

# Pulmonary *Mycobacterium kansasii* Disease with Solitary Nodule

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## Abstract

We recently encountered two patients with pulmonary *Mycobacterium kansasii* disease showing a solitary nodule. The patients were 53 and 66 years old and both were male. One patient had underlying diseases. The diagnosis was based on the clinical symptom in one patient and an abnormal chest shadow in the other. The final diagnosis was obtained by bronchoscopy and CT-guided lung biopsy. Antituberculous drugs were administered to one patient. We emphasize the importance of the positive identification of causative microorganisms in patients who present with a solitary nodule including surgical methods to differentiate the infection from lung cancer.

## Keywords

Pulmonary *Mycobacterium kansasii* Disease, Lung Cancer

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## 1. Introduction

*Mycobacterium kansasii* (*M. kansasii*) was reported to be the third most common pulmonary nontuberculous mycobacterial (NTM) disease-causing pathogen in Japan following *M. avium* and *M. intracellulare* (MAC) [1]. Regarding the clinical characteristics of patients with pulmonary *M. kansasii* disease, it has been reported that most patients are male with underlying respiratory diseases and that radiological findings are similar to those of pulmonary tuberculosis with a thin-walled cavity [2].

We previously reported the first case of pulmonary *M. kansasii* disease involving a solitary nodule [3]. We recently encountered another two patients with pulmonary *M. kansasii* disease showing a solitary nodule. Because numbers of patients with pulmonary *M. kansasii* disease showing a solitary nodule have increased, including other NTM diseases, in Japan, we report the clinical findings

of these two patients including one patient previously described [3]. Both patients satisfied the diagnostic criteria for pulmonary NTM disease proposed by the American Thoracic Society (ATS) [4].

## 2. Case

**Case 1:** A 53-year-old man with no past history visited the Department of Collagen Disease Medicine in our hospital complaining of low-grade fever and general fatigue. He had been referred because of an abnormal chest shadow on chest CT. He had a smoking history of 20 cigarettes per day for 20 years.

There were no abnormal physical findings excluding the body temperature (37.8°C). The laboratory findings showed an inflammatory response (CRP: 5.04 mg/dL) without leukocytosis and mild hypoalbuminemia (Albumin: 3.6 g/dL). TST was weakly positive and QFT-GIT showed a negative response.

A chest radiograph showed a nodular shadow in the right middle lung field. Chest CT revealed a solitary nodule (20 × 15 mm) with spicula and no cavity in the right upper lobe (S<sup>3</sup>) and mediastinal lymphadenopathy (#4R: 30 × 20 mm) (**Figure 1(a)** and **Figure 1(b)**). We performed bronchoscopic examinations such as bronchoalveolar lavage fluid (BALF), brushing, and transbronchial lung biopsy (TBLB) for a solitary nodule in the right upper lobe and endobronchial ultrasound transbronchial needle aspiration (EBUS-TBNA) for mediastinal lymphadenopathy. Subsequently, smear tests of acid-fast bacilli of both the BALF specimen for the solitary nodule and aspiration specimen for mediastinal lymphadenopathy were positive and culture tests for both specimens were also positive. The final diagnosis based on the DNA-DNA hybridization (DDH) test was *M. kansasii* disease of the lung and mediastinal lymph node.

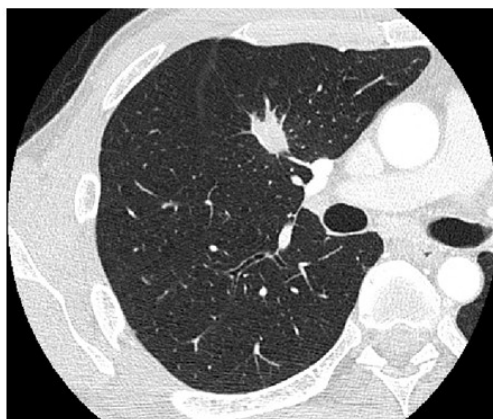
Concerning the treatment, since antituberculous drugs using isoniazid (INH), rifampicin (RFP), and ethambutol (EB) were administered after the definite diagnosis, the clinical symptoms and solitary nodule including mediastinal lymphadenopathy were improved.

