

## *Nocardia*로 인한 중증 패혈증 및 농흉

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### Severe Sepsis and Empyema Caused by *Nocardia*

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Pulmonary nocardiosis is a rare opportunistic infection that commonly affects immunocompromised hosts, such as patients with organ transplants, acquired immunodeficiency syndrome, or prolonged immunosuppression. Recently, we encountered a case of pulmonary nocardiosis with empyema that progressed to severe sepsis. The patient was treated in the intensive care unit. Thereafter, medical thoracoscopy was performed to improve drainage of the pleural fluid. *Nocardia* was identified in the culture of the pleural fluid. (Korean J Med 2018;93:296-299)

**Keywords:** Pulmonary nocardiosis; Sepsis; Thoracoscopy

#### INTRODUCTION

Nocardiosis is an opportunistic infection that is more likely to affect immunocompromised patients, such as those with organ transplants, acquired immunodeficiency syndrome (AIDS), or prolonged immunosuppression. Although pulmonary nocardiosis is rare, reports show that it has a high mortality rate (approximately 41-64%) [1]. The diagnosis of nocardiosis is often delayed because it lacks a characteristic clinical presentation.

We present a recent case of severe sepsis and empyema asso-

ciated with pulmonary nocardiosis in a patient who was being treated with systemic corticosteroids for glomerulonephritis. After he was treated in the intensive care unit (ICU), a thoracoscopy was performed to improve drainage of his pleural cavity. *Nocardia* species was cultured from his pleural fluid. At the time of publication, we are not aware of any other reports of severe sepsis caused by pulmonary nocardiosis in our country.

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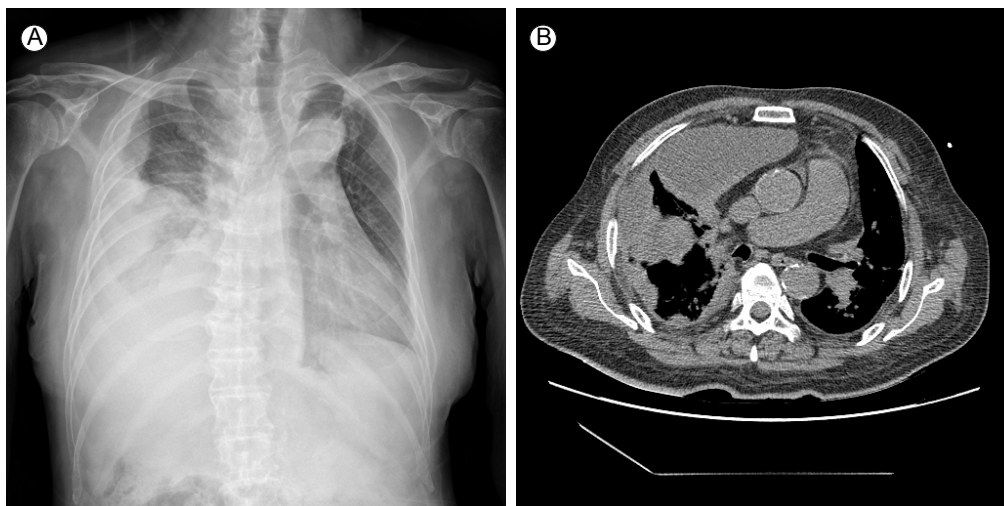
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**Figure 1.** Chest radiographs showed diffuse lung haziness with large right-sided pleural effusion (A). Computed tomography revealed loculated pleural effusion with diffuse pleural thickening in the right hemithorax and passive atelectasis in the lower and right middle lobes (B).

### CASE REPORT

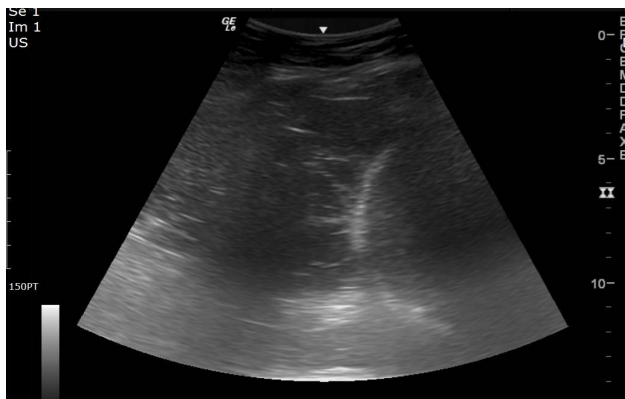
A 63-year-old man presented to the emergency department with a 2-week history of dyspnea, fever, and right flank pain. His medical history included diabetes, hypertension, liver cirrhosis induced by hepatitis B virus, a cerebral infarction, and chronic kidney disease due to focal segmental glomerulosclerosis (FSGS). His medications at the time included systemic steroid therapy (prednisolone 30 mg daily over a 4-month period) as treatment for FSGS.

