemoptysis so massive that it is difficult to secure a visual field by bronchoscopy. Herein, we present a case of massive haemoptysis in which bleeding was controlled by bronchial occlusion with EWSs using a two-scope technique while securing the field of view.

CASE REPORT

An 84-year-old woman complained of dyspnoea for several days and was admitted to our cardiology department due to acute decompensated heart failure. Although she was administered inotropic drugs and diuretics, the course of the disease was refractory. Upon closer examination, the deteriorating factor of heart failure was severe mitral regurgitation (MR). Due to poor control of heart failure, percutaneous edge-to-edge mitral valve repair using the MitraClip device under general anaesthesia was scheduled for severe MR. Although the surgeon confirmed that her MR was under control by transesophageal echocardiography, massive haemoptysis was observed from the intubation tube

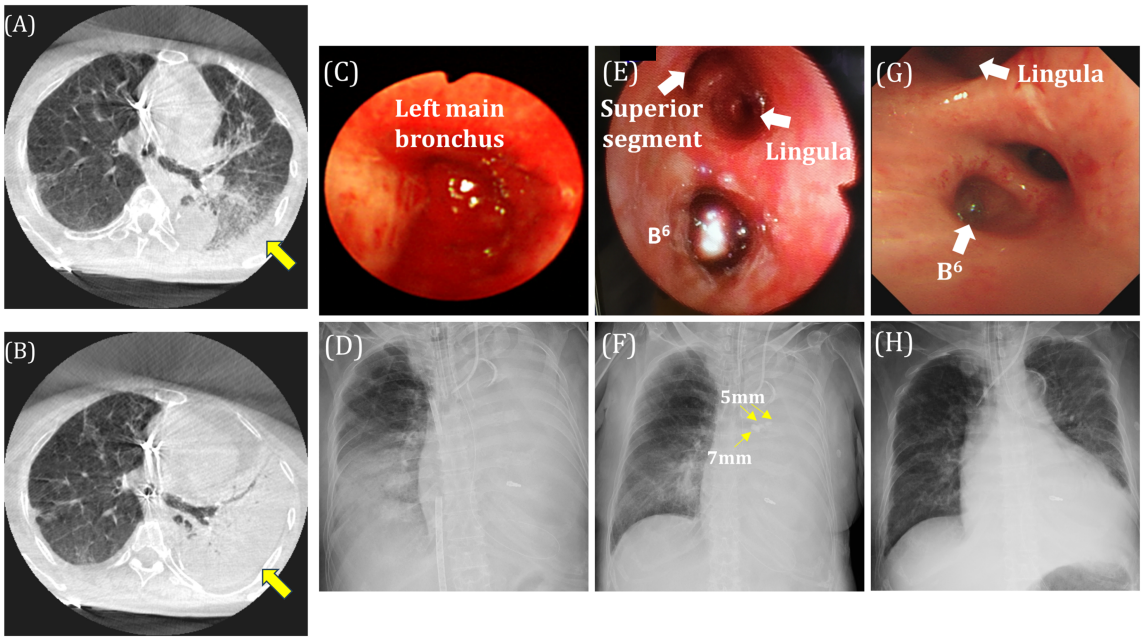

FIGURE 1 Course of bronchial occlusion treatment. (A) Cone-beam computed tomography (CBCT) image immediately after surgery: Ground glass lesion in the left lower lobe (yellow arrow). (B) CBCT image after 1 h after surgery: Atelectasis in the left whole lung (yellow arrow). (C, D) Postoperative day 8: Before EWS insertion. Bleeding protrudes into the left main bronchus. Left whole lung area is atelectatic, and infiltration is seen in the right lower lung area due to haemorrhage soiling from the left lung. (E, F) Postoperative day 17: Three EWSs were properly inserted into the left B6, resulting in no active bleeding. Two 5-mm EWSs were deployed continuously into distal to the left B6, and one 7-mm EWS was deployed proximal to the left B6 (yellow arrow). Veno-venous extracorporeal membrane oxygenation (V-V ECMO) disengaged. (G, H) Postoperative day 36: All EWSs were removed. No recurrent bleeding was seen from the left B6. x-ray showed improvement in left atelectasis.

immediately after the surgical operation. Cone-beam computed tomography (XperCT, Philips) revealed infiltration in a left lower lobe, suggesting bleeding from the left lung (shown in Figure 1A,B). The left main bronchus was subsequently obstructed by a blood clot, and ventilation could not be maintained on ventilator control; therefore, veno-venous extracorporeal membrane oxygenation (V-V ECMO) was introduced.

