



## Solitary pulmonary nodule caused by pulmonary *Mycobacterium lentiflavum* infection

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### ABSTRACT

An 82-year-old Japanese man who previously had descending colon cancer and underwent partial resection showed a growing solitary pulmonary nodule, suspected as lung cancer, on follow-up computed tomography. Thoracoscopic partial lobectomy was therefore performed. The surgical specimen showed granulomatous lesions with necrosis. Mass spectrometry was performed on the sputum specimen collected after surgery, which identified *Mycobacterium lentiflavum* infection. Antibiotics were not prescribed following surgery, and the patient has not experienced recurrence 2 years since the surgery. To our knowledge, this is the second case of solitary pulmonary nodule and the first case of *M. lentiflavum* infection treated via surgical resection.

### 1. Introduction

*Mycobacterium lentiflavum* is a late-growing nontuberculous mycobacterium that belongs to Runyon group II, and it was first identified by Springer et al., in 1996 [1]. Although studies on lung infection due to *M. lentiflavum* are limited, there are several recorded cases of isolated cervical lymph nodes and skin infections among children with *M. lentiflavum* infection [2,3]. *M. lentiflavum* cannot be detected by the conventional DNA–DNA hybridization method. Previously, genetic examination, such as 16S ribosomal RNA gene identification, was used to diagnose *M. lentiflavum* infection [4]. However, mass spectrometry, which is used nowadays, can easily identify *M. lentiflavum* with high accuracy and specificity. Therefore, the diagnostic rate of *M. lentiflavum* infection has been increasing. In our institution, there were three cases of *M. lentiflavum* infection from 2015 to 2020. The imaging findings were nodular bronchiectatic pattern in two cases and solitary nodule pattern in one case. As per a previous report, *M. lentiflavum* lung infection is typically characterized by nodular bronchiectatic or fibrocavitary pattern [5]. In this report, we present a case of pulmonary *M. lentiflavum* infection that presented as a solitary nodule resembling lung cancer.

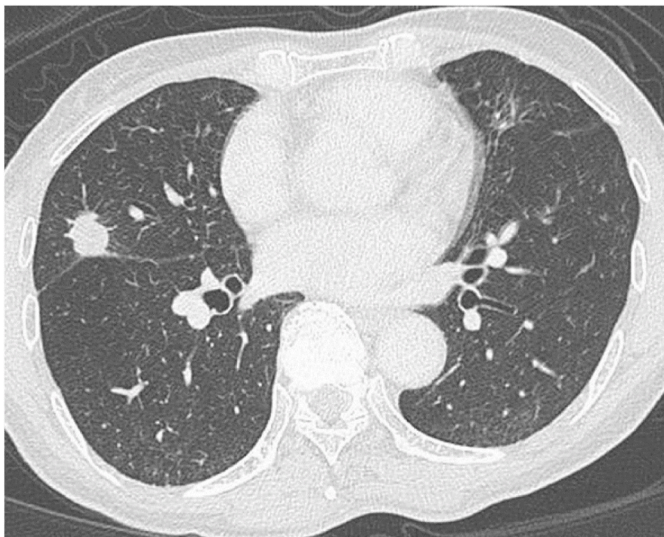
### 2. Case presentation

An 82-year-old Japanese man who previously presented with descending colon cancer was treated via partial resection. He was referred to our hospital because of an abnormal shadow on chest radiography during a general medical checkup. He had no smoking history or risk of diseases associated with immunosuppression, including diabetes mellitus and human immunodeficiency virus infection. Moreover, he did not have low serum immunoglobulin levels. Chest computed tomography revealed a nodular shadow in the middle lobe of the right lung (Fig. 1).

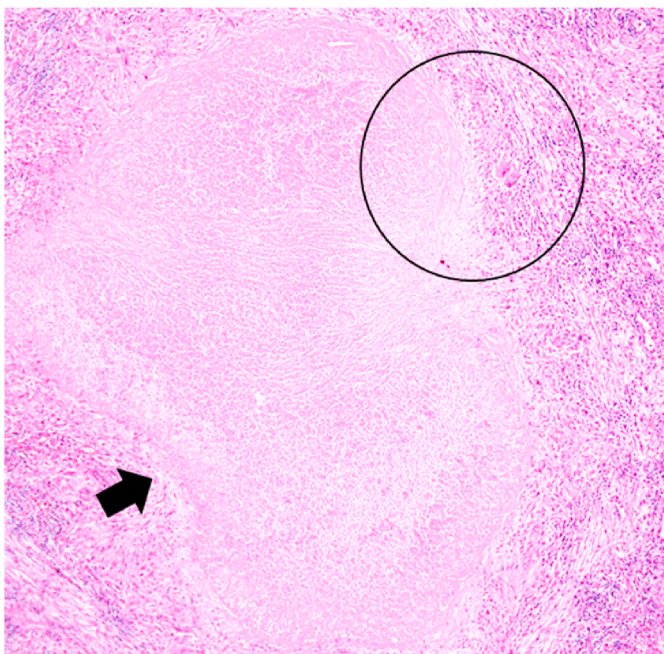
A radiological examination was performed after 3 months. Because the nodule size increased, lung cancer was suspected. Bronchoscopy was proposed; however, the patient requested surgery. The patient was subsequently admitted to our hospital for lung surgery, which was a diagnostic procedure. Thoracoscopic partial lobectomy was performed on the second day of hospitalization, and rapid intraoperative pathological examination revealed a granulomatous lesion with caseous necrosis (Fig. 2).

