

Lipoid pneumonitis in a patient with an accidental ingestion of kerosene successfully treated with bronchoscopic segmental lavage and systemic steroid

Case report

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Abstract

Rationale: Standard treatment of lipoid pneumonitis remains unclear. This study reports a case of kerosene pneumonitis successfully treated with systemic steroid and segmental bronchoalveolar lavage (BAL).

Patient concerns: A 30-year-old woman referred to our hospital because of worsening of respiratory symptoms and fever despite antibiotic therapy following accidental ingestion of kerosene. She had no underlying disease.

Diagnoses: Chest CT scan showed necrotic consolidation, ground glass opacity (GGO), bronchial wall thickening in the *right middle/lower lobe* (RML/RLL) and right pleural effusion. The lipoid pneumonitis was confirmed by identification of a lipid laden macrophage in bronchoalveolar lavage fluid.

Interventions: The patient was treated with systemic corticosteroid and segmental BAL.

Outcomes: The patient's symptoms rapidly improved after treatment and she was discharged one week after admission. A follow-up CT scan a week after discharge revealed marked resolution of consolidation. No recurrence was reported for 8 months.

Lessons: This is the first case of kerosene pneumonitis successfully treated with systemic steroid and bronchoscopic segmental lavage therapy in Korea. Very few cases have been reported worldwide.

Abbreviations: BAL = bronchoalveolar lavage, CT = computer tomography, GGO = ground glass opacity.

Keywords: broncho-alveolar lavage therapy, kerosene pneumonitis, lipoid pneumonitis, systemic steroid

1. Introduction

Exogenous lipoid pneumonia is an uncommon form of pneumonia that is related to the aspiration of fatty substances. Kerosene is one of the petroleum distillates, with low viscosity and high volatility, widely used for heating and lamp oil.^[1] Due to low viscosity, there is a rapid diffusion throughout the bronchial

mucosa leading to severe pulmonary and systemic inflammation after aspiration.^[1] Kerosene ingestion or aspiration is one of the most common poisonings in children, but very rare in adults. Among adults, the most common cause of kerosene pneumonitis is Fire eater's lung (FEL), which is caused by accidental aspiration by street performers of "fire eating."^[2] In Korea, the most common cause is accidental aspiration by oral suction through use of a pipet for transferring to a fuel tank.

Optimal treatment of kerosene pneumonitis remains unclear and some controversies exist, particularly regarding the use of antibiotics and systemic steroid. This paper reports the first successful treatment in Korea, with a systemic steroid and bronchoscopic segmental lavage, of aspiration pneumonitis by accidental ingestion of kerosene.

2. Case report

A 30-year-old Korean woman was referred to the emergency department at our hospital because of worsening states in shortness of breath, cough, fever and right pleuritic pain despite antibiotic therapy from another hospital. Three days after the initial therapy the patient was admitted to our hospital for accidental ingestion of a half cup of kerosene, used for lamp oil. Upon admission, the patient had no other underlying diseases. The patient's body temperature and oxygen saturation were 38.3°C and 97% on room air, respectively. Her breath sounds

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Ethics approval and informed consent to participate was waived due to the retrospective character of the study and patient's anonymity can be maintained in this case.

The authors have no conflicts of interest to disclose.

