




Use of saline to evaluate a cavity due to *Mycobacterium kansasii* infection during ultrathin bronchoscopy and endobronchial ultrasonography

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Keywords

Cavity, endobronchial ultrasonography, *Mycobacterium kansasii*, thin bronchoscope, ultrathin bronchoscope.

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Introduction

Well-vascularized malignant tumours, tuberculosis, and chronic inflammation are the most common causes of massive bleeding during bronchoscopy [1]. Those conditions often form cavitory lesions. Bronchoscopy of cavitory lesions requires attention to massive bleeding. Bleeding during bronchoscopy can be life-threatening in some cases, and diagnosis can be delayed due to inaccurate diagnosis. To reduce the risk of bleeding, direct examination of the blood vessels in the lesion might be helpful.

Case Report

A 28-year-old man presented to our hospital due to a chest radiograph abnormality. He had no past medical history. He was a current smoker who had smoked 1 pack/day for eight years. Family history was unremarkable. His vital signs and breath sounds were normal. Chest radiography showed small granular shadows in the upper right lung field (Fig. 1A). Chest

Abstract

A 28-year-old man had a cavitory lesion in the upper right lobe with a tree-in-bud appearance on chest computed tomography (CT). Diagnostic bronchoscopy was performed. An ultrathin bronchoscope in the right B2a11βxy reached the cavity. We filled the cavity with saline under direct bronchoscopic visualization. We suspected a blood vessel was present in the cavity wall based on narrow-band imaging. Bronchial lavage of the cavity was performed. Next, endobronchial ultrasonography (EBUS) using a guide sheath was performed with a thin bronchoscope. EBUS showed a pulsating blood vessel in the cavity wall. Bronchial lavage collected with ultrathin and thin bronchoscopy revealed *Mycobacterium kansasii*. Observation of vessels in the wall of a cavitory lesion with ultrathin bronchoscopy and EBUS may be useful for avoiding severe bleeding associated with biopsy of a cavitory lesion.

computed tomography (CT) showed a cavitory lesion in the upper right lobe with a tree-in-bud appearance (Fig. 1B, C). There were no notable blood test findings. T-cell interferon-γ responses to *Mycobacterium tuberculosis*-specific antigens (T-SPOT.TB[®], Oxford Immunotec Ltd, England) and anti-*Mycobacterium avium* complex antibodies were negative. Bacteriological tests of sputum and gastric juice were all negative. The possibility of tuberculosis could not be ruled out, so we performed bronchoscopic examination with endobronchial ultrasonography using a guide sheath (EBUS-GS).

Chest CT suggested that the right B2a11βxy led to the cavitory lesion. With the ultrathin bronchoscope (BF-XP260F, outer diameter 2.8 mm; Olympus, Japan), we reached the lesion and a blood vessel running in the superficial tissue was observed (Fig. 2A). Narrow-band imaging (NBI) showed a brownish blood vessel (Fig. 2B). We could not observe pulsation of vessels by the NBI. The cavity was washed with saline, which was collected for bacterial and cytological examination. Next, EBUS-GS was performed using a thin bronchoscope (BF-P260F, outer diameter

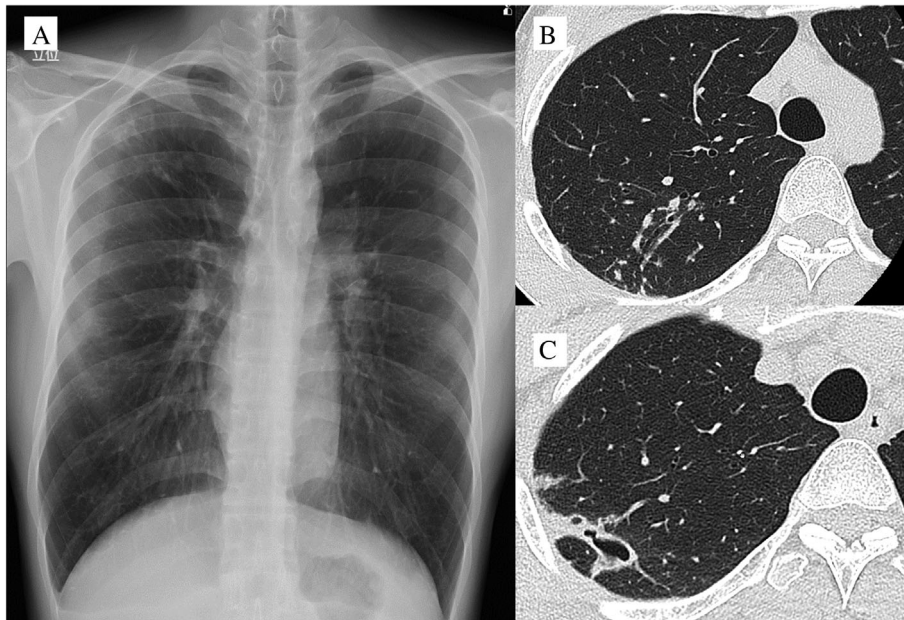


Figure 1. (A) Granular shadows in the upper right lung field on a chest radiograph. (B, C) A cavitary lesion in the upper right lobe with a tree-in-bud appearance was observed with high-resolution computed tomography.

