

## A Community-acquired Lung Abscess Attributable to *Streptococcus pneumoniae* which Extended Directly into the Chest Wall

Yuki Ko<sup>1</sup>, Kazunori Tobino<sup>1,2</sup>, Yuichiro Yasuda<sup>1</sup>, Takuto Sueyasu<sup>1</sup>, Saori Nishizawa<sup>1</sup>, Kouhei Yoshimine<sup>1</sup>, Miyuki Munechika<sup>1</sup>, Mina Asaji<sup>1</sup>, Yoshikazu Yamaji<sup>1</sup>, Kosuke Tsuruno<sup>1</sup>, Hiroyuki Miyajima<sup>1</sup>, Yosuke Mukasa<sup>1</sup> and Noriyuki Ebi<sup>1</sup>

---

### Abstract

---

We herein report the case of 75-year-old Japanese female with a community-acquired lung abscess attributable to *Streptococcus pneumoniae* (*S. pneumoniae*) which extended into the chest wall. The patient was admitted to our hospital with a painful mass on the left anterior chest wall. A contrast-enhanced chest computed tomography scan showed a lung abscess in the left upper lobe which extended into the chest wall. Surgical debridement of the chest wall abscess and percutaneous transthoracic tube drainage of the lung abscess were performed. A culture of the drainage specimen yielded *S. pneumoniae*. The patient showed a remarkable improvement after the initiation of intravenous antibiotic therapy.

**Key words:** chest wall abscess, *Streptococcus pneumoniae*, lung abscess

(Intern Med 56: 109-113, 2017)

(DOI: 10.2169/internalmedicine.56.7398)

---

### Introduction

---

*Streptococcus* species are the second most common pathogens for a community-acquired lung abscess (CALA) reported in the West (1), and the most common pathogens of CALA in Japan. Among adult patients with CALA due to *Streptococcus* species, *Streptococcus mitis* is the most frequently identified strain - *Streptococcus pneumoniae* is much less common (2). To our knowledge, this is the first report of a patient with CALA attributable to *S. pneumoniae* in which the abscess extended into the chest wall.

---

### Case Report

---

A 75-year-old Japanese female was admitted to our hospital with a painful mass on the left anterior chest wall for eight days without any other symptoms. She presented at another hospital with left chest pain 3 days previously with

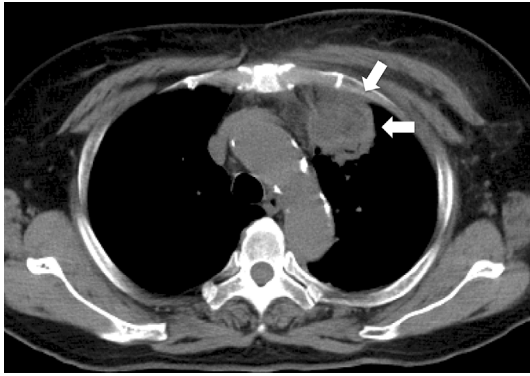
out any features suggestive of pneumonia including cough, sputum or dyspnea. Chest computed tomography (CT) obtained at the other hospital showed a mass in the left upper pulmonary lobe without any chest wall abnormalities (Fig. 1). As a result, lung cancer was suspected. She had no significant past medical history, nor did she have any history of smoking or alcohol consumption. She had no known tuberculosis exposure, and had not traveled outside Japan. She had not previously received a pneumococcal vaccine. Her vital signs were within the normal limits. A physical examination revealed a palpable, pink erythematous, warm and tender mass measuring 8 cm in size located close to the sternum overlying the left first to third intercostal spaces (Fig. 2). Her breath sounds were slightly decreased over the left upper zone, but there were no rales. A laboratory test revealed a high white blood cell count (14,310 cells/mm<sup>3</sup> with 87.9% of neutrophils) and an elevated C-reactive protein level (33.35 mg/dL). Moreover, she was diagnosed with diabetes mellitus because of her elevated HbA1c level (7.5%).

