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Successful treatment of pyopneumothorax with bronchopleural fistula using endobronchial Watanabe spigots

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Keywords
Air leakage, bronchial occlusion, bronchopleural fistula, endobronchial Watanabe spigot, pyopneumothorax.

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Abstract

Bronchopleural fistula (BPF) can complicate necrotizing pneumonia. Surgery would be indicated in patients who fail conservative management, yet this group is often of poor pulmonary function and general condition. Bronchial occlusion with endobronchial Watanabe spigots (EWS) can be a potential alternative treatment when the culprit bronchi can be isolated. In this case report, we describe a middle-aged gentleman who presented with necrotizing pneumonia complicated with pyopneumothorax with right upper lobe BPF, and who had failed to respond to chest drainage and antibiotics. EWS bronchial occlusion finally led to cessation of air leak, allowing removal of chest tube. EWS were removed uneventfully six months later. This case highlights the role of EWS in the management of BPF in patients with high surgical risk.

Introduction

Bronchopleural fistula (BPF) is a fistulous tract between the bronchus and pleural space. It causes significant morbidity, with mortality rates of 18–67%. Endobronchial Watanabe spigot (EWS®; Novatech, France) is a bronchoscopic technique to occlude culprit bronchi with success rates of 96.7% and low complication rates [1]. We report a case of necrotizing pneumonia with pyopneumothorax secondary to BPF, treated successfully with EWS.

Case Report

A middle-aged gentleman with chronic obstructive pulmonary disease presented with one month of productive cough, haemoptysis, fever, and right pleuritic chest pain. Patient was cachexic at 46 kg, with low serum albumin of 20 g/L. Chest X-ray revealed a right upper lobe (RUL) cavitating consolidation with right hydropneumothorax. Diagnostic thoracentesis drained pus, thus a chest drain was inserted. No growth was obtained from blood or sputum cultures, and tuberculosis workup was negative. However, despite drainage and antimicrobial therapy, right lung remained unexpanded with persistent air leak for two weeks (Cerfolio Grade 2—bubbling present during expiration). Computed tomography (CT) of the thorax had demonstrated a BPF at the RUL (Fig. 1A). Cardiothoracic team deemed the patient high surgical risk.

After discussion, the patient agreed to endobronchial blockade. A flexible bronchoscopy was performed under conscious sedation to identify the affected bronchi via sequential endobronchial occlusion using a 4Fr balloon catheter (B5-2C balloon catheter; Olympus, Japan). Air leak persisted upon occlusion of RUL apical segment (RB1), posterior segment (RB2), and anterior segment (RB3) individually, but ceased completely when RUL was occluded. A week later, under deep sedation and endobronchial intubation, three EWS with different diameters were inserted via flexible bronchoscope—one each into RB1 (7 mm), RB2b (5 mm), and RB3a (5 mm), with cessation of air leak when all EWS were in place during mechanical ventilation. The patient had no significant peri-procedural cough. However, air leak unfortunately recurred 1 h post procedure during spontaneous respiration. Hence, procedure was repeated a week later, with