**Case 2:** A 66-year-old man with a past history of cerebral infarction and a dissecting aneurysm was admitted to our gastrointestinal surgical department to undergo surgery for colon cancer (T3N0M0, Stage II). He had a smoking history of 10 cigarettes per day for 40 years. Although there were no clinical respiratory symptoms, we detected a tumor shadow in the left lower lobe (3 cm) on preoperative examination. He was introduced to our department after the operation for colon cancer.

There were no abnormal physical findings excluding mild anemia. The laboratory findings showed a mild inflammatory response (CRP: 1.34 mg/dL) without leukocytosis, mild anemia (Hemoglobin: 10.3 g/dL), and a hyponutritional condition (Alb: 2.9 g/dL, Total protein: 5.9 g/dL, ChE 193 IU/L). However, there were no abnormal findings regarding fungus serological examination results or tumor markers. QFT-GIT showed a negative response.

Chest CT showed a solitary nodule (30 × 25 mm) with calcification and no cavity in the left lower lobe (**Figure 2**). We performed CT-guided lung biopsy to

distinguish metastatic lung cancer from colon cancer. Subsequently, the histological diagnosis was epitheloid granuloma with Langhans giant cells and a culture test of acid-fast bacilli of tissue was positive (10 colonies, 2 weeks). The final diagnosis based on the DNA-DNA hybridization (DDH) test was pulmonary *M. kansasii* disease.

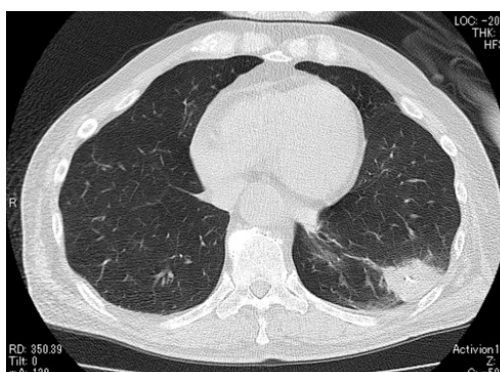


(a)



(b)

**Figure 1.** (a) Chest CT on the initial visit to the Department of Collagen Diseases Medicine showed a solitary nodule (20 × 15 mm) with spicula and no cavity in the right upper lobe (S<sup>3</sup>) (Case 2). (b) Chest CT on the initial visit to the Department of Collagen Diseases Medicine showed mediastinal lymphadenopathy (#4R: 30 × 20 mm) (Case 2).



**Figure 2.** Chest CT on introduction to our department showed a solitary nodule (30 × 25 mm) with calcification and no cavity in the left lower lobe (Case 3).

Concerning the treatment, we were going to administer antituberculous drugs after the definite diagnosis. However, the solitary nodule gradually improved without medication after six months. Therefore, we did not perform antituberculous treatment, and no relapse has since been noted.

We present the clinical characteristics of the two present patients with pulmonary *M. kansasii* disease showing a solitary nodule and two previously reported patients [3] [5] in **Table 1**. The average age of the four patients was 59 years old and all were male. Two of the four patients had underlying diseases, and clinical respiratory symptoms were recognized in two. The final diagnosis was obtained by invasive diagnostic methods of bronchoscopy, CT-guided or open lung biopsy, and surgical resection.

### 3. Discussion

The radiological findings of pulmonary *M. kansasii* disease using chest CT have been changing. Takahashi *et al.* described the main abnormalities with cavities in the upper lobe (83%), and small centrilobular nodules were also observed in the majority of patients. The incidences of bronchiectasis and consolidation were low [6]. On the other hand, non-cavitary lung disease has also been recognized as the part of the spectrum of pulmonary *M. kansasii* disease. We encountered three patients with solitary pulmonary nodules due to *M. kansasii* in our hospital. The most common benign granuloma was previously reported as pulmonary tuberculoma. Although pulmonary tuberculoma is pathologically diagnosed in most cases, bacteriological confirmation is not always performed [7]. Therefore, there was no distinction between pulmonary tuberculoma and pulmonary NTM disease in previously published reports [8]. It is possible that cases of a solitary pulmonary nodule due to NTM infection have been included among those with pulmonary tuberculoma.

**Table 1.** Clinical characteristics of four patients with pulmonary *M. kansasii* disease showing solitary nodules including one case previously reported [3] [5].