---

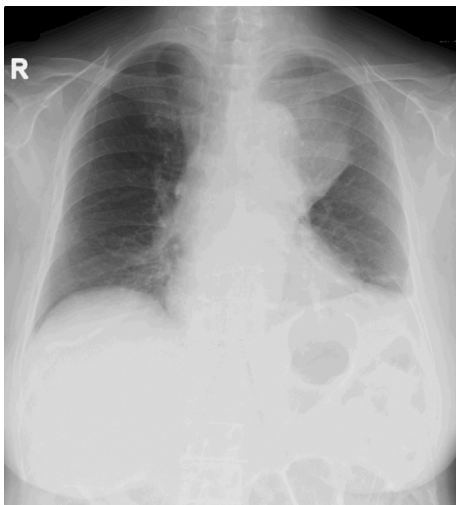
<sup>1</sup>Department of Respiratory Medicine, Iizuka Hospital, Japan and <sup>2</sup>Department of Respiratory Medicine, Juntendo University, School of Medicine, Japan

Received for publication March 10, 2016; Accepted for publication May 9, 2016

Correspondence to Dr. Yuki Ko, godsnow0830@gmail.com



**Figure 1.** Three days before admission, chest CT showed a mass in the left upper pulmonary lobe without any chest wall abnormalities (arrows).



**Figure 3.** A chest X-ray obtained on admission demonstrated a 7×5 cm mass in the left upper lung field.

A chest X-ray obtained on admission demonstrated a 7×5 cm mass in the left upper lung field (Fig. 3). Chest contrast-enhanced CT showed a gas-containing lung abscess in the left upper lobe and a chest wall abscess (Fig. 4). There was some air in the first sternocostal joint and no pleural effusion. These findings were thought to indicate that lung abscess had directly extended into the chest wall through the sternocostal joint. Chest ultrasonography showed almost the same findings as those obtained from CT. Surgical debridement of the subcutaneous and intramuscular fluid collection was carried out under local anesthesia (Fig. 5). Then, under ultrasonographic guidance, an 8-Fr aspiration catheter (Argyle™ Aspiration Catheter; Covidien, Japan) was percutaneously inserted into the lung abscess, and odorless pus was drained (Fig. 6). Gram staining of the pus revealed numerous Gram-positive cocci, and empiric antimicrobial therapy with intravenous meropenem and clindamycin was initiated. On the 5th day, the culture specimens obtained from the lung and subcutaneous abscess grew *S. pneumoniae*. Mycobacterial and anaerobic cultures of the same specimens and two sets of blood cultures were all negative. Antibiotic

