



## Case report

## Exogenous lipid pneumonia in old people caused by aspiration: Two case reports and literature review

Maoqing Guo<sup>a,1</sup>, Jianguo Liu<sup>b,1</sup>, Bo Jiang<sup>a,\*</sup><sup>a</sup> Department of Respiratory Medicine, Affiliated Hospital of Jining Medical University, Jining, Shandong, 272029, People's Republic of China<sup>b</sup> Department of Critical Care Medicine, Affiliated Hospital of Jining Medical University, Jining, Shandong, 272029, People's Republic of China

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## ABSTRACT

**Background:** Exogenous lipid pneumonia is a rare entity, the diagnosis is often missed or delayed.

**Objective:** To investigate the clinical characteristics of exogenous lipid pneumonia in elderly patients, improve the efficiency of early diagnosis and treatment of this disease.

**Methods:** Retrospectively analyzed the clinical information and imaging data of these 2 exogenous lipid pneumonia patients, reviewed related literature.

**Results:** Both of the 2 patients were over 60 with a history of gastrointestinal diseases. The clinical presentation is nonspecific. Chest CT showed many different manifestations. Histopathology analysis revealed the accumulation of lipid carrying macrophages, vacuolar cells and inflammation. A literature review indicated that 25 previous cases of exogenous lipid pneumonia were caused by aspiration. The most common site of the lesion was located in right lung, while mineral oil was the most common substances. We sought to discuss the patient's treatment and the corresponding outcomes.

**Conclusion:** The diagnosis of lipid pneumonia's mainly depends on medical history and histopathological morphology. The standard treatment for exogenous lipid pneumonia was composed of antibiotics, steroid, bronchoscopic lavage and a regular follow-up.

## 1. Introduction

Exogenous lipid pneumonia (ELP) was initially described by Laughlen in 1925. This disease can be caused by chronic long term ingestion, inhalation of oily products or acute from accidental aspiration [1]. Two main source of the oil in adults are nose oil drops and laxatives. Exposure cases of exogenous lipid pneumonia. Because of the rarity of this entity, many clinicians are unfamiliar with it. Patients with ELP tend to be asymptomatic or present non-specific symptoms (fever, weight loss, cough, dyspnoea, abundant sputum, chest pain, haemoptysis), while only chest X-ray examination could show lesions in the lungs, mimicking other diseases, mainly neoplasm in older patients [2]. From the view of pathologists, these lesions in lungs are very strange and unusual. Thus, we presented 2 ELP cases successful comprehensive treatment. We subsequently reviewed the recent literature regarding to ELP.