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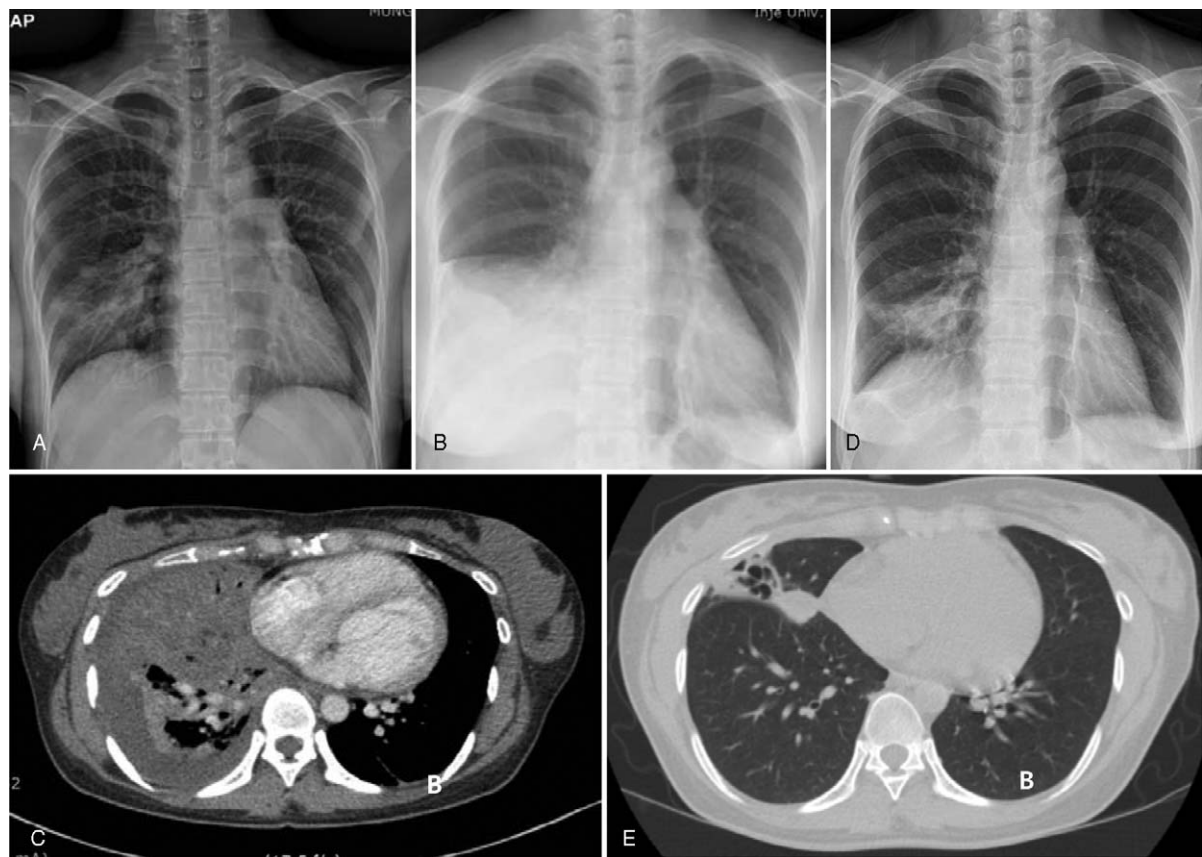


Figure 1. (A) Chest radiography revealed reticular opacity in right mid and lower lung fields. (B) Newly developed right pleural effusion and right middle and lower lung consolidation. (C) Chest computed tomography scans revealed a necrotic consolidation in the right middle and lower lobe with right pleural effusion. (D) Nearly disappeared right pleural effusion and improving of consolidation. (E) Obviously decreased necrotic consolidation in RML and resolution of consolidation of RLL, right pleural effusion. But, newly developed multiple pneumatoceles in RML.

were decreased with inspiratory rales and crackle on right side. Laboratory examination showed leukocytosis ($16760/\text{mm}^3$) with increased C-reactive protein level (24.74 mg/dL). Initially chest x-rays performed at a local clinic showed *right middle lobe/right lower lobe (RML/RLL)* consolidation (Fig. 1A). At the emergency department, chest x-ray showed RML/RLL consolidation with right pleural effusion which was aggravated compared to three days before (Fig. 1B). Chest CT scan performed at our hospital showed necrotic consolidation, ground glass opacity (GGO) and bronchial wall thickening in the right middle/lower lobe and right pleural effusion [Fig. 1C].