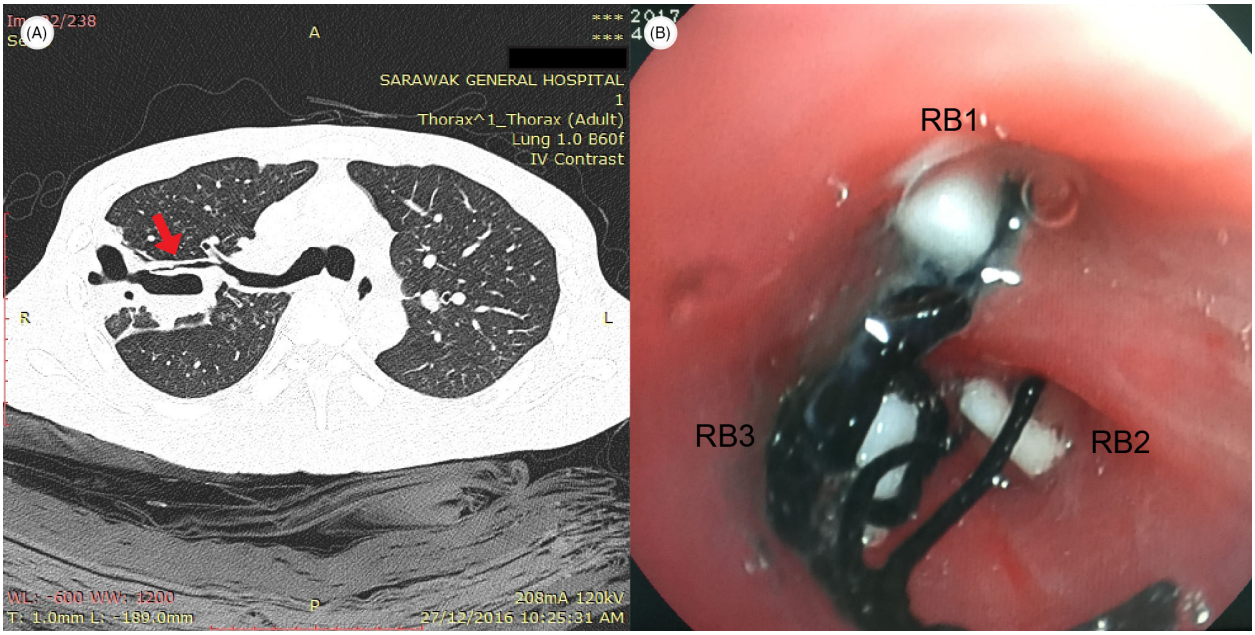

Figure 1. (A) Computed tomography (CT) of the thorax demonstrating bronchopleural fistula at right upper lobe (RUL, red arrow). (B) Post insertion of three endobronchial Watanabe spigot (EWS; with black nylon thread) at segmental bronchi of RUL.

removal of the in situ sub-segmental RB2b and RB3a EWS, replaced with two segmental EWS, inserted into RB2 (6 mm) and RB3 (7 mm), respectively (Fig. 1B). The air leak resolved completely, chest drain was removed the following day, and the patient was discharged the day after, with antibiotic continuation for total two months.

During subsequent follow-up, serial chest radiographs demonstrated significant improvement of right pleural thickening (Fig. 2). Symptoms resolved with good weight gain and return to work. CT of the thorax at two months showed all EWS in place with no recurrence of pyopneumothorax. EWS were removed via flexible bronchoscopy six months later. Minimal granulation tissue was noted at RUL bronchus with minimal secretion upon EWS retrieval (Fig. 3). Patient remained well and lungs maintained expansion.

Discussion

BPF may result from necrotizing pneumonia, neoplasms, lung injuries, or as a complication of thoracic procedures. In our region, necrotizing pneumonia is a common aetiology. Such patients usually pose high surgical risk due to poor pulmonary reserve and a majority will end up with prolonged chest drainage, protracted hospital stay, and antibiotic exposure.

EWS was introduced by Watanabe et al. in 1991. It is a silicon spigot used for bronchial occlusion in BPFs and peripheral bronchial bleeding [1]. It is a treatment option for BPF in patients who are not surgical candidates and have failed conservative treatment. Watanabe et al.'s cohort described a high success rate of treating BPF, predominantly in patients with spontaneous pneumothoraces. However, literature regarding its role in patients with BPF secondary to necrotizing pneumonia and pyopneumothorax remains scarce.

