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CASE REPORT

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Detection of a pinhole-sized bronchoesophageal fistula under bronchoscopic autofluorescence imaging

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Abstract

Autofluorescence imaging (AFI) is a technique for detecting early-stage lung cancer by amplifying the difference in autofluorescence of the bronchial mucosa. However, there are few reports detailing its other applications. Here, we report the case of a 54-year-old woman with stage IVa esophageal cancer who completed chemoradiation therapy, but developed a bronchoesophageal fistula at the left main bronchus and underwent fasting treatment. Computed tomography confirmed that the fistula had closed; however, she subsequently developed aspiration pneumonia and underwent bronchoscopy for confirmation. Although it was difficult to identify the site of the pinhole bronchoesophageal fistula under white light, AFI could easily identify the fistula and digestive mucus in light magenta. AFI may therefore be worth considering for the detection of pinhole bronchoesophageal fistulas.

KEYWORDS

autofluorescence imaging, bronchoesophageal fistula

INTRODUCTION

Normal bronchial mucosa emits faint autofluorescence and is attenuated in cancerous tissue.[1,2] With autofluorescence imaging (AFI), lung cancer can be detected at an early stage by amplifying the weak fluorescence with a charged coupled device (CCD) camera.[3] When viewed under AFI, the normal airway epithelium is visualized in green, and in precancerous lesions and early lung cancer sites, it appears blackish red or pink. The sensitivity of locating small lesions using AFI is about two times that of a normal bronchoscope in different clinical and research settings.[4–8] While AFI is useful in detecting early-stage lung cancer, there are few reports of its other uses.[9–11] Here, we report a case where a pinhole-sized bronchoesophageal fistula could be easily detected using AFI.

CASE REPORT

A 54-year-old woman was referred to our hospital complaining of chest pain, cough and difficulty swallowing. She had previously been diagnosed with squamous cell carcinoma of the middle-lower esophagus (cT4bN0M0, stage IVa). A bronchoscopy performed prior to treatment revealed redness and swelling of the left main bronchus due to the direct invasion of the primary esophageal cancer (Figure 1a,b). She was treated with 5-fluorouracil plus cisplatin with a total of 60 Gy irradiation, which resulted in complete response. However, at the end of her treatment, a cough and a slight fever appeared, and chest computed tomography (CT) revealed a bronchoesophageal fistula (Figure 1a) with left lower lobe pneumonia. After abstaining from food, she was administered central parenteral nutrition management for one month. After treatment, chest CT confirmed that the bronchoesophageal fistula had closed (Figure 1b). However, CT image detected pneumonia at the lower left lobe and she underwent a secondary bronchoscopic examination to confirm the healing process at the left main bronchus.

Compared with the luminal findings before treatment, the left main bronchus displayed a near normal bronchial epithelium, but the longitudinal folds of the membrane had

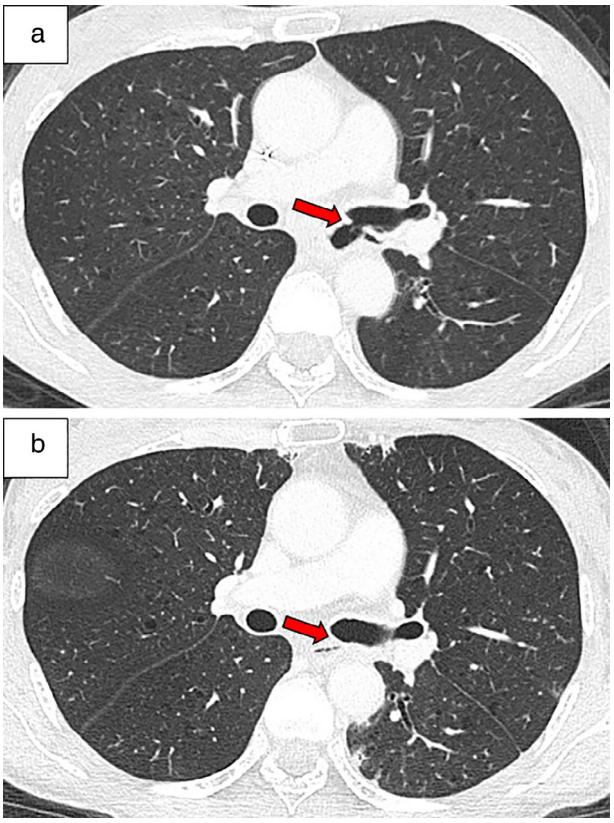

FIGURE 1 (a) Bronchoesophageal fistula developed after chemoradiation therapy (red arrow). (b) Three months later, chest computed tomography (CT) showed the bronchoesophageal fistula had closed (red arrow)

disappeared. At first glance, the fistula appeared to be completely closed under white light observation. However, closer observation revealed a slight epithelial defect on the dorsal side in front of the bifurcation of the left upper and lower lobes, leaving a pinhole-shaped fistula (Figure 2c,e). Observation under AFI (BF TYPE F260 Olympus) revealed that the fistula and leaked gastrointestinal mucus were highlighted in light magenta, which contrasted with the normal tissue in green (Figure 2d,f). Using AFI, the site of the fistula was easily identified. Furthermore, AFI was found to estimate the volume and distribution of the leaked gastrointestinal mucus. In the subsequent clinical course, since the bronchoesophageal fistula had not completely closed, thoracoscopic laparotomy bypass surgery using the Postelweit Y-shaped gastric tube technique was performed. Her esophageal cancer remains in remission with chemoradiotherapy.

