Broncholithiasis Assessed by Bronchoscopic Saline Solution Injection

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Abstract

A 68-year-old man was admitted with hemoptysis. Bronchoscopy showed bronchial obstruction at the right B3bii proximal to the broncholith. The distal end of the bronchoscope was placed in a wedge position at the right B3bii. After repeated injection of saline solution through the working channel of the bronchoscope, we observed that the broncholith was freed from the bronchial wall. The broncholith was easily removed with forceps through the working channel of the bronchoscope. Bronchoscopic saline solution injection was safe and effective in confirming the mobility of the broncholith as bronchoscopy alone could not detect the broncholiths due to bronchial occlusion.

Key words: bronchoscopy, saline solution injection, broncholithiasis


Introduction

Broncholithiasis is defined as a condition in which calcified or ossified material is present within the bronchial lumen (1). A broncholith is usually formed by the erosion and extrusion of a calcified adjacent lymph node into the bronchial lumen (2). Other causes of broncholithiasis include calcification of bronchial mucus and aspirated foreign material (2). Options for treating broncholithiasis include bronchoscopic broncholithectomy and surgery. Lobectomy or segmentectomy is usually required since removal of the broncholith will usually take a portion of the bronchial wall (3). If a broncholith is completely free within the bronchus, it can be removed bronchoscopically (4); however, bronchoscopic broncholithectomy may be accompanied by massive hemoptysis and fistula if the broncholith is not completely detached from the bronchial wall (3). Although preoperative diagnosis is important, bronchoscopy can not always assess whether the broncholith is completely free in the narrow lumen.

We herein report a case of broncholithiasis in which the mobility was easily estimated by bronchoscopy using saline solution injection in the right B3b.

Case Report

A 68-year-old man with a history of diabetes, hypertension and dyslipidemia presenting with hemoptysis was admitted to another hospital. Chest computed tomography (CT) revealed a calcified nodule at the orifice of the right B3b and he was referred to our hospital for closer examination. There were no abnormal findings in the general physical examination. The patient’s white blood cell (WBC) count was 7,500/μL, C-reactive protein (CRP) level was 0.06 mg/dL, serum glucose level was 147 mg/dL and the HbA1c was 8.2 %. Tumor markers were negative. Chest radiograph showed a nodule in the right hilum (Fig. 1A). A chest CT scan demonstrated a 6 mm calcified nodule at the B3b and parenchymal infiltrate within the segment (Fig. 1B, C). Bronchiectasis was not seen at the distal site of the broncholith. Bronchoscopy revealed bronchial obstruction at the right B3bii proximal to the broncholith (Fig. 2A). Bronchoscopy failed to visualize the broncholith directly, because the broncholith was obscured by bronchomalacia due to overlying bronchial wall inflammation.
The distal end of the bronchoscope was placed in a wedge position at the right B’bii, and 1 mL of saline solution was injected as needed (Fig. 3). After repeated injection of 1 mL of saline solution, the bronchus was sufficiently dilated and we could confirm the broncholith was mobile (Fig. 2B, C). The broncholith was removed using forceps (Fig. 2D). No adverse events, such as bleeding or bronchial tearing, were noted as a result of this bronchoscopic approach. The broncholith was a yellowish-white, hard material similar to sea coral. After broncholithectomy, there was no evidence that calcified peribronchial lymph nodes eroded the airway.

**Discussion**

When a broncholith is completely free within the bronchus, bronchoscopic extraction may be considered safe and effective (4). In this case, at the beginning of bronchoscopic...
procedure, we could not confirm that the broncholith was mobile because the right B'bi (arrow) broncholith and the application of bronchoscopic extraction solution using a bronchoscope confirmed the mobility of the broncholith and the application of bronchoscopic extraction.

The term broncholithiasis is used to denote the presence of calcified or ossified material within the lumen of the bronchus (1). The most frequent site of broncholithiasis is the middle lobe bronchus (5). The most common symptoms are a nonproductive cough frequently associated with hemoptysis and, less commonly, the presence of a secondary infection after obstruction of the distal portion of the lung that causes chest pain, dyspnea and fever (5). A broncholith is usually formed by the erosion and extrusion of a calcified adjacent lymph node into the bronchial lumen (2). Other causes of broncholithiasis include calcification of bronchial mucus and aspirated foreign material, and calcification of bronchial cartilage (2). The most common etiology of broncholithiasis is mycobacterial granulomatous lymphadenitis (6). Chemical compositions of broncholiths are calcium phosphate and calcium carbonate. Nonaka and colleagues reported that the broncholith caused by a calcified lymph node consisted of calcium phosphate, whereas the broncholith caused by calcification of bronchial mucus consisted of calcium carbonate (7). In our patient, the bronchial lavage fluid was free of bacteria, malignant cells, and fungi. The broncholith consisted of more than 98% calcium carbonate, suggesting that its origin consisted of bronchial mucus due to bronchial stenosis with inflammation.

When compared to the morbidity and mortality of surgical interventions, bronchoscopic management appears favorable in patients with loose or partly eroded broncholiths (7). The indications for bronchoscopic broncholith removal include: (a) a small broncholith; (b) migration of the calcified nodule and no bronchiectasis distal to the broncholith on chest X-ray; (c) a free broncholith in the tracheobronchial tree bronchoscopically; and (d) partly eroded and mild inflammation around the broncholith (8).

Bronchoscopy is a relatively sensitive technique for the detection of broncholiths. Several authors have argued that broncholiths may be visualized directly approximately 28 to 44% during bronchoscopic procedures (8-10). The failure of bronchoscopy to identify some broncholiths is due to bronchial occlusion by a postinflammatory granulation tissue (11). Arrigoni and colleagues reported that the frequency of obstruction proximal to a broncholith was 23.3% among 223 patients with broncholiths (8). Shinkai and colleagues reported that bronchoscopic air injection could be effective for dilating the bronchus for detailed observation (12). However, the dilation of the bronchus was insufficient and transient by bronchoscopic air injection. In this case, we could observe the broncholith by repeated injections of saline solution at the bronchial obstruction site. Furthermore, we confirmed the mobility of the broncholith using this method.

When injecting saline solution during bronchoscopy, the bronchoscopist should ensure that the distal end of the bronchoscope is placed in a wedge position in a segmental or subsegmental bronchus to avoid leakage of saline solution. In our case, the saline solution was rapidly injected into the bronchus through the working channel of the bronchoscope. One mL of saline solution was repeatedly injected (up to 20 mL) using a 10 mL syringe.

Furthermore, when attempting a bronchoscopic extraction, the bronchoscopist should be aware of infection and prevent the spread of infection. Infection control, such as antibiotic usage, is necessary to control for secondary infections due to broncholiths. In this case, there were no inflammatory responses and broncholithectomy was performed safely.

We conclude that saline solution injected bronchoscopically was safe and effective for confirming the mobility of the broncholith as bronchoscopy alone could not detect the broncholiths due to bronchial occlusion.

The authors state that they have no Conflict of Interest (COI).

References

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