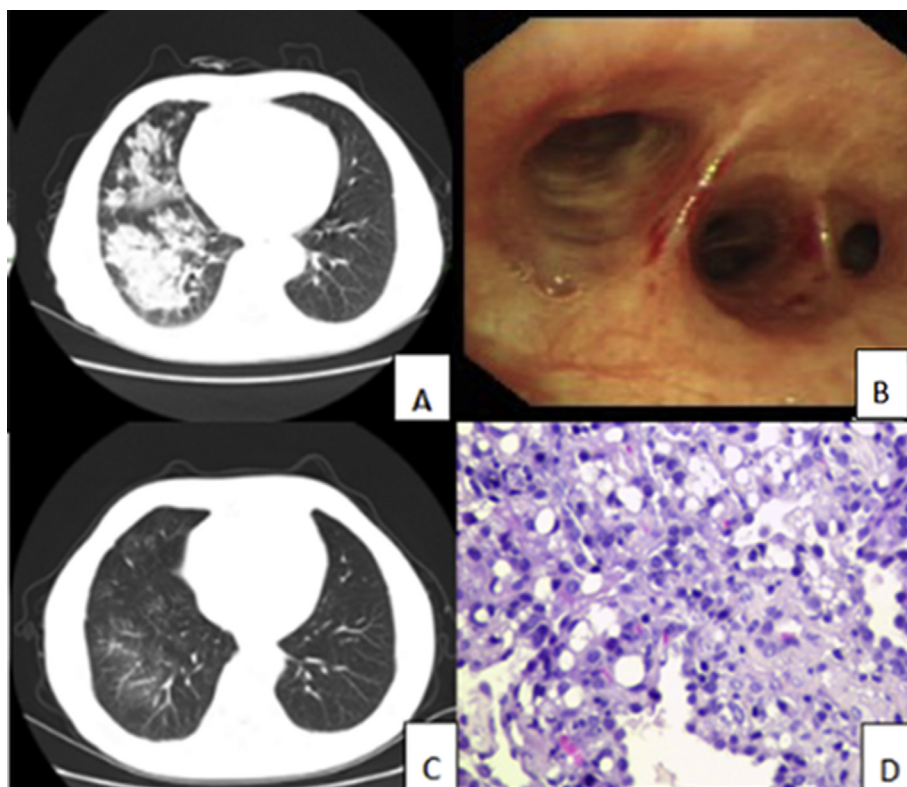
## 2. Case reports

## 2.1. Case 1

69-year-old, Chinese, male, with a history of ileus, was referred to the emergency department of our hospital because of worsening states in shortness of breath, cough and fever despite antibiotic therapy from another hospital. Upon admission, the patient had no other underlying diseases. 5 days before admission, he was diagnosed as upper respiratory tract infection in community clinic and accepted antibiotic therapy for 4 days. However, no improvement on his conditions were observed. On 11th in December 2014, his body temperature rose up to 39.5 °C, then he presented to our hospital. After admission, a chest CT was performed which showed multiple dense consolidation located in right lung, predominantly in low lobe (Fig. 1A). His white blood cell (WBC) count was  $6.30 \times 10^9$  cells/L, C-reactive protein was 6.8 mg/dL. Take all of these in consideration, we treated him with Piperacillin-sulbactam and levofloxacin. On 28th in December 2014, we performed bronchoalveolar lavage (BAL). Through bronchoscopy, we found that

\* Corresponding author.

E-mail address: [153239007@qq.com](mailto:153239007@qq.com) (B. Jiang).<sup>1</sup> Maoqing Guo and Jianguo Liu are contributed equally.



**Fig. 1.** A. Pre-treatment Chest CT shows massive opacities in the right lung lobes, geographic distribution of ground-glass opacities and associated thickening of the interlobular septa mainly in middle and lower lobes, consolidation mainly in low lobe. B. Bronchoscopy showed that the wall of the air tube was edematous with a small amount of pus. C. One year after Steroid treatment, Chest CT Shows dramatic Improvement. D. Lung puncture biopsy specimen of right lung nodular area showed empty spaces and vacuoles correspond to lipid dissolved. Hematoxylin- and eosin-stained slide.

the wall of the air tube was edematous with a small amount of pus (Fig. 1B), the lavage was clear. Bronchoalveolar lavage fluid (BALF) cultures were negative for bacterial. Because there was only a small amount of pus in airways, bronchoscopic segmental lavage was not performed again. 2 weeks after treatment, a repeated chest CT showed the increased consolidation, while the patient's symptoms, including dyspnea, fever and pleuritic chest pain were improved. As a result, the patient was discharged on 28th in December 2014. Then he continued to receive antibiotic treatment for an additional week in clinic. However, the fever with highest temperature at 40.0 °C occurred on 4th January 2015. He rehospitalized after 4 days, during which transbronchial lung biopsy (TBLB) was performed in the right lower lobe. Lung specimens showed chronic inflammatory cell infiltrated. Based on this, we empirically treated him with steroid. After steroid treatment, the patient was no longer feverish, other symptoms were also improved obviously. A chest CT performed after 1 week steroid treatment showed resolution of the radiographic abnormalities. In order to confirm the nature of the lesions, CT guided percutaneous transthoracic needle biopsy was performed. Lung biopsy showed lipid granulomas with fat-laden macrophages (Fig. 1D), consistent with the pathological features of lipid pneumonia. After two months of missed diagnosis, the patient was diagnosed ELP at last. Oral systemic steroid was continued for 8 weeks with gradual tapering off. Chest CT showed dramatic improvement 1 year after steroid therapy. (Fig. 1C).