For several days, she continued bleeding from her left lower lobe and was managed without anticoagulation on the ECMO circuit. It was determined that the cause of the bleeding was perforation of the left pulmonary vein by the stiff guide wire used during the procedure. Selective embolization of pulmonary vein was generally not indicated because of the risk of stroke, and that the appropriate surgical treatment would be left lower lobectomy; however, she was ineligible for this procedure because she had cardiac dysfunction and poor lung function. On the eighth postoperative day, bronchial occlusion with EWSs was performed on the lower lobe of her left lung using a bronchoscope with 3.0 mm working channel (BF-1 T60; Olympus, Tokyo, Japan); however, this procedure was rendered difficult by profuse bleeding, and it was difficult to obtain a clear view without aspirating using a bronchoscope (shown in Figure 1C,D). Thus, two-scope technique was used to ensure a clear field of view while stopping bleeding. First, bleeding was aspirated with a bronchoscope (BF 1T60; Olympus), and bronchial occlusion with EWSs was performed with a second bronchoscope with 2.2 mm working channel (BF-P60; Olympus) while maintaining visual field clarity (shown in Figure 2A–D). Using two scopes, two 5-mm EWSs were deployed consecutively to the left B6. However, the first two 5-mm spigots placed distally did not completely stop the bleeding. Additionally, one 7-mm EWS was deployed proximal to the left B_6. The first endoscopist had to reintroduce the bronchoscope to perform further suction between spigot insertion. Thereafter, there was no inflow of blood from bleeding into the right bronchus. On postoperative day 15, ventilation stabilized and V-V ECMO was weaned off. On postoperative day 16, it was confirmed that EWSs were properly inserted into the left B6, active bleeding was absent and bronchus was open on the left upper lobe segment (shown in Figure 1E,F). On postoperative day 36, all EWSs were removed, and haemostasis was finally achieved (shown in Figure 1G,H).

DISCUSSION

Bronchial occlusion with EWSs developed by Watanabe et al. for refractory pulmonary and bronchial fistulas is a less invasive and safer procedure than surgery.[3,6] There have been reports of safe temporary control for moderate haemoptysis by bronchial occlusion using EWSs, but insertion into the target bronchus is reportedly challenging for