On examination, his temperature was 35.8, blood pressure was 101/63 mmHg, and pulse was 106 beats per minute. On lung exam, he had decreased breath sounds on the right. Results from his laboratory tests were as follows: white blood cell count, 22,090 cells/mm<sup>3</sup> (segmented neutrophils: 84%); hemoglobin level, 8.8 g/dL; C-reactive protein level, 33.14 mg/dL; procalcitonin level, 24.88 mg/dL; blood urea nitrogen, 95 mg/dL; and serum creatinine, 4.07 mg/dL. A chest radiograph revealed diffuse lung haziness with a large right-sided pleural effusion (Fig. 1A). Computed tomography (CT) of the chest was also obtained (Fig. 1B). The CT showed a loculated pleural effusion with diffuse pleural thickening in the right hemithorax and passive atelectasis in the lower and right middle lobes, which was suggestive of a complicated effusion. Owing to suspicion of an empye-

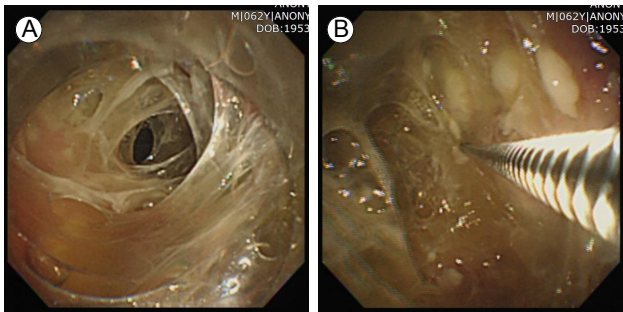
ma, his right pleural cavity was drained by percutaneous drainage and he was empirically treated with ampicillin-sulbactam. The cell count from the pleural fluid included a white blood cell count of 793/mm<sup>3</sup> with 60% polymorphonuclear leukocytes. The level of lactate dehydrogenase in his pleural fluid was 1,816 IU/L. Protein level in the pleural fluid and serum were 3.1 g/dL and 4.4 g/dL, respectively. The adenosine deaminase level was 63.4 IU/L. Gram staining of the pleural fluid showed no organisms.

After 5 hours of treatment, his condition rapidly deteriorated with hypotension (75/52 mmHg) and hypoxemic respiratory failure. He was intubated, supported with mechanical ventilation, and transferred to the ICU. An arterial blood gas test while on ventilator support showed a pH of 7.25, a partial pressure of oxygen of 48 mmHg, partial pressure of carbon dioxide of 102 mmHg, bicarbonate of 21.0 mmol/L, and an oxygen saturation of 97%. Continuous renal replacement therapy (CRRT) was initiated for a persistent metabolic acidosis with decreased urine output. We changed his antibiotics to piperacillin/tazobactam.

On the 4th hospital day, as hypoxemia and severe sepsis were improved, he was extubated and CRRT was stopped. We performed lung ultrasonography due to poor drainage of pleural fluid. On ultrasonography, multifocal loculated pleural effusion was shown (Fig. 2). On the 6th hospital day, a medical thoraco-



**Figure 2.** Lung ultrasonography showed multifocal loculated pleural effusion.



**Figure 3.** (A, B) On medical thoracoscopy, a very large adhesion with fibrous septation was found in the pleural cavity.

scopy was performed to evaluate and drain his loculated pleural effusion. After a trocar was inserted at his right anterior axillary line, a semi-rigid bronchoscope was used for evaluation of his pleural cavity, where a very large adhesion with a fibrous septation was found (Fig. 3). Each sac contained a turbid, pus-like fluid. We removed as much of the fibrous septation as possible and inserted a 24-Fr chest tube into the septation. Histology of the pleural specimen showed chronic active inflammation with abscess formation and necrosis. *Nocardia* species was cultured from his pleural fluid; therefore, his antibiotic was appropriately switched to sulfamethoxazole/trimethoprim.

His symptoms improved and the pleural effusion decreased, as evidenced by his follow-up chest radiograph. The patient was discharged with oral sulfamethoxazole/trimethoprim after a 14-day hospitalization.

## DISCUSSION

The patient was diagnosed with an empyema caused by *Nocardia* species that progressed to severe sepsis. Nocardiosis is rare, but has been described relatively often in immunocompromised hosts with transplants, AIDS, other autoimmune diseases, and those receiving prolonged corticosteroid therapy or chemotherapy [2]. The mortality rate of nocardiosis varies between 15-40% based on past review reports [1,3-5]. An increased rate of mortality is associated with old age, brain involvement, and disseminated disease [2].

Pulmonary nocardiosis is the most common presentation of a *Nocardia* infection and 30% of the cases manifests as disseminated disease [2,6]. Twenty-five percent of cases involve the pleura [7]. The predominant finding on a chest CT is a multifocal lung consolidation, but a solitary nodule or multiple lung nodules are also common findings [8]. In approximately one-third of the cases, cavitation occurs. Diagnosis is often delayed owing to the low incidence of the various presentations of pulmonary nocardiosis. Also, in the absence of radiologic findings that are suggestive of nocardiosis such as pulmonary nodules or consolidation, correct diagnosis is difficult without medical thoracoscopy.