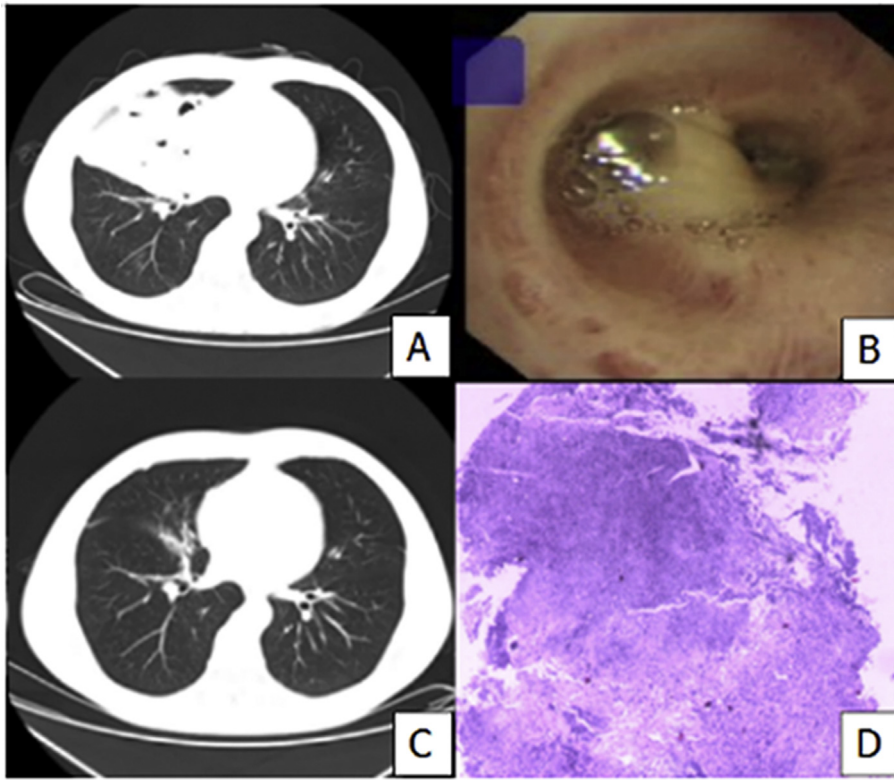
## 2.2. Case 2

65-year old, male, with a history of daily ingestion of liquid paraffin for chronic constipation, was admitted following cough, sputum, chest pains and episodes of fever in June 2018. Two days before admission, he accidentally inhaled liquid paraffin which used as laxative. Chest CT scan performed at our hospital showed necrotic consolidation, ground glass opacity (GGO) and bronchial wall thickening in the right middle lobe (Fig. 2A). Laboratory examination showed leukocytosis (18000/mm<sup>3</sup>) with increased C-reactive protein level. Then we treated him with broad spectrum antibiotic. Bronchoscopy was performed with BAL

and TBLB on the second day after admission. Edematous changes was observed in the right middle and lower lobe with a lot of grayish purulent secretions were observed under bronchoscopy (Fig. 2B). The lavage was turbid, oily substances could be seen floating on the precipitated surface of the lavage solution. The pathological examinations reflected the acute inflammation and granuloma formation (Fig. 2D). The diagnosis of ELP was confirmed preliminarily based on medical history and radiological findings. Then we treated the patient with 30 mg prednisolone for 3 days, which significantly improved the patient's symptoms including fever, cough and sputum. Along with pharmacologic treatment, BAL was performed for several times to eliminate the non-soluble paraffin and inflammation. Two weeks after admission, we decided to discharge the patient because the symptoms and chest CT manifestations were thoroughly improved. A low dose chest CT was performed in outpatient clinic after 2 week of discharge. The CT scanning showed a remarkable decrease in necrotic consolidation and GGO in right middle lobe. Oral systemic steroid was prescribed for 6 weeks with gradual tapering off. 6 months after the treatment, chest CT showed dramatic improvement (Fig. 2C), no recurrence has been observed in the patient so far.

## 3. Literature review

To review previous literature for related cases, we conducted a PubMed search on 16th January 2019 by using key words "exogenous lipid pneumonia". 89 case reports were found. Upon the review of titles, abstracts, and full texts of these publications, we identified 22 articles (25 cases) describing exogenous lipid pneumonia caused by aspiration [3–24]. In particular, we found 3 articles describing 2 cases among these articles [17,20,24]. Of the 25 cases identified, abnormal chest radiographic findings of 3 cases were found during health examination, while these patients had no symptoms, and their CT scans all showed GGOs, mainly located in low lobes. 9 cases with fever and dyspnea were acute ELP, others are chronic. CT scans of acute cases showed large confluent consolidation mainly located in middle and low lobes of lung. The symptoms of chronic cases were mild, maybe just dry cough. Chest



**Fig. 2.** A Chest CT showed necrotic consolidations with air bronchograms in right middle lobe (lung window). B Six months after treatment, chest CT shows most of lung opacity has been resolved. C Edematous change was observed in the right middle and lower lobe with a lot of grayish purulent secretions. D Photomicrograph of lung biopsy with hematoxylin-eosin stain showed necrosis, granuloma.