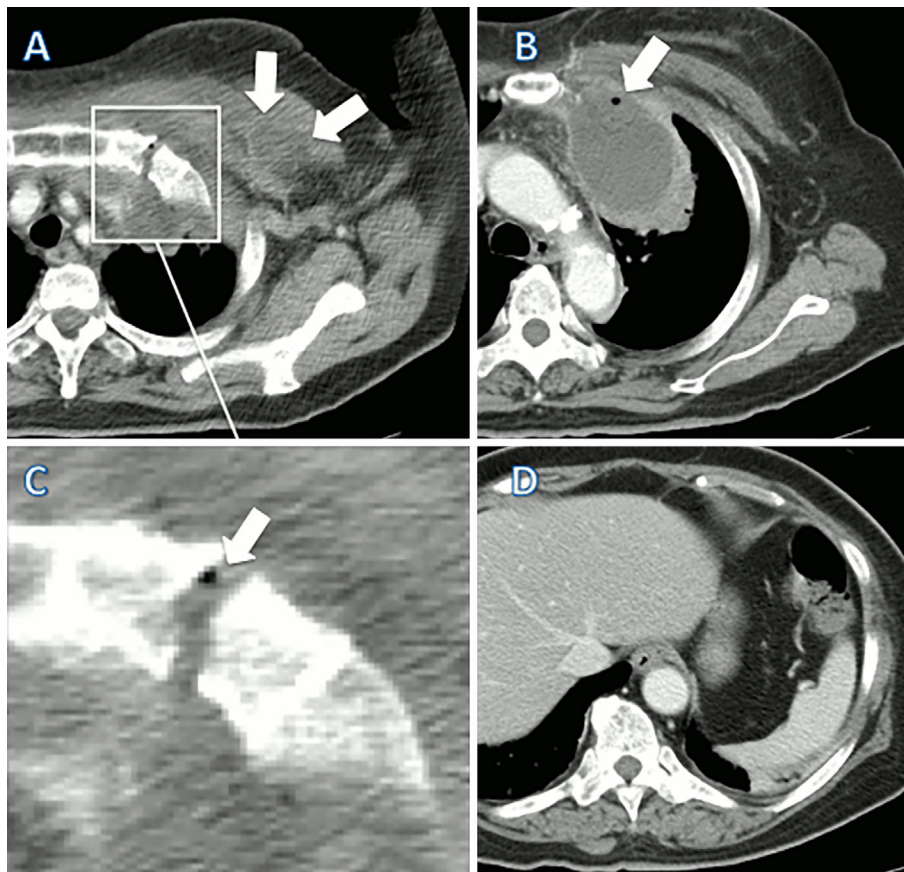


**Figure 2.** A palpable, pink erythematous, warm and tender mass measuring 8 cm in size was located on the left anterior chest wall.

susceptibility testing was performed by lung and subcutaneous drainage cultures. The isolate was susceptible to penicillin, ceftriaxone, and vancomycin, and resistant to erythromycin. The patient was considered to have a lung abscess attributable to *S. pneumoniae* which had directly extended into the chest wall. The antibiotic therapy was changed to intravenous ampicillin/sulbactam according to the results of antimicrobial susceptibility testing. After 16 days of antimicrobial therapy, the catheter was removed because the drainage had become serous and chest CT showed a remarkable improvement (Fig. 7A and B). Oral amoxicillin/clavulanic acid was used for 1 week after 3 weeks of intravenous antibiotic therapy, and the patient was discharged on the 25th day of hospitalization. At a follow-up examination at 1 month after the patient's discharge, she was asymptomatic and demonstrated normal chest radiography findings (Fig. 7C).

## Discussion

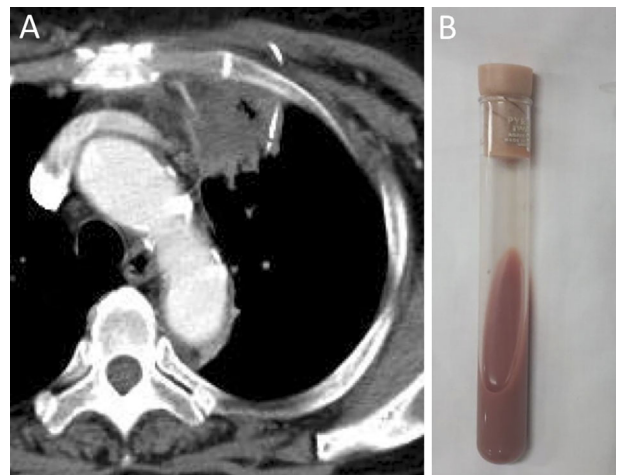
A lung abscess is defined as a localized area of liquefactive necrosis of the lung parenchyma which is caused by a microbial infection. *Streptococcus* species are the most common cause of CALA in Japan. Takayanagi et al. retrospectively reviewed 205 CALA patients, and reported that the four most common aetiological pathogens were *Streptococcus* species (59.8%), anaerobes (26.2%), *Gemella* species (9.8%), and *Klebsiella pneumoniae* (8.2%). *S. mitis* was the most common organism in patients in whom *Streptococcus* species were isolated. However, *S. pneumoniae* was only found in 3 patients (2.12%) of those patients (2). The common aetiological pathogens of the intrathoracic infectious diseases extending into the chest wall are *Mycobacterium tuberculosis* (3) and *Actinomyces* spp. (4), and such conditions have not been previously reported to be caused by *S. pneumoniae*. This condition is thought to have occurred by two mechanisms: first, pathogens of the lung or pleura may flow into the chest wall through the lymphatic network which is



**Figure 4.** Chest contrast-enhanced CT showed a gas-containing lung abscess in the left upper lobe (A) and a chest wall abscess (arrows on A and arrow on B). There is some air in the first sternocostal joint (arrows on A and C) without pleural effusion (D) and the abscess extended between the lung and the chest wall.



