Tracheobronchitis in Patients with Diffuse Wall Thickening: Three Case Reports

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Abstract

We herein report the cases of three patients with chest symptoms or fever and diffuse wall thickening of the trachea and main bronchi on chest CT. They were diagnosed with various causes of inflammations of the trachea and main bronchi using bronchial or tracheal biopsy specimens and flexible bronchoscopy.

INTRODUCTION

Chest tightness, cough and fever are common symptoms of many diseases. Many patients with these chief complaints are examined in medical facilities, and although bronchitis, bronchial asthma, cough-variant asthma, or reflux esophagitis is often diagnosed, a lack of diagnosis is common. We suggest that these patients often have inflammation of the trachea and main bronchi.

Chest computed tomography (CT) is very useful in the detection of chest diseases in patients presenting with chest symptoms or fever. Central airway abnormalities such as wall thickening are also easy to detect by chest CT [1,2]. Characteristic central airway wall thickening is typically observed in central airway amyloidosis, relapsing polychondritis, granulomatosis with polyangiitis, and adenoid cystic carcinoma, among other diseases [1,2].

Here, we present three patients with cough, chest tightness or fever exhibiting inflammation of the trachea and main bronchi with diffuse wall thickening and without abnormalities in other organs. The patients were diagnosed with the aid of chest CT and bronchoscopy.

CASE PRESENTATIONS

CASE 1

A 58-year-old Japanese man with a previous history of hypopharyngeal cancer visited Toyama Prefectural Central Hospital due to cough and chest tightness aggravated over four months. The patient was a current smoker and worked as a cook. No problems were noted upon auscultation. Blood test results showed an eosinophil count of 53 cells/μL, a C-reactive protein level of 10.09 mg/dL (normal range: 0 – 0.14), and an immunoglobulin G4 (IgG4) concentration of 131 mg/dL (normal range: 5 – 117) (Table 1). Chest CT revealed moderate diffuse wall thickening of the trachea and main bronchi (Figure 1A). Flexible bronchoscopy detected an imbricate, oedematous tracheal and bronchial wall (Figure 1B). Bronchial biopsy specimens indicated airway inflammation with moderate eosinophilic and mild plasmacytic infiltration (Figure 1C, Supplement 1).

Prednisolone 0.5 mg/kg/day was administered; the patient's symptoms improved promptly, and the airway wall thickness exhibited a gradual reduction on chest CT after four months of treatment. The prednisolone

dose was gradually reduced and stopped after one year of treatment.

CASE 2

A 46-year-old Japanese man visited Toyama Prefectural Central Hospital due to a cough that had persisted for one month. He was a current smoker. No problems were noted upon auscultation. Blood test results showed a C-reactive protein level of 6.58 mg/dL and an IgG4 concentration of 191 mg/dL (Table 2). Diffuse wall thickening of the trachea and main bronchi was observed on chest CT (Figure 2A), and flexible bronchoscopy showed an oedematous tracheal and bronchial wall (Figure 2B). Airway inflammation with mild plasmacytic infiltration was detected based on bronchial biopsy specimens (Figure 2C, Supplement 2). Most immunoglobulin G-positive plasmacytes were positive for IgG4, and the IgG4/CD138 ratio was 0.56.

After five days, the patient developed severe cryptogenic haemoptysis. We treated him with methylprednisolone 1 g for three days, after which prednisolone 0.5 mg/kg/day was administered. The patient's symptoms disappeared promptly, and the airway wall thickness exhibited a gradual reduction on chest CT. The prednisolone dose was gradually reduced to 10 mg/day and was continued as a maintenance therapy to control his symptoms and inflammation.

CASE 3

A 76-year-old Japanese man with a history of bronchial asthma and chronic obstructive pulmonary disease for two years visited Toyama Prefectural Central Hospital due to a cough and fever of approximately 38. No problems were noted upon auscultation. Blood test results showed an eosinophil count of 518 cells/μL, a C-reactive protein level of 4.75 mg/dL, an IgG4 concentration of 51 mg/dL, and normal levels of myeloperoxidase and proteinase 3-anti-neutrophil cytoplasmic antibodies (Table 3). Chest CT showed diffuse wall thickening of the trachea and main bronchi (Figure 3A), and flexible bronchoscopy revealed an oedematous tracheal and bronchial wall (Figure 3B). The bronchial biopsy specimens indicated tracheitis with palisading granuloma and multinucleated giant cells in the subepithelial area of the tracheal mucosa (Figure 3C, Supplement 3).

We treated the patient with prednisolone 0.5 mg/kg/day. His symptoms disappeared promptly, and the airway wall thickness exhibited a gradual reduction on chest CT. The prednisolone dose was gradually reduced for six months and then stopped.

DISCUSSION

These case reports demonstrate that patients with cough, chest tightness and fever may have inflammation of the trachea and main bronchi without abnormalities in other organs, which can constitute the pathogenesis of various clinical conditions. Previous reports have presented some cases of inflammation of the trachea and main bronchi with abnormalities in the lung and/or other organs, such as a case of IgG4-related disease [3-5] and a case of granulomatosis with polyangiitis [6,7]. However, there is no past report on inflammation localized to the trachea and main bronchi. We referred to this presentation as tracheobronchitis in the title because these three cases presented with lesions confined to the trachea and main bronchi.