CT scans showed consolidations, nodules or GGOs in the bilateral lungs, predominantly in the right middle and lower lobes. The treatment of ELP usually includes antibiotics, steroid, BAL. In our identified 25 cases, BALs were performed for 9 cases, steroid for 12 cases and both therapy with 5 cases. As a result, most patients, conditions were improved, while only one elderly female patient died [18]. The course of treatment ranged from a few days to one year. If a patient's treatments included antibiotics, BAL and steroid, he or she was likely to recover more quickly. All 25 cases are presented in [Table 1](#).

#### 4. Discussion

ELP is an uncommon form of pneumonia related to the aspiration of lipid containing substances, such as petroleum jelly, mineral oil laxatives, oil based nasal drops, milk, poppy seed oil, and egg yolk [17,25]. It is characterized by a chronic foreign body-type reaction to inhaled exogenous lipid droplets on histologic specimens [26,27]. The clinical presentation is nonspecific and consistent with pneumonia of other etiologies. Patients are likely to present with dyspnea and potentially a cough, chest pain, hemoptysis, intermittent fever, or leukocytosis may also manifest as well [23]. Betancourt et al. [28] reported that ELP could be classified into acute and chronic forms. Acute exogenous lipoid pneumonia is uncommon and typically caused by an episode of aspiration of a large quantity of a petroleum-based product. Chronic exogenous lipoid pneumonia usually results from repeated episodes of aspiration or the inhalation of fatty substances over an extended period.

In underdeveloped areas of China, especially in rural areas, constipation is a common illness of senior citizen. One of most important factors is unbalanced diet. The majority of senior citizens tend to have insufficient fruits and vegetables. Liquid paraffin and vegetable oil are cheap but effective treatments to relieve constipation. ELP occurs when oily substance reaches the alveoli through aspiration or inhalation. Many elderly ELP patients in China are farmers which means medical history and profession are very important clues for diagnose of ELP. Doctors should inquire the medical history of suspected patients carefully before the final diagnose. Mineral oil has been recommended as a

first-line therapy for constipation, however, the safety are questionable, especially in the patients with swallowing problems. After the aspiration of liquid paraffin, almost 50% of patients are asymptomatic. Although patients may have a history of aspiration or inhalation of ELP causing agents, this information is often undiscovered at the time of initial presentation [29]. In many cases, the ELP is discovered by chance, during routine chest imaging.

We diagnosed only 2 patients in the past 8 years, because clinical presentation was nonspecific, one of them was misdiagnosed for more than 2 months because we didn't obtained his history of oil administration, At last, his diagnosis was confirmed by histopathology analysis that revealed the accumulation of lipid carrying macrophages, vacuolar cells. The other patient had a clear history of mineral oil aspiration, so we diagnosed at first and gave effective treatment as early as possible. On chest radiographs, lipoid pneumonia showed many different manifestations. Most series are similar between acute and chronic presentations. ELP is more likely to manifest in middle and lower lobes bilaterally with consolidation, GGOs, septal thickening, infiltrates, atelectasis, fibrosis, interstitial lung disease, and crazy paving, while pleural effusions are often described in acute ELP. Chronic disease is more likely to appear as single or multiple nodules or masses, which could be regular or spiculated [30]. Kennedy et al. [30] separated the radiographic findings according to the time course of presentation. Patients with an acute presentation were noted to have a diffuse acinar pattern. The subacute form was described to have mixed interstitial and alveolar opacities while the chronic form was characterized by focal pneumonia with fibrosis, atelectasis, or tumor-like consolidation.

Treatment of lipoid pneumonia is not well studied, most published treatment experience to date is limited to case reports. Various treatments for lipoid pneumonia have been reported including discontinuing exposure to the offending agent, treating complicating infections with antibiotics, repeated bronchoalveolar lavage and providing supportive care including oxygen therapy. To date, no standard treatment regimen has been established. Antibiotic treatment for severe cases seems justified, considering bacterial superinfection [7–13]. Several case reports demonstrated the effectiveness of therapeutic lung lavage for lipoid

