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Case report

An unusual case of lung abscess secondary to round pneumonia caused by recurrent *Klebsiella pneumoniae* strain and the role of occult metastases tumor

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ABSTRACT

Round pneumonia is an uncommon form of community-acquired pneumonia usually found in children. To this date, there has been no report on local pulmonary complications in this entity in adult patients. The present study reports a case of a 77-year-old male with lung abscess secondary to round pneumonia caused by recurrent *Klebsiella pneumoniae* infection accompanied by occult metastases tumor. Occult metastases may have played an important role in leading to cavity as in this present case. Further investigation regarding the relationship between recurrent infection and metastases is needed.

1. Introduction

Round pneumonia is an unusual radiological manifestation of community-acquired pneumonia (CAP) presenting as spherical or oval-shaped opacities on chest radiographs in adults [1–3]. This entity often mimic pulmonary neoplasm by its radiological appearance especially in patients with high risk factors. Moreover, it is of no doubt that the underlying malignancies can partly affect the hosts' immune function status and predispose patients to severe or recurrent infections [4]. Until now, there have been no reports on local pulmonary complications in case of round pneumonia in adults though deaths have occurred in various sporadic reports [2,5]. We present here a rare adult case with lung abscess secondary to round pneumonia caused by recurrent *Klebsiella pneumoniae* (*K. pneumoniae*) strain whose radiological features mimic malignancy accompanied by occult metastases tumor.

2. Case report

A 77-year-old, non-smoker male was presented with mild bloody sputum for 10 days in July, 2015. He showed no pyrexia and no other respiratory symptoms. His past medical history recorded a radical gastrectomy due to gastric adenocarcinoma, followed by laparoscopic assisted splenotomy due to multiple postoperative *K. pneumoniae* splenic abscesses in July, 2013. Due to the complication, no adjuvant chemotherapy was administered at that time, and his condition was stable for two-year follow-up period. Additional past medical history revealed type 2 diabetes mellitus of a 22-year duration without the problem of alcoholism. Outpatient laboratory data revealed a white blood cell (WBC) count of 7280/mcl, with 66.1% neutrophils, platelet count of 208,000/mcl, and serum carcinoembryonic antigen (CEA) level of 172.5 ng/mL. The routine chest computed tomography (CT) scan revealed an irregular opacity with lobulated borders in the right upper lobe (Figs. 1 and 2).

After admission, further laboratory data revealed a blood glucose level of 9.94 mmol/L, glycosylated hemoglobin (HbA) level of 7.5%, serum alanine aminotransferase (ALT) level of 6.7 U/L, serum aspartate aminotransferase (AST) level of 10.1 U/L, serum C-reactive protein (CRP) level of 7.2 mg/L, and erythrocyte sedimentation rate (ESR) level of 15 mm/h. Both routine urine test and stool occult blood test were normal. Four consecutive acid fast stains and cytological stains of sputum were performed, which were all negative. Two consecutive sputum cultures yielded *K. pneumoniae* strains, whose antimicrobial drug-susceptibility phenotype were similar to those isolated from splenic pus 2 years ago.

A CT-guided percutaneous lung biopsy was performed on the fourth day of admission. On the ninth day of admission while the histopathological results were pending, our patient suddenly presented with a body temperature of 38.6 °C. The specimen for blood culture was

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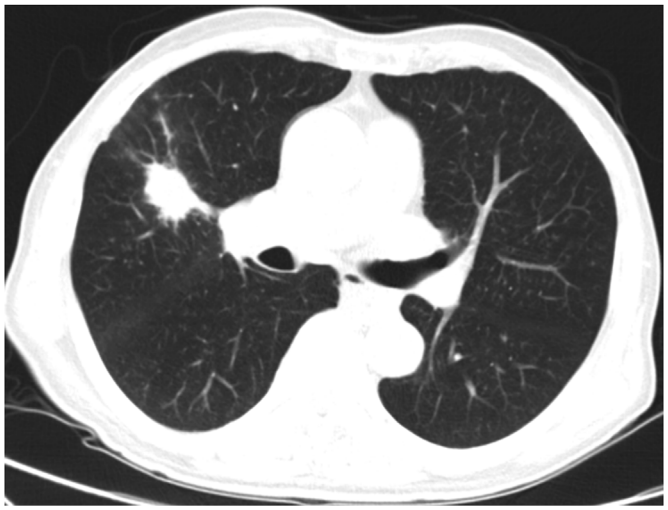

Fig. 1. Outpatient chest computed tomography (CT) scan (lung window) showed an irregular opacity with lobulated borders in the right upper lobe accompanied with spiculation.