DISCUSSION

AFI has been introduced for the purpose of detecting endoscopic early-stage lung cancer since it can detect bronchial mucosal lesions that are difficult to locate by bronchoscope under ordinary white light alone.[1,2] On the other hand, the attenuation of autofluorescence can occur due to a thickening of the bronchial mucosal tissue, sputum or bleeding.[8,12]

In this case, the presence of an esophagobronchial fistula was unknown prior to chest CT. A pinhole-sized fistula was located by careful observation at the left main bronchus, but it was difficult to detect under white light alone. However, AFI

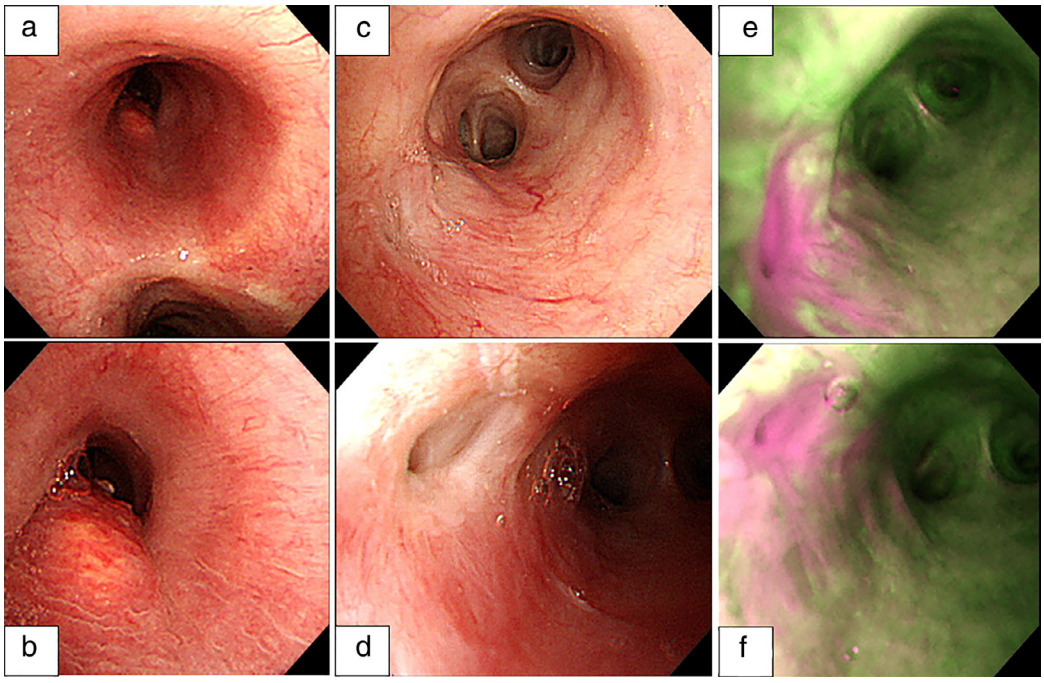

FIGURE 2 (a) Esophageal cancer invasion at the left main bronchus before chemoradiation treatment. (b) Close-up view of the left main bronchus. (c) A pinhole-sized bronchoesophageal fistula was present in the left main bronchus membrane (white arrow), but was difficult to distinguish under white light. (d) When the same site was observed under autofluorescence imaging (AFI), the fistula was visualized in light magenta. (e) Close-up view of bronchoesophageal fistula with white light. (f) Close-up view of the bronchoesophageal fistula with AFI

was able to highlight the fistula and leaked gastrointestinal mucus in light magenta against the green excitation light of the normal bronchial epithelium. We assumed that this phenomenon might be caused by two mechanisms. First, the thickening of the mucosa in the process of repairing the mucous membrane could let the autofluorescence attenuate as magenta.[11] Secondly, due to gastrointestinal mucus, the bronchial epithelium autofluorescence might have changed so that the bronchial wall autofluorescence attenuated where sputum was stored.[13,14] Considering the distribution of magenta, we believe that the latter factor is more likely in this case.

Since the range of gastrointestinal mucus leakage was easily confirmed by the magenta excitation light, it can be useful for identifying the sagging bronchus and estimating its association with peripheral aspiration pneumonia. In addition, AFI might be able to more clearly visualize changes in the fistula diameter over time. Thus, using AFI in patients with suspected tracheoesophageal fistulas can be particularly useful in identifying smaller pinhole-sized fistula sites. On the other hand, since it is always necessary to discriminate from artifacts such as the normal thickening of bronchial epithelium, sputum or bleeding, it is important to alternately compare autofluorescence images to white light images.[8,12] However, further studies are needed to confirm the effectiveness of AFI in patients with small bronchoesophageal fistulas.

In conclusion, we report on the successful application of AFI as a tool for the detection of a pinhole-sized bronchoesophageal fistula. Although AFI was not intended for this use, we believe it may be worth considering when smaller fistulas are suspected and cannot be identified by normal bronchoscopy alone.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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