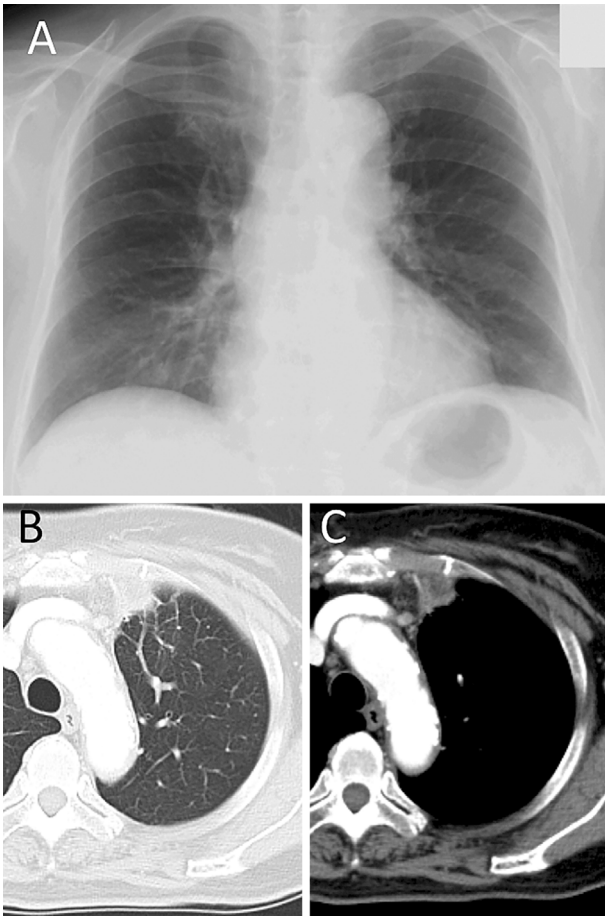
**Figure 5.** Surgical debridement of the subcutaneous and intramuscular fluid collection was carried out under local anesthesia.



**Figure 6.** Chest CT (A) after drainage therapy under ultrasonographic guidance. An 8-Fr aspiration catheter was percutaneously inserted into the lung abscess, and odorless pus was drained (B).

anastomosed by pleural inflammation and thus causing a chest wall infection; second, an infection may extend directly into the chest wall (e.g. empyema necessitatis) (5). The characteristic radiographic finding of a lung abscess is an air-fluid level. On chest CT, a lung abscess appears as a rounded intrapulmonary mass that forms an acute angle with the chest wall and contains central necrosis or cavitation (6).

In our patient, the chest radiographic and CT findings were consistent with those of a lung abscess, and the lung abscess seemed to directly extend into the chest wall through the first sternocostal joints without any pleural effu-



**Figure 7.** After the antimicrobial therapy, chest CT (A, B) and chest radiography (C) showed a remarkable improvement.

sion, which thus ruled out a diagnosis of empyema necessitatis (Fig. 4). Empyema necessitatis is a rare complication of pulmonary infection. The most common site of this condition is the anterior chest wall between the midclavicular and anterior axillary lines, however, the reason why this site is frequently affected is unclear (7). In our patient, the lung abscess extended into the chest wall through the same site, and it was thought that it might demonstrate the same mechanisms as empyema necessitatis. Moreover, it is thought that the lung movement is physiologically smaller at this site than in other regions, which thus makes it easier for the lung abscess to invade. To our knowledge, only two cases of empyema necessitatis due to *S. pneumoniae* have been previously published (7, 8), and there are no case reports of CALA attributable to *S. pneumoniae* in which the abscess extended into the chest wall as far as we know. It was thought that both host and bacterial factors contributed to the development of the disease. Regarding the host factors, the most common risk factors for developing a lung abscess are aspiration and a systemic or local immunocompromised status, such as chronic lung disease, malignancy, and diabetes mellitus (9). Our patient was 75 years old and also had diabetes mellitus. Diabetes mellitus is a well-known risk factor associated with an increased susceptibility to severe pneumococcal infection and a higher mortal-

ity (10). With respect to the bacterial factors, capsular serotypes of *S. pneumoniae* are important risk factors for disease severity. Currently, over 46 serogroups and 97 pneumococcal serotypes have been documented and not all serotypes are equally virulent (10-12). Fletcher et al. reported that serotypes 1, 19A, 3, 14, and 7F predominated as causes of complicated pneumococcal pneumonia (13). In our patient, the pneumococcal serotype was unclear because no serotype testing was done.