The key to success of endobronchial blockade is the localization and isolation of the culprit bronchus [2]. During our initial balloon occlusion test, air leak ceased only when RUL bronchus was occluded but not the individual segmental bronchi, possibly due to the presence of collateral ventilation within the RUL segments [3] or presence of multiple fistulae from all three segments of RUL. Hence, a detailed CT scan analysis to identify BPF before bronchoscopy is crucial. The Chartis system (Pulmonx, USA) can be used for air leak localization and assessment of collateral ventilation if available [3]. Our initial attempt at sub-segmental level EWS blockade was aimed at preventing lobar collapse as well as to allow drainage of secretion. Although air leak apparently ceased with sub-segmental blockade, it later recurred upon spontaneous ventilation. This highlights the importance of effective air leak assessment—forced expiratory or cough manoeuvre—

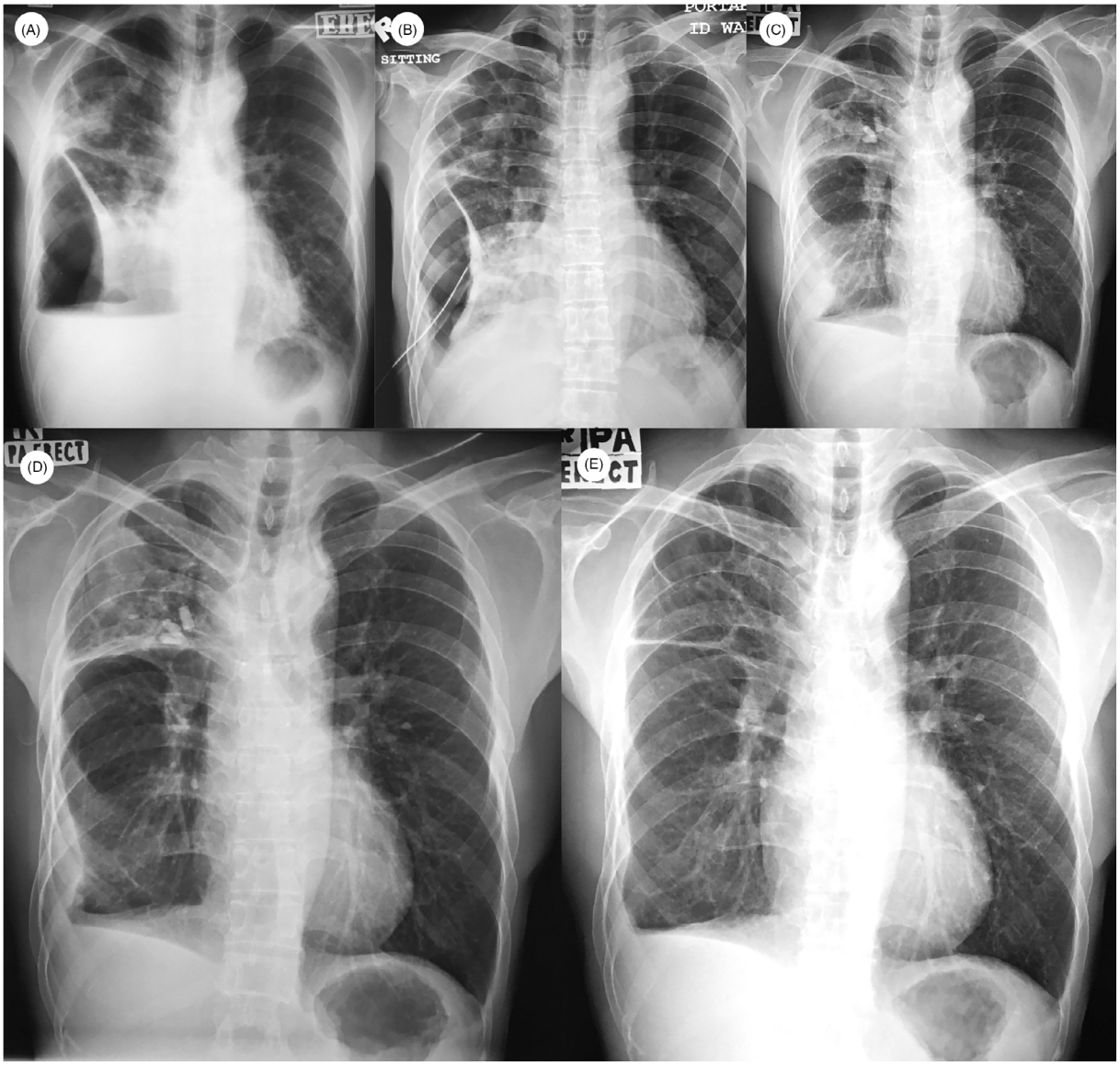

Figure 2. Serial progression of chest radiograph. (A) Upon presentation. (B) Post chest tube insertion. (C) Post endobronchial Watanabe spigot (EWS) insertion. (D) Six months after EWS insertion. (E) Post EWS removal with significant improvement of pleural thickening.