Acid-fast bacillus staining showed negative results. We performed *M. tuberculosis* and *M. avium* complex (MAC) polymerase chain reaction using resected samples in addition to the T-SPOT.TB test. However, the results were negative. The patient was discharged from the hospital, and

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**Fig. 1.** Chest computed tomography image showing a 2-cm solitary nodule along the major fissure in the middle lobe of the right lung (S4).



**Fig. 2.** Histological findings. The solitary nodule had several granulomas with caseous necrosis (arrow) surrounded by epithelioid cells; multinucleated giant cell infiltration (circle) was also observed (hematoxylin and eosin stain).

we decided to wait for the culture examination result. The acid-fast bacillus liquid culture of the specimen showed negative results. However, culture performed using sputum samples collected after surgery showed positive results after 5 weeks. Nevertheless, the DNA–DNA hybridization method could not identify the mycobacterial strain. Hence, mass spectrometry was performed, and results showed the presence of *M. lentiflavum*. Based on the histological findings and the sputum culture results that met the American Thoracic Society and the Infectious Diseases Society of America criteria, the patient was diagnosed with pulmonary *M. lentiflavum* infection. During the postoperative follow-up, the patient did not present with symptoms and chest radiography showed no specific findings. Therefore, antibiotics were not prescribed following surgery, and the patient did not present with recurrence 2 years since the surgery.

### 3. Discussion

We presented the case of an 82-year-old Japanese man who previously had descending colon cancer and underwent partial resection. Chest radiography revealed a nodular shadow. Hence, he was initially diagnosed with lung cancer and treated via lobectomy. However, pathological examination revealed granulomatous lesions with caseous necrosis. The patient was then finally diagnosed with pulmonary *M. lentiflavum* infection.

To the best of our knowledge, only one case of solitary nodule has been reported previously [6]. Therefore, this is only the second case. Yagi et al. reported 16 cases of *M. lentiflavum* infections [5]. In most cases, the imaging findings were either nodular bronchiectatic or fibrocavitary pattern. Approximately 5% of cases involve solitary nodules due to nontuberculous mycobacteriosis, which must be differentiated from lung cancer. In addition, most cases are associated with MAC [7,8]. Similar to MAC, *M. lentiflavum* is correlated with solitary nodules in some cases and should be considered a possible causative agent of solitary pulmonary nodule due to nontuberculous mycobacteriosis.

This is the first case of *M. lentiflavum* treated via surgery. If the number of nodules increases, the condition should be distinguished from pulmonary tuberculoma and lung cancer. However, as in the present case, solitary nodules without cavities, calcifications, scatter shadows, and bronchiectasis, which are characteristics of acid-fast bacillus infection, are difficult to identify via imaging alone. Generally, a minimally invasive biopsy, such as bronchoscopy or CT-guided transthoracic needle biopsy (TNB), is performed for diagnosis. TNB is optimal when the nodule is 2 cm in size and located on the periphery of the lung, as observed in this case. However, the diagnostic rate of tuberculoma via bronchoscopy is as low as 45.9% [9] and has also been reported to have reached 37.5%, despite using bronchoscopy and TNB together for diagnosis [10]. In the present case, surgery was performed because the patient requested the same and because of the high possibility of malignancy based on the colon cancer history. Surgery may be an effective diagnostic method when the nodule is in a location where biopsy is technically difficult, when the probability of malignancy is high, or when the biopsy cannot provide a diagnosis.

As with other rare nontuberculous mycobacterium infections, pulmonary *M. lentiflavum* infection has no established treatment [11]. Moreover, cases with a fatal course have not been reported, and the importance of treating these lung lesions is unknown. Rifampicin, isoniazid, and ethambutol are recommended for treating *M. szulgai* infection, whereas rifampicin, ethambutol, and clarithromycin are recommended for treating *M. gordonae* infection. These bacteria belong to the same group as *M. lentiflavum* based on the Runyon classification [12]. Therefore, similar treatments may be useful. A previous report that summarized 16 cases found no exacerbations in any of the cases. A total of 62.5% of these patients were treated with anti-mycobacterial combination therapy, whereas 37.5% of them did not receive treatment and were followed up [5]. Similarly, in the present case, observation or combination chemotherapy would have been sufficient for the patient's management if the patient was diagnosed based on a biopsy. By contrast, as in the present case, the need for postoperative chemotherapy in nontuberculous mycobacteriosis mainly caused by MAC, with the resection of solitary nodules because of suspected lung cancer, has not been determined. In addition, Gribetz et al. showed that chemotherapy after a complete resection of solitary lesions was ineffective and unnecessary [8]. Moreover, in the present case, recurrence was not observed even though the patient was not treated with postoperative chemotherapy. Therefore, surgery may provide a complete cure for solitary nodular mycobacterium infection. However, data regarding the use of such a treatment are limited. Hence, more studies regarding the efficacy of this therapy are needed in the future.

#### 4. Conclusion

We presented a case of solitary pulmonary nodule due to *M. lentiflavum* infection. Similar to MAC, *M. lentiflavum* causes solitary nodules in certain patients. Hence, it should be considered a possible causative agent of solitary pulmonary nodules. Surgical resection may be an effective diagnostic method for localized pulmonary lesions associated with *M. lentiflavum* when the lesion is in a location where biopsy is technically difficult, when the possibility of malignancy cannot be ruled out, or when the biopsy cannot provide a diagnosis.

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#### Declaration of competing interest

None.

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