Through bronchoscopy, edematous and erythematous changes were observed in the right middle and lower lobe with slightly grayish secretions (Fig. 2). A bronchoalveolar lavage was performed to confirm the bacterial superinfection and lipid laden macrophage in fluid. Also, Bronchoscopic segmental lavage therapy was conducted to eliminate the non-soluble kerosene oil. The initial lavage return was slightly turbid with an oily smell and fatty material floating in the upper layer. Bronchoalveolar lavage fluid from the right B5 bronchus showed a normal total cell count ($3.1 \times 10^5\text{ cell/mL}$) with 13% macrophages, 53% neutrophils, and 34% lymphocytes. The CD4/CD8 ratio of lymphocyte subset was 4.3. Cultures of the bronchoalveolar lavage fluid were negative for bacterial, mycobacterial, fungus and tuberculosis PCR were also negative. The bronchoalveolar lavage fluid cytology showed multiple lipid-laden macrophages with Oil red O stain (Fig. 3). In addition, bronchoscopic segmental lavage was

performed in the right middle lung. Two times 200 mL volumes of warmed saline were instilled and the retrieve rate was 53% and 55%. Bronchoscopic segmental lavage was not performed in the right lower lung because of severe desaturation. The patient had moderate amount of right pleural effusion and had severe right pleuritic pain with dyspnea, thoracentesis was performed and 600 mL of pleural fluid was retrieved. Pleural fluid examination showed slight cloudy color and WBC count was $7750/\text{mm}^3$ with 90% neutrophils. Cultures of the pleural fluid were all negative.

Systemic steroid with 0.5 mg/kg commenced after bronchoscopy. After three days of treatment, the patient's symptoms, including dyspnea, fever and pleuritic chest pain, were significantly improved. However, the patient still had a cough and required oxygen therapy via nasal prong. After 5 days of 0.5 mg/kg (30 mg) systemic steroid therapy, steroid treatment was gradually tapered off and empirical antibiotics stopped after identification of the negative culture result. One week after admission, we decided to discharge the patient because the symptoms were thoroughly improved with no oxygen demand and improved chest x-ray results (Fig. 1D).

In outpatient clinic, after 1 week of discharge, a low dose chest CT was performed. The CT scan showed a marked decrease in necrotic consolidation and GGO in right middle lobe with resolution of consolidation in right lower lobe and right pleural effusion. However, it also showed newly developed multiple pneumatoceles in right middle lobe (Fig. 1E). Oral systemic steroid was prescribed for six weeks with gradual tapering off.

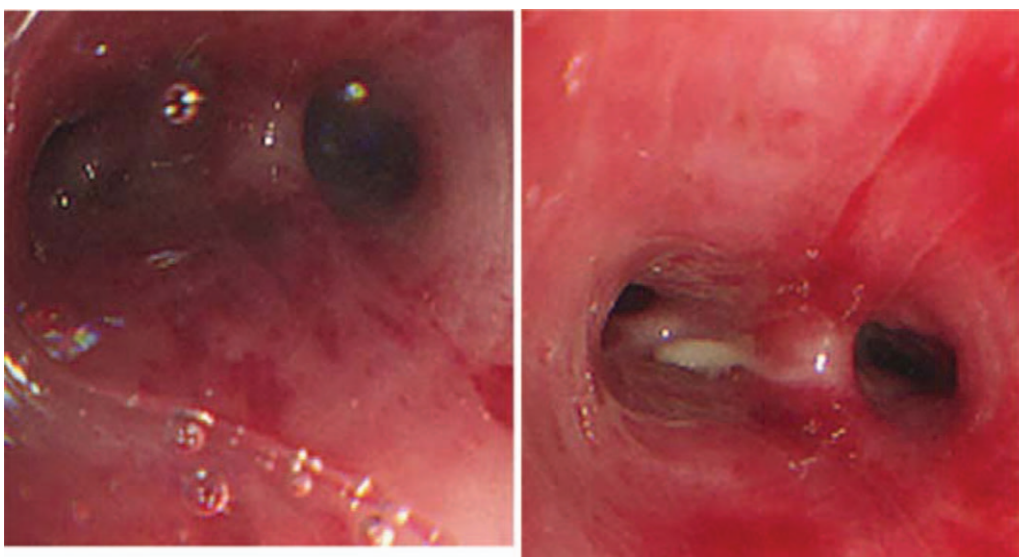


Figure 2. Edematous and erythematous changes were seen in the right middle and lower lobe with slightly grayish secretions in right middle lobe.

At the last outpatient follow-up, the patient reported total clinical /radiological improvement without recurrence.