Reports published from 1968 to 2008 show that lung abscesses are associated with a mortality rate of approximately 1-4% (2, 14). Although 80-90% of lung abscess are now successfully treated with antibiotics, this conservative therapy may occasionally fail. Thus, 11-21% of lung abscess patients require surgical or percutaneous drainage (14, 15). Wali et al. reported that the overall success rate of percutaneous tube drainage (PTD) was 84% with a complication rate of 16%. PTD is a safe and effective method for treating lung abscesses, and this treatment modality is associated with less morbidity and mortality than surgical resection. Moreover, the other advantages include the rapid clinical and radiological improvement of the lung abscess which may avoid the complications that can occur with prolonged and conservative treatment (16). Mengoli et al. advocated that surgical drainage is required in patients with lung abscesses larger than 8 cm in diameter (17). In our case, the size of lung abscess was relatively large (8 cm in diameter); however, PTD was safely performed under ultrasonographic guidance and it proved to be effective.

In conclusion, we should consider the possibility that community-acquired lung abscesses which occur due to *S. pneumoniae* may extend into the chest wall in the differential diagnosis of infectious diseases of the chest wall. To our knowledge, this is the first case report of such a condition.

**The authors state that they have no Conflict of Interest (COI).**

## References

- Bartlett JG. The role of anaerobic bacteria in lung abscess. *Clin Infect Dis* **40**: 923-925, 2005.
- Takayanagi N, Kagiya N, Ishiguro T, et al. Etiology and outcome of community-acquired lung abscess. *Respiration* **80**: 98-105, 2010.
- Kuzucu A, Soysal O, Günen H. The role of surgery in chest wall tuberculosis. *Interact Cardiovasc Thorac Surg* **3**: 99-103, 2004.
- Herrak L, Msouger Y, Ouadnouni Y, et al. Pulmonary actinomycosis with chest wall fistula formation. *Rev Mal Respir* **24**: 349-352, 2007.
- Koreeda Y, Hirotsu Y, Fukunaga H, et al. A case of tuberculous abscess in the chest wall close to the thickening pleural lesion following tuberculous pleuritis. *Nihon Kyobu Shikkan Gakkai Zasshi* **35**: 1013-1019, 1997 (in Japanese, Abstract in English).
- Stark DD, Federle MP, Goodman PC, et al. Differentiating lung abscess and empyema: radiography and computed tomography. *AJR Am J Roentgenol* **141**: 163-167, 1983.
- Freeman AF, Ben-Ami T, Shulman ST. *Streptococcus pneumoniae* empyema necessitatis. *Pediatr Infect Dis J* **23**: 177-179, 2004.
- Marks MI, Eickhoff TC. Empyema necessitatis. *Am Rev Respir*

- Dis **101**: 759-761, 1970.
9. Bartlett JG. Anaerobic bacterial infections of the lung and pleural space. Clin Infect Dis **16** (Suppl 4): S248-S255, 1993.
  10. Cillóniz CM, Polverino E, Amaro R, et al. Invasive pneumococcal disease today: epidemiology, treatment, and prevention. Clin Pulm Med **19**: 191-198, 2012.
  11. Calix JJ, Porambo RJ, Brady AM, et al. Biochemical, genetic, and serological characterization of two capsule subtypes among *Streptococcus pneumoniae* Serotype 20 strains: discovery of a new pneumococcal serotype. J Biol Chem **287**: 27885-27894, 2012.
  12. Park IH, Geno KA, Yu J, et al. Genetic, biochemical, and serological characterization of a new pneumococcal serotype, 6H, and generation of a pneumococcal strain producing three different capsular repeat units. Clin Vaccine Immunol **22**: 313-318, 2015.
  13. Fletcher MA, Schmitt HJ, Syrochkina M, et al. Pneumococcal empyema and complicated pneumonias: global trends in incidence, prevalence, and serotype epidemiology. Eur J Clin Microbiol Infect Dis **33**: 879-910, 2014.
  14. Moreira Jda S, Camargo Jde J, Felicetti JC, et al. Lung abscess: analysis of 252 consecutive cases diagnosed between 1968 and 2004. J Bras Pneumol **32**: 136-143, 2006.
  15. Hogan JL, Hardy JD. Lung abscess revisited. A survey of 184 cases. Ann Surg **197**: 755-762, 1983.
  16. Wali SO. An update on the drainage of pyogenic lung abscesses. Ann Thorac Med **7**: 3-7, 2012.
  17. Mengoli L. Giant lung abscess treated by tube thoracostomy. J Thorac Cardiovasc Surg **90**: 186-194, 1985.

The Internal Medicine is an Open Access article distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).