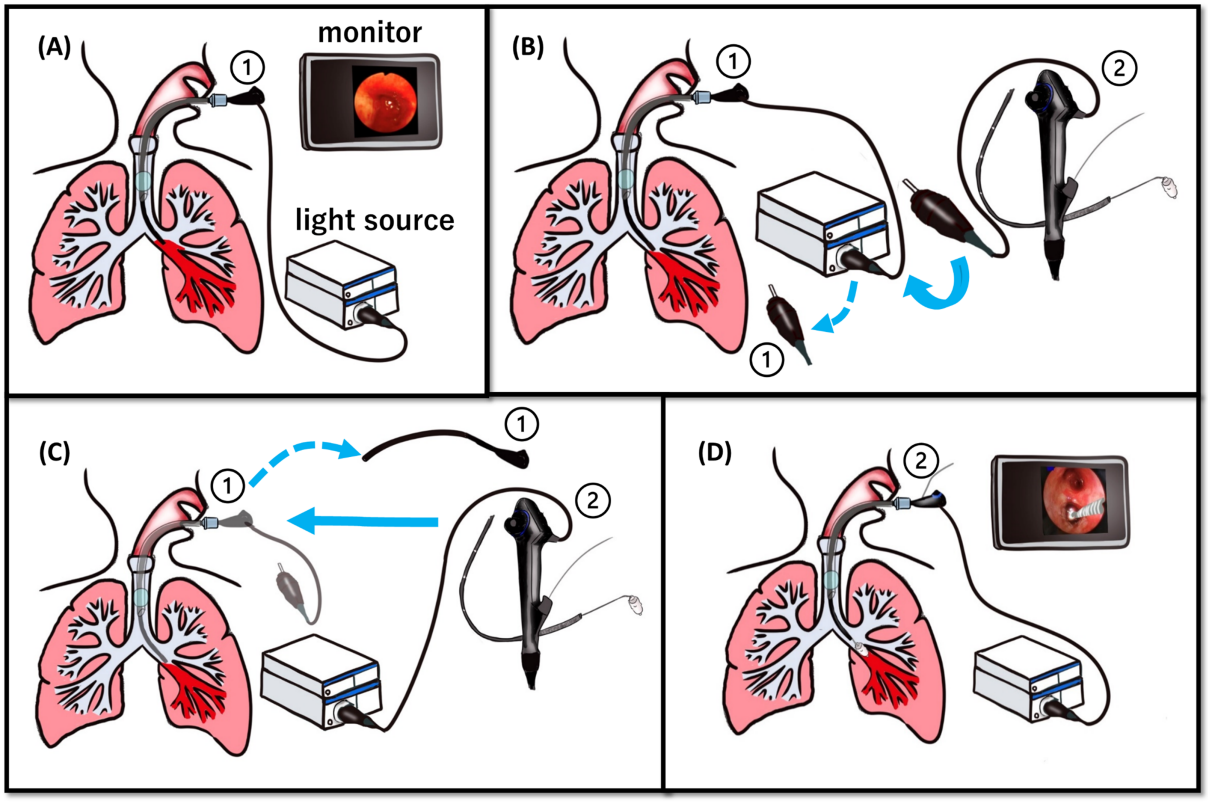

FIGURE 2 Scheme of the two-scope technique when performing bronchial occlusion with EWSs. (A) First, blood was continuously aspirated with a first bronchoscope (① BF 1 T60; Olympus) by a first endoscopist. (B) Second, while an operator inserted the BF 1 T60 (①) into the left B6 and continued aspirating the bleeding, second endoscopist disconnected the BF 1 T60 (①) from the light source and connected the BF-P60 (②) using a curette pre-loaded with an EWS to the light source. (C) Subsequently, the BF 1 T60 (①) was removed by the first endoscopist, and the second endoscopist immediately inserted the BF-P60 (②) using a curette preloaded with an EWS through the endotracheal tube. (D) Finally, the second endoscopist inserted an EWS to the left B6 while maintaining visual field clarity.

active bleeding due to the necessity of a clear field of vision.[5] Recently, there have been reports of haemostasis using EWSs for massive haemoptysis; however, to the best of our knowledge, there are no previous reports which have been mentioned how to secure the field of vision.[4] Therefore, this case is significant in that two-scope technique enabled us to secure the field of view and perform haemostasis with bronchial occlusion using EWSs for massive haemoptysis unfit for IVR and surgery, resulting in weaning off from V-V ECMO.

One of the factors that made the EWSs procedure difficult was that the patient could not be moved to the fluoroscopy room and the procedure had to be performed without fluoroscopy. In recent years, a two-scope technique has been considered useful in cryobiopsy for peripheral lung lesions to achieve haemostasis.[7,8] We focused on a two-scope technique because it is similar to bronchial occlusion with EWSs in that the bronchoscope must be removed and reinserted quickly to achieve haemostasis. We expect it is useful that it can be easily introduced in facilities with two or more bronchoscopes and dose not incur additional costs.

In conclusion, it is useful to use a two-scope technique to secure the visual field and perform bronchial occlusion with EWSs when it is difficult to secure the visual field for massive haemoptysis.

AUTHOR CONTRIBUTIONS

Takayasu Ito is the guarantor of the content of this manuscript. Tomoya Baba contributed to the draft of the manuscript. Yoshiki Sato, Shunsaku Hayai, Junji Koyama, Shota Nakamura, Yoshiyuki Tokuda, Toyofumi Fengshi Chen-Yoshikawa, and Makoto Ishii contributed to the editing of the manuscript.

ACKNOWLEDGMENTS

The authors thank Enago (www.enago.jp) for English language editing. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The authors declare that appropriate written informed consent was obtained for the publication of this manuscript and accompanying images.

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How to cite this article: Baba T, Ito T, Sato Y, Hayai S, Koyama J, Nakamura S, et al. Bronchial occlusion with endobronchial Watanabe spigots using a two-scope technique for massive haemoptysis. Respirology Case Reports. 2024;12(6):e01405. https://doi.org/10.1002/rcr2.1405