Case	Age-Sex	Past history	Detecting method	TST (mm)	QFT	Microbiological exa. Smear, Culture (Clinical specimen)	Portion	Padiological findings Size (mm)	Cavity	Diagnostic method
1 <sup>[5]</sup>	71, M	Pulmonary tuberculosis Parkinson syndrome	Fever	0 × 0/8 × 9	N.D.	(-)(+) (3weeks) (Pus)	Left S <sup>8</sup>	15 × 15	(-)	Open lung bio psy
2 <sup>[3]</sup>	46, M	(-)	Health examination	0 × 0/0 × 0	(-)	(+)(-) (4 weeks) (Tissue)	Left S <sup>1+2</sup>	35 × 20	(-)	VATS
3	53, M	(-)	Fever Generall fatigue	0 × 0/10 × 10	(-)	(+)(+) (3 weeks) (BALF)	Rigth S <sup>3</sup>	20 × 15	(-)	Bronchoscopy
4	66, M	Cerebral infarction Dissecting aneurysm Prostatic hypertrophy	Follow-up of other disease	N.D.	(-)	(-)(+) (1 weeks) (Tissue)	Left S <sup>9</sup>	30 × 25	(-)	CT-guided lung biopsy

TST: Tuberculin skin test, QFT: Quantiferon, N.D.: Not done, VATS: Video-assisted thorascopic surgery.

Concerning reports on solitary pulmonary nodules due to NTM infection, Gribetz *et al.* initially described 20 cases in 1982 [9]. Twelve of these 20 cases involved pulmonary infection due to MAC, with no cases due to *M. kansasii*. Although Hahm *et al.* and Yonemori *et al.* reported solitary pulmonary nodules due to NTM infection (16 and 24 cases, respectively), there were also no cases due to *M. kansasii* [10] [11]. There were only two cases of a solitary pulmonary nodule due to *M. kansasii* diagnosed microbiologically in tissue resected by thoracotomy, as reported by Kurasawa *et al.* and Abe *et al.*, as far as we investigated [3] [5]. The differential diagnoses with a solitary pulmonary nodule on chest CT were as follows: primary or metastatic lung cancer, benign tumor, and inflammatory granuloma such as tuberculoma. However, it is difficult to establish a correct diagnosis for small solitary pulmonary nodules. Because there was a clear margin and no calcification or satellite lesion in the two present patients, we could not deny the possibility of lung cancer and had to perform invasive diagnostic methods such as CT-guided, or bronchoscopic lung biopsy. In addition, although FDG-PET was not performed for the two recently enrolled patients, one patient previously described by Abe *et al.* [3] showed high FDG uptake on FDG-PET imaging. FDG-PET can demonstrate glucose metabolism regardless of a benign or malignant lesion. Therefore, granulomatous lesions of solitary nodules due to mycobacterial disease indicating an active state frequently show positive results. Mediastinal lymphadenopathy was observed in one of the four cases, and this is a rare finding in patients with pulmonary *M. kansasii* disease. Takahashi *et al.* also reported that there were few cases of pulmonary *M. kansasii* disease with mediastinal lymphadenopathy [6]. Finally, EBUS was useful to obtain a correct diagnosis of mediastinal lymphadenopathy in Case 1.

Regarding the treatment of patients with a solitary pulmonary nodule due to *M. kansasii* infection, there is no evidence regarding whether antituberculous drugs such as INH, RFP, and EB should be administered after surgical resection of a solitary pulmonary nodule. Although we performed antituberculous treatment for only one patient diagnosed by TBLB (Case 1) for 12 months after the definite diagnosis, we did not perform antituberculous treatment for the other patient. We consider that we have to continue to monitor these patients for relapse in the future.

#### 4. Conclusion

Lung cancer was initially suspected when a solitary pulmonary nodule without a cavity was detected on chest CT. However, pulmonary NTM disease due to *M. kansasii* must be considered as a differential diagnosis of a solitary pulmonary nodule. Because the treatment methods differ based on the microorganisms causing solitary pulmonary nodules, it is important to obtain appropriate clinical specimens and identify causative microorganisms by acid-fast culture examination of the clinical specimens when granulomatous tissue is detected.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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