In this series, CASE 1 showed eosinophilic and plasmacytic infiltration based on bronchial biopsy specimens, suggesting an allergic mechanism. For CASE 2, mild IgG4-positive plasmacytic infiltration based on bronchial biopsy specimens was observed, indicating possible localized IgG4-related disease. However, this is not definitive because IgG4-positive cells are also present in other diseases, such as vasculitis. CASE 3 exhibited palisading granuloma and multinucleated giant cells in the bronchial biopsy specimens, which led us to suspect a subtype of localized granulomatosis with polyangiitis. Although inflammation of the central airway was observed in all three cases, there is a distinct possibility that these three diagnoses had different underlying mechanisms.

Previously, it was not commonly considered that inflammation of the large airways would produce such diffuse wall thickening. However, in this report, we show that tracheobronchitis can cause various types of inflammation with wall thickening. It is suspected that tracheobronchitis is not a rare condition; however,

it is likely less noticeable. More attention should be paid to the wall of the trachea and main bronchi during the interpretation of chest CT findings in patients with chest symptoms or fever to fully understand their clinical condition. If thickening of the airway wall is detected, we should investigate the cause of thickening with bronchial or tracheal biopsy using flexible bronchoscopy. The pathological findings in the biopsy tissue can reveal large airway conditions in these patients and guide appropriate treatment strategies.

We hope that additional cases with similar findings are reported in the future to further our understanding of this clinical condition.

CONFLICT OF INTEREST

None declared.

ETHICAL APPROVAL

This report was approved by the ethics committee at the Toyama Prefectural Central Hospital, and informed consent was obtained.

AUTHOR CONTRIBUTIONS

HT: drafted the manuscript and provided patient care. AU, AA and SI: performed pathological investigations. YM, TT, AM, MS and NT: performed bronchoscopy. HA: created the computed tomography images.

REFERENCES

1. Marom EM, Goodman PC, McAdams HP. Diffuse abnormalities of the trachea and main bronchi. *AJR* 2001; 176: 713-717.
2. Stern EJ, Swensen SJ, Kanne JP. Large airways diseases. High-Resolution CT of the Chest. 3rd ed. Philadelphia/ USA: Lippincott Williams & Willkins; 2010: 30-68.
3. Hamano H, Kawa S, Horiuchi A, Hamano H, Kawa S, Horiuchi A, Unno H, Furuya N, Akamatsu T, Fukushima M, Nikaido N, Nakayama H, Usuda N, Kiyosawa K. High serum IgG4 concentrations in patients with sclerosing pan- creatitis. *New Engl J Med* 2001; 344: 732-738.
4. Hayashi M, Okajima M, Shimizu T, Shimizu N, Morohashi K, Toyama J, Mori K. A case of IgG4-related disease with marked thickening of the bronchial wall. *Annals of the Japanese Respiratory Society*2011; 49: 936-941.
5. Ito M, Yasuo M, Yamamoto H, Tsushima K, Tanabe T, Yokoyama T, Hamano H, Kawa S, Uehara T, Honda T, Kawakami S, Kubo K. Central airway stenosis in a patient with autoimmune pancreatitis. *Eur Respir J* 2009; 33: 680-683.
6. Daum TE, Specks U, Colby TV, Edell ES, Brutinel MW, Prakash UB, DeRemee RA. Tracheobronchial Involvement in Wegener's Granulomatosis.*Am J Respir Crit Care Med* 1995; 151: 522-526.
7. Allen AR, Moen CW. Wegener's granulomatosis. Case report and evaluation of the diagnostic techniques used in disease of the chest. J Thorac Cardiovasc Surg 1965; 49: 388.

FIGURES

Figure 1. CASE 1: (A) Chest-enhanced computed tomography revealed thickening of the tracheal wall (A1) and the main bronchi (A2) (arrow). (B) Flexible bronchoscopy showed an imbricate, oedematous tracheal wall. (C) Bronchial biopsy specimens indicated bronchitis with moderate eosinophilic (white arrow) and mild plasmacytic (black arrow) infiltration. (haematoxylin and eosin stain)

Figure 2. CASE 2: (A) Chest plain computed tomography revealed thickening of the tracheal wall (A1) and the main bronchi (A2) (arrow). (B) Flexible bronchoscopy showed an oedematous tracheal wall. (C) Bronchial biopsy specimens indicated bronchitis with mild plasmacytic infiltration (arrow). (haematoxylin and eosin stain)

Figure 3. CASE 3: (A) Chest plain computed tomography revealed thickening of the tracheal wall (A1) and the main bronchi (A2) (arrow). (B) Flexible bronchoscopy showed an oedematous tracheal wall. (C) Bronchial biopsy specimens indicated a palisading granuloma. (haematoxylin and eosin stain)