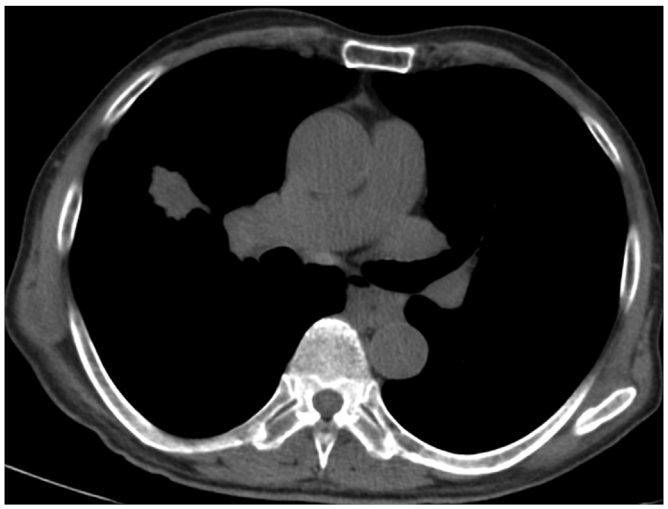

Fig. 2. Outpatient chest computed tomography (CT) scan (mediastinal window) showed an irregular opacity with lobulated borders and spiculation.

Fig. 3. The narrowing lung lesion and formation of an obvious cavity were shown on chest CT scan after enhanced antibiotic therapy.

obtained. The laboratory data revealed a WBC count of 10,630/mcl, containing 73.0% neutrophils, and serum CRP level of 61.5 mg/L. After three days with intravenous injections of antibiotics, the body temperature returned to normal and *K. pneumoniae* strain was detected in the blood culture. Histopathological results of the lung biopsy showed no malignant cell. Based on these findings, the patient was diagnosed with round pneumonia and septicemia. He continued to receive antibiotics and was noticed a small cavity formation in the right lung opacity by reviewed chest CT on the twelfth day after the episode of fever. Following ten-day long further enhanced antibiotic therapy, another chest CT scan was performed which showed the right lung lesion narrowing and an enlarged formation of an obvious cavity (Fig. 3). The same time laboratory data revealed a normal WBC count but a serum CEA level of 407.6 ng/mL. The patient then chose to be discharged and oral antibiotics for additional ten-day duration. He was not given further examination to determine the cause of the elevated serum CEA level.

The patient's condition was stable after discharge. He was admitted in local hospital due to right femoral intertrochanteric fracture on May 2, 2016. The preoperative routine chest CT scan showed the right upper lung lesion completely absorbed, leaving only a small fibrous shadow (Fig. 4). Moreover, this patient was admitted in our hospital again due to sudden painless gross hematuria on July 13, 2016. The laboratory data revealed a serum CEA level of > 1000 ng/mL. An enhanced abdominal CT scan showed multiple metastasis tumors involving left renal pelvis and ureter. In addition, typical malignant cells were found in the urine (Fig. 5). Therefore, the patient was eventually diagnosed with extensive peritoneal metastasis.

3. Discussion

Round pneumonia was first reported in 1954 and has been frequently encountered in children [1,3]. One theory holds that the underdeveloped pore of Kohn and the absence of canals of Lambert in children limit the spread of organism, which results in a focal round mass seen on radiographs [1]. The clinical symptoms of round pneumonia vary from no clinical symptoms to classical respiratory symptoms and pyrexia [1–3,5]. To this date, the majority of round pneumonias in adults follow a benign course with no pulmonary complications such as abscess or empyema, although sporadic death has occurred [2,3,5].

Lung is one of the most common sites for metastases tumors including relapse from the gastric adenocarcinoma though it is less common as the initial site of post-operative recurrence of gastric cancer [6]. The detection of serum CEA on postoperative recurrence was

Fig. 4. Only small fibrous shadow was shown on the preoperative routine chest CT scan nine months later.