In our patient, improvement occurred after treatment with sulfamethoxazole/trimethoprim. For the past 50 years, sulfamethoxazole/trimethoprim has been considered the antimicrobial of choice for nocardiosis [6]. However, the rate of resistance of *Nocardia* to sulfamethoxazole/trimethoprim is considerably high (10-43%) [3]. A retrospective study has reported that the rate of resistance to sulfamethoxazole/trimethoprim to be as high as 57.9% [4]. Therefore, an antimicrobial susceptibility test and individualized therapy are recommended.

We performed a medical thoracoscopy for examination and drainage of the septate pleural cavity. Medical thoracoscopy is a simple and safe diagnostic and therapeutic tool and had high accuracy for diagnosing pleural disease [9]. Several previous studies have shown high diagnostic yield using medical thoracoscopy in patients with exudative pleural effusion. A meta-analysis showed that overall diagnostic sensitivity of medical thoraco-

scopy is as high as 91% [10], which was similar to several other studies [11-13]. According to these studies, subjects were almost all suspected to have malignancy and tuberculosis, which were the two leading causes of pleural effusion. Hence, the exact diagnostic yield of medical thoracoscopy is unknown, especially in non-tuberculosis infectious pleural diseases. In our center, among 26 cases who underwent medical thoracoscopy for diagnosis, only two cases had non-tuberculosis infectious disease and seven cases still without diagnosis [14]. An advantage of a medical thoracoscopy is that it can be performed in an outpatient setting under local anesthesia without intubation. It is also a more cost-effective procedure than surgical thoracoscopy. Also, the diagnostic yield can be increased from direct visual assessment of pleura, targeted biopsy, and intervention. Medical thoracoscopy is recommended for various pleural diseases such as an undiagnosed pleural effusion, a malignant pleural effusion, and tuberculous pleurisy. Although it is tolerated well, it is contraindicated in unstable patients, patients who cannot tolerate a unilateral lung collapse, have a fused pleural space and dense adhesions, or have difficult access due to obesity or a thick chest wall [11].

The number of immunosuppressed patients is increasing and nocardiosis could become a common infectious disease encountered by intensivists. Suspicion, early detection, and appropriate treatment determined by drug susceptibility tests are needed for good prognosis.

**중심 단어:** 폐 *Nocardia* 감염증; 패혈증; 농강경

## REFERENCES

1. Martínez Tomás R, Menéndez Villanueva R, Reyes Calzada

- S, et al. Pulmonary nocardiosis: risk factors and outcomes. *Respirology* 2007;12:394-400.
2. Yang M, Xu M, Wei W, et al. Clinical findings of 40 patients with nocardiosis: a retrospective analysis in a tertiary hospital. *Exp Ther Med* 2014;8:25-30.
3. Minero MV, Marín M, Cercenado E, Rabadán PM, Bouza E, Muñoz P. Nocardiosis at the turn of the century. *Medicine (Baltimore)* 2009;88:250-261.
4. Mootsikapun P, Intarapoka B, Liawnoraset W. Nocardiosis in Srinagarind Hospital, Thailand: review of 70 cases from 1996-2001. *Int J Infect Dis* 2005;9:154-158.
5. Georghiou P, Blacklock Z. Infection with *Nocardia* species in Queensland. A review of 102 clinical isolates. *Med J Aust* 1992;156:692-697.
6. Wilson JW. Nocardiosis: updates and clinical overview. *Mayo Clinic Proc* 2012;87:403-407.
7. Corti ME, Villafañe-Fioti MF. Nocardiosis: a review. *Int J Infect Dis* 2003;7:243-250.
8. Kanne JP, Yandow DR, Mohammed TLH, Meyer CA. CT findings of pulmonary nocardiosis. *AJR* 2011;197:W266-W272.
9. Wang Z, Tong Zh, Li Hj, et al. Semi-rigid thoracoscopy for undiagnosed exudative pleural effusions: a comparative study. *Chin Med J (Engl)* 2008;121:1384-1389.
10. Agarwal R, Aggarwal AN, Gupta D. Diagnostic accuracy and safety of semirigid thoracoscopy in exudative pleural effusions: a meta-analysis. *Chest*. 2013;144:1857-1867.
11. Shojae S, Lee HJ. Thoracoscopy: medical versus surgical-in the management of pleural diseases. *J Thorac Dis* 2015;7(Suppl 4):S339-S351.
12. Wang Z, Xu LL, Wu YB, et al. Diagnostic value and safety of medical thoracoscopy in tuberculous pleural effusion. *Respir Med* 2015;109:1188-1192.
13. Wang XJ, Yang Y, Wang Z, et al. Efficacy and safety of diagnostic thoracoscopy in undiagnosed pleural effusions. *Respiration*. 2015;90:251-255.
14. Kim SJ, Choi SM, Lee J, et al. Medical thoracoscopy in pleural disease: experience from a one-center study. *Tuberc Respir Dis (Seoul)* 2017;80:194-200.