**Table 1**  
Cases of exogenous lipoid pneumonia caused by aspiration obtained from the literature review.

Author(s)	Year	Age at onset	Gender	Lesion location	Substance	Symptoms	Duration	Treatment	Outcome
Salgado IA	1992	four-month	M	bilateral	mineral oil	fever, vomiting, cough, dyspnea	one month	antibiotics, BAL, steroid	Much improved
Yokohori N	2002	34	M	RML	paraffin	fever, dyspnea, cough, hemoptysis, chest pain	Unknown	steroid, antibiotics, urinastatin	Very much improved
Ohwada A	2002	42	M	RLL	Paraffin	no	Unknown	untreated	No change
Cohen MA	2003	55	F	RUL	petrolatum	fever, dyspnea	2 weeks	comycin, steroid	much improved
Weinberg	2010	32	M	right perihilar	paraffin	dyspnoea, dry cough	7 days	amoxicillin-clavulamic acid	Very much improved
Harris K	2011	54	M	RML/RLL	unknown	mild, dry cough	5 weeks	antibiotics, steroid	Very much improved
Ishimatsu K	2012	69	F	RML/RLL	insecticide	unknown	2 years	antibiotics	Much improved
Pielaszkiewicz-Wydra M	2012	44	M	RML/LLB	mineral oil	fever, hemoptysis, chest pain, dyspnea	3months	antibiotics, steroid	Much improved
Nguyen CD	2013	63	F	LUL/RUL	unknown	fever, dyspnea, cough, sputum	3months	azithromycin	Very much improved
Doubková, M	2013	38	F	RLL	baby body oil	no	unknown	refused treatment	unknown
Venkatnarayan K	2014	40	M	bilateral	diesel	cough, sputum	2 months	antibiotics	Much improved
Marchiori E	2014	78	F	bilateral lungs	mineral oil	cough, sputum	unknown	nifurtimox	Much improved
Nakashima S	2015	65	M	bilateral middle and lower lung fields	milk	no	3months	BAL	much improved
Modaresi M	2015	2.5	M	bilateral	oil	dyspnea	1 month	BAL	much improved
Kuroyama M(case1)	2015	66	M	bilateral middle and lower lobes	oil	dry cough	8 month	BAL	Very much improved
Kuroyama M(case2)	2015	38	F	bilateral middle and lower lobes	oil	short of breath	3 months	no treatment	Much improved
Nie X	2016	100	F	bilateral	menthol	fever, cough, sputum	1 day	antibiotics, noninvasive ventilator	Ddied
Yasui H	2016	32	M	bilateral	kerosene	fever, chest pain, chills	2months	steroid	much improved
Cabri A E (case1)	2017	57	F	RLL	mineral oil	dry cough	3months	unknown	much improved
Cabri A E (case2)	2017	66	M	RML/LLB	mineral oil	dyspnea, cough, wheezing	2months	unknown	much improved
Kilaru H	2017	23	F	LLB	petrolatum ointment	fever, cough, dyspnea	1year	steroid, BAL	Very much improved
Tukaram S J	2018	2	M	bilateral lungs	mineral oil	dyspnea	6weeks	BAL, antibiotics, steroid	Very much improved
Kim H J	2018	30	F	RML/RLL	mineral oil	fever, dyspnea, cough and right pleuritic pain	6weeks	BAL, antibiotics, steroid	Very much improved
Wong CF(case 1)	2018	50	F	RML	kerosene	cough, sputum	1year	steroid, BAL	much improved
Wong CF(case2)	2018	Middle age	F	RML	oil	cough	1year	steroid, BAL	much improved

RUL = right upper lobe RML = right middle lobe RLL = right low lobe.

LUL = left upper lobe LLL = left lower lobe.

BAL = bronchosopic lavage.

pneumonia, which not only washed away lipids directly but also improved lung opacities [15–17]. Steroids are suggested for the treatment of lipid pneumonia and have been proved successful in some cases, however, the efficiency of steroids mostly depending on the degree of intoxication [5–10,18,22–24]. Systemic steroid was administered initially at dose of 0.5mg/kg and gradually tapered off [31]. ELP is an uncommon clinical condition, we don't have too many experience in treating this disease, we treated these two patients with antibiotics, systemic steroid and BAL therapy. When the patients leucocyte and C-reactive protein returned to normal level, antibiotic treatment was stopped. Oral systemic steroid was then continued for several weeks with gradual tapering off. At follow-up times, chest CT scans showed marked resolution of most of consolidation in right lung, and patients had no symptom.

## 5. Conclusions

ELP is a rare, often underdiagnosed entity. It can mimic many respiratory conditions, including lung cancer and various infectious pneumonias, so the diagnosis is frequently missed or delayed. Our two patients were treated successfully at last and our treatments may provide valuable reference for severe lipid pneumonia. Patients who are self-treating chronic constipation with routine mineral oil use should be referred to a physician provider to ensure proper management because pharmacists may not be familiar with the risk of lipid pneumonia posed by the use of mineral oil. And health education messages are also needed to highlight the risks associated with the cultural practice of oil administration.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rmcr.2019.100850>.

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