4 mm; Olympus) under fluoroscopic guidance. After filling the cavity with saline, EBUS showed a large space. Chest CT before bronchoscopy showed no dilation of the bronchus at the proximal site from the cavitary lesion, so this large space filled with saline was considered as the cavity. We advanced and pulled the ultrasonic probe slightly and EBUS showed a pulsating blood vessel in the cavitary wall (Fig. 2C). To avoid severe bleeding, we

confirmed the proximal side of the cavity wall using EBUS and performed brushing. The saline wash from the cavity collected with the ultrathin bronchoscope was added to bronchial lavage with the thin bronchoscope. Testing revealed 1+ acid-fast bacillus staining, and the acid-fast bacillus culture was positive for *Mycobacterium kansasii*. We started treatment with isoniazid, rifampicin, and ethambutol.

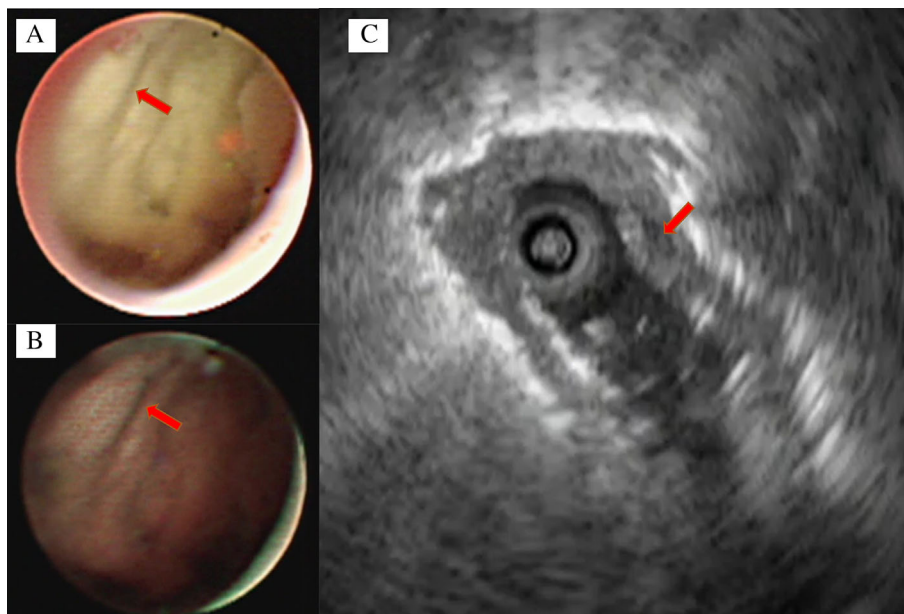


Figure 2. (A) Findings observed with an ultrathin bronchoscope inside the cavity. A blood vessel running in the superficial tissue was observed (red arrow). (B) Narrow-band imaging (NBI) showed a brownish blood vessel (red arrow). (C) Observing the cavity with endobronchial ultrasonography (EBUS), EBUS showed a blood vessel running in the cavity wall (red arrow).

Discussion

Filling a cavity with saline is useful for observing a cavitory lesion. In gastrointestinal endoscopy, the saline immersion technique is often used for endoscopy in the stomach; a deeper field makes it easier to obtain a focused image [2]. On the other hand, in Japan, there are few reports of cases in which saline was injected into a peripheral cavitory lesion during bronchoscopy [3].

In this cavitory lesion, we were able to observe a running vessel in the wall by filling the cavity with saline. Bronchoscopy for cavitory lesions requires attention to massive bleeding. Isobe et al. reported bronchovascular bundles in the cavity wall during autopsy of a patient with lung cancer [4]. We attempted to observe the bronchovascular bundle in the cavity wall with ultrathin bronchoscopy and EBUS. EBUS showed the blood vessel running in the cavity wall, and NBI showed a brownish blood vessel in the cavitory wall in this case. We were able to avoid biopsy of the blood vessel, which improved the safety of the procedure. We could observe a running vessel in the cavitory wall using radial scanning. The convex scanning is better to confirm the accurate site of running vessel than the radial scanning. If the thinner EBUS-transbronchial needle aspiration bronchoscope will be developed in the future, we suspect there will be some possibilities to perform biopsies from cavitory wall with NBI and convex scanning, avoiding the biopsy of vessels.

In this case, the acid-fast bacillus test of bronchial lavage fluid from the cavitory lesion and bronchus was positive. Nakahara et al. reported the usefulness of diagnosing cavitory lesions by inserting a needle into the cavity percutaneously and injecting in with saline [5]. In this case, saline injection was also useful for diagnosis. We collected the saline after filling the cavity and observing the cavity wall. In the future, we will aim to demonstrate the diagnostic utility of injecting and collecting saline from cavitory lesions for diagnosis.

Disclosure Statements

Appropriate written informed consent was obtained for publication of this case report and accompanying images. Noriaki Kurimoto has received an honorarium from Olympus.

Author Contribution Statement

Megumi Hamaguchi: writing the original draft of the manuscript; reviewing and editing the manuscript. Noriaki Kurimoto: conceptualization; supervision; writing the original draft of the manuscript; reviewing and editing the manuscript. Takae Okuno: reviewing and editing the manuscript. Akari Tanino: reviewing and editing the manuscript. Takamasa Hotta: reviewing and editing the manuscript. Yukari Tsubata: reviewing and editing the manuscript. Takeshi Isobe: supervision; reviewing and editing the manuscript.

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