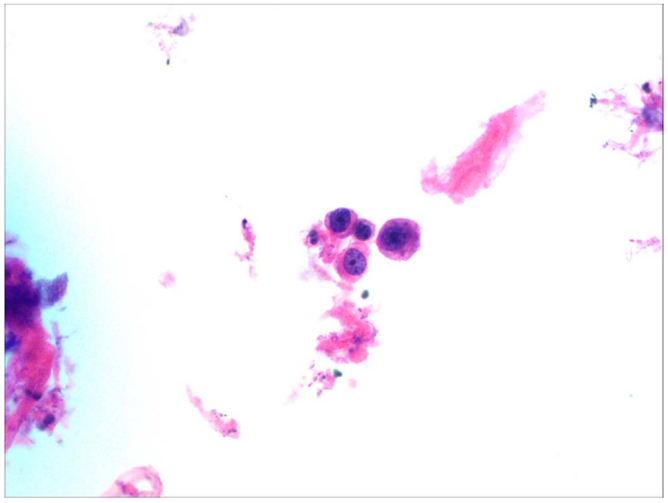

Fig. 5. Typical malignant cells were found in the urine cytology with markedly in size and shape, nuclear pleomorphism with a significantly abnormal karyoplasmic ratio (H and E stained smearing sample, × 800).

characterized by high specificity though a relatively low sensitivity [7]. The present patient complained of bloody sputum and solitary pulmonary opacity in the lung, as well as high serum CEA level before admission. The malignant entity especially metastases tumor in the lung was highly suspected. He was assertively diagnosed with lung abscess secondary to round pneumonia. Unfortunately, the patient was eventually diagnosed with multiple peritoneal metastasis over a one-year period. Due to the obviously elevated serum CEA level at that time and the follow-up results, we speculate that the patient has been harboring the extensive peritoneal metastasis with manifestations of round pneumonia.

Possible causative factors of lung abscess in the present case included several aspects. Although the qualified sputum smears suggested lower respiratory airway infections at that time, the antibiotics had not been administered until obvious manifestation of typical infectious symptoms (e.g. fever, evaluated WBC counts) appeared. We speculated that the delayed antibiotic administration may be one of the factors to cause cavitation. Meanwhile, the pathogen *K. pneumoniae* strain possesses the potential to cause necrotizing pneumonia itself and has become a more common cause of lung abscess than before in certain areas [8,9]. Patients with diabetes are known to show defects in neutrophil chemotaxis and phagocytosis [10] which may be another predisposing factor to *K. pneumoniae*-pathogenic lung abscess. Furthermore, as the patients with advanced or refractory malignancy are inherently associated with immune deficits [4], the underlying metastases tumor may also be another important predisposing factor leading to cavity as in this present case. Few studies have suggested that occult gastrointestinal malignancies such as colonic cancer may play an important role in recurrent *K. pneumoniae* liver abscess, particularly in patients with diabetes [11,12]. In this present patient, the *K. pneumoniae* strain from the sputum culture is identical to that isolated from pus 2 years ago, and the antimicrobial drug-susceptibility phenotype of two strains was highly consistent. This data indicated that both the splenic abscess and lung abscess were caused by the same *K. pneumoniae* strain although the molecular typing was not studied. It was hypothesized that the pathogen began to colonize in the lesion of the spleen 2 years ago due to the non-surgical intervention and the underlying diabetes mellitus. Therefore, the pulmonary infection may be as a combined consequence of *K. pneumoniae* colonization and the occult metastases as well as the presumed factors above. To our knowledge, this is the first report case of lung abscess secondary to round pneumonia caused by recurrent *K. pneumoniae* strain.

In conclusion, early recognition of round pneumonia and timely antimicrobial treatment may be a useful alternative to differentiate the nodular lesions as well as to prevent the associated complications when this entity could not be excluded. The recurrent *K. pneumoniae* infection also disclosed that the underlying metastatic tumor may play an important role on pathogenesis of lung abscess in this particular case and recurrent infections may indicate the underlying metastatic tumor in certain patients. Further investigation regarding the relationship between recurrent infection and metastases is needed.

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