which may be difficult to elicit when the patient is under deep sedation or mechanically ventilated. A digital drainage system could provide objective real-time data of air leakage—unfortunately not available to us. Fortunately, our patient had a good outcome even with the eventual segmental level blockade.

The main concern in using EWS for BPF secondary to necrotizing pneumonia is worsening of infection as it causes lobar collapse and retention of distal secretion. Hence, temporary rather than permanent EWS placement is recommended, especially in patients with high infective risk [4]. Spigots were removed after six months in our patient. Interestingly, throughout the six months, the RUL remained aerated and patient had no worsening infective symptoms. This might be due to the presence of intralobar collateral ventilation. Sasada et al. reported the permanent placement of EWS in 24 patients, eight of whom were empyema-related BPF, without any late-phase complications or treatment-related deaths. Although other tools such as endobronchial valve—which would address the issue of secretions—may be preferred, it involves high cost and is not readily available [5].

In conclusion, bronchial occlusion using EWS appears to be a potential alternative treatment for BPF secondary

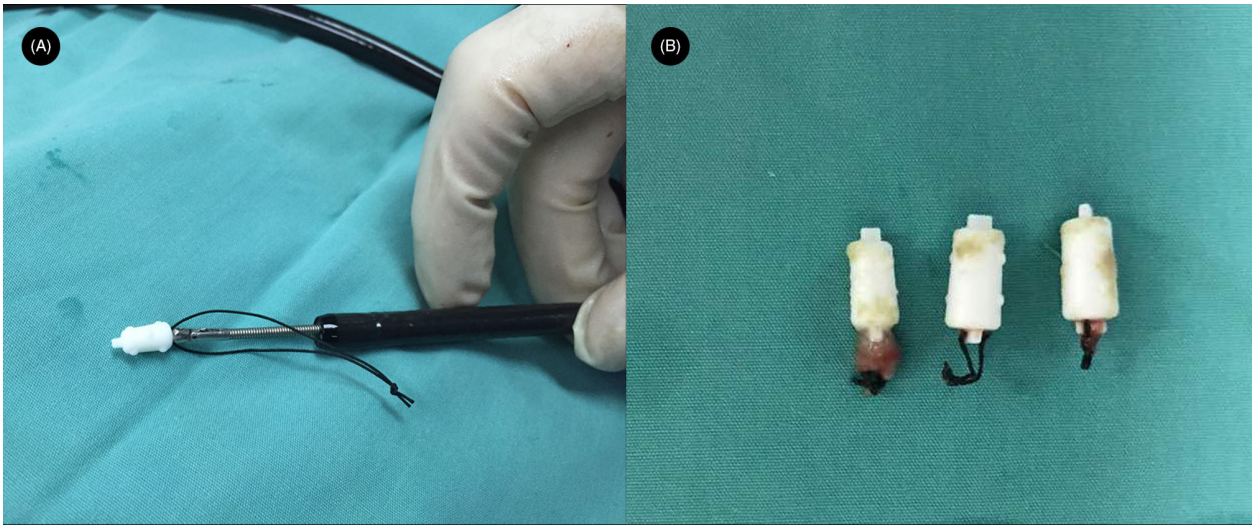

Figure 3. (A) An endobronchial Watanabe spigot (EWS) with an attached nylon thread prior to its insertion. The nylon thread acted as a safety mechanism for easy retrieval and adjustment of EWS later. (B) Three EWS removed six months later intact with some granulation tissue and slough at the proximal end.

to necrotizing pneumonia with pyopneumothorax, particularly in patients at high risk for surgical intervention.

Disclosure Statement

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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