3. Discussion

Exogenous lipid pneumonia is an uncommon form of pneumonia that is related to the aspiration of fatty substances. Kerosene is one of the hydrocarbons, with low viscosity and high volatility, widely used for heating and lamp oil.^[1] Due to low viscosity, there is easy aspiration and rapid diffusion throughout the bronchial mucosa leading to disrupted surfactant, decreased pulmonary compliance causing severe pulmonary and systemic inflammation, edema, and necrosis.^[1] Commonly reported symptoms after aspiration are coughing, nausea/vomiting, fever, drowsiness, tachypnea, and tachycardia. Altered mentality, restlessness, agitation and seizures are also reported.^[3] Breathing sounds are either normal or have rhonchi, wheezing or rales.^[4]

Typical chest x-ray findings after acute aspiration of kerosene are consolidation predominantly in the middle and lower lobes, air bronchograms, areas of low attenuation within consolidation, ground-glass attenuation, pneumatocele, and pleural effusions.^[4-7] Radiologic abnormalities can last for months.^[4]

This is a rare case of kerosene induced pneumonitis successfully treated with a systemic steroid and bronchoscopic segmental lavage therapy in a 30-year-old female patient without complication. Treatment of lipid pneumonia is not well studied, and the published data contains only case reports. Most case reports are aimed at young children in a different treatment and to date, there is no standard treatment regimen. Antibiotic treatment of severe cases seems justified, considering bacterial superinfection.^[5,8] Bronchoalveolar lavage is indicated in case of suspected bacterial superinfection before initiation and stopping of antibiotic treatment.^[9] Initiation of prophylactic antibiotics use is debatable because of lack of evidence.^[10] Steroid use on hydrocarbon pneumonitis is also debatable. Steroids are suggested for the treatment of lipid pneumonia and have proved successful in some cases, depending on the degree of intoxication.^[11-13] However, some studies showed no difference of duration of hospitalization and radiological improvement with steroid use.^[14,15] Duration and dosing of the systemic corticosteroid for lipid pneumonitis are not established. Based on previous cases^[12,13] systemic steroid was also administered initially at dose of 0.5 mg/kg and gradually tapered off. Bronchoalveolar lavage therapy can remove lipid-laden macrophages as a leading cause of fibrosis in the alveoli and interstitium.^[16,17] Bronchoalveolar lavage is a successful treatment strategy for the pulmonary alveolar proteinosis. Several case reports demonstrate effectiveness of whole lung lavage for lipid pneumonia.^[18-20] Two case reports showed effectiveness of multiple segmental bronchoalveolar lavage when not severe enough perform whole lung lavage.^[21,22] Segmental BAL is a safe and easily performed procedure not requiring general anesthesia. We also successfully performed segmental BAL without severe complications.

This is the first case in Korea and a rare case worldwide treated with systemic steroid and segmental bronchoalveolar lavage

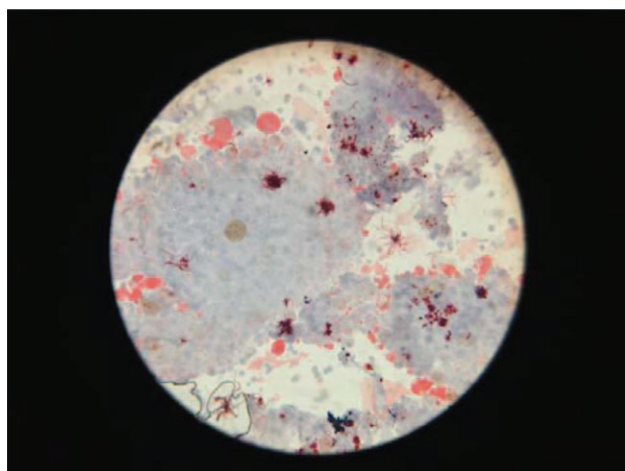


Figure 3. Bronchoalveolar lavage fluid cytology showed multiple lipid-laden macrophages with Oil Red O staining.

which resulted in notable rapid improvement of kerosene pneumonitis. In conclusion, these treatments could be a therapeutic option for severe lipid pneumonia.

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