

## Fire-eater's pneumonia characterized by pneumatocele formation and spontaneous resolution

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### ABSTRACT

Liquid hydrocarbons derived from petroleum are widely used in industry and in households. Aspiration of massive amounts may lead to an acute and fatal form of exogenous lipid pneumonia (fire-eater's pneumonia). We present a rare case of chemical pneumonitis following accidental lamp oil aspiration characterized by pneumatocele formation and spontaneous resolution. Initial findings on posteroanterior chest radiographs were smoothly circumscribed lower zone masses with and without air-fluid levels. Chest computed tomography also showed multiple thin-walled cavities with and without air-fluid levels. Complete resolution of findings despite initial severe presentation without corticosteroid or antibiotic treatment is noteworthy.

*Key words:* • pneumonia • computed tomography • radiography

Liquid hydrocarbons derived from petroleum are widely used in industry and in households. Gasoline, fluorochlorocarbon, lubricating oils/motor oils, lighter fluid, mineral spirits, diesel fluid, lamp oil and kerosene are the most frequently encountered liquid hydrocarbon compounds (1). Human beings may be exposed to these compounds by several means, the most common one being accidental aspiration. Petroleum aspiration can also occur in fire-eaters who use a lighter fluid, such as kerosene, for flame blowing. The aspiration of massive amounts of liquid paraffin and petroleum may lead to an acute and fatal form of exogenous lipid pneumonia (fire-eater's pneumonia) (2). Characteristic clinical symptoms are cough, dyspnea, chest pain and fever. Consolidations, smooth circumscribed nodules, and pneumatoceles are observed on chest radiography (3–5). A steroid and/or antibiotic regimen is the recommended type of treatment (6–8). Our case is a 27-year-old male with chemical pneumonitis following accidental lamp oil aspiration during a flame blowing act. He rejected the treatment regimen and, although he only used analgesics, both clinical and radiological improvements were observed.

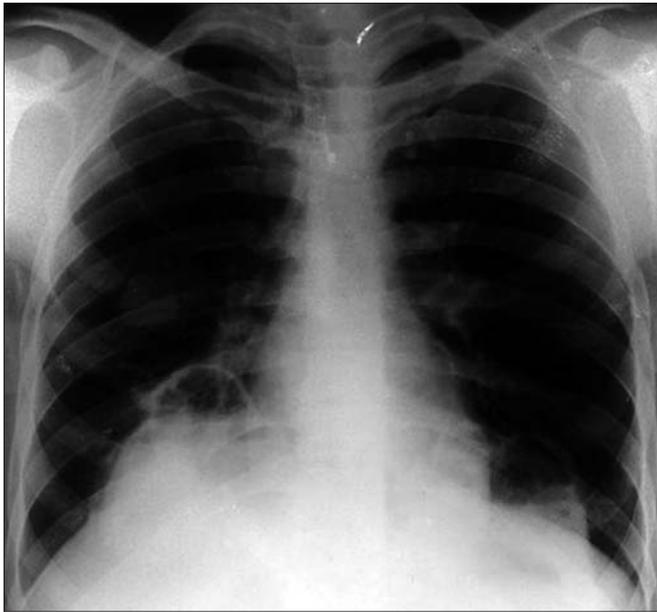
### Case report

A 27-year-old male patient working as a showman aspirated 50 mL of lamp oil (paraffin mixture) during fire-eating. He was admitted to the emergency service of a local hospital for chills, high fever (40°C axillary), dyspnea and chest pain 4 to 5 hours after the incident. The patient rejected hospitalization and treatment, but later consented to a 2-day course of analgesics. On the third day following the incident, he referred to our outpatient clinic with similar symptoms except fever. Physical examination was normal and his general body habitus was within normal limits. Posteroanterior chest radiograph showed smoothly circumscribed lower zone masses with and without air-fluid levels (Fig. 1). All of the laboratory results were within normal ranges. Pulmonary function test results were as follows: FVC (forced vital capacity), 4.07 L/s (79% predicted); FEV1 (forced expiratory volume in 1 second), 3.83 (L/s) (88% predicted); FEV1/FVC, 94.1%. Chest computed tomography (CT) revealed multiple thin-walled cavities with and without air-fluid levels (Fig. 2). The patient was admitted to the hospital with a diagnosis of chemical pneumonitis. He rejected treatment and thus was discharged with a follow-up appointment in 10 days. During the follow-up examination all his complaints had disappeared and the opacities identified on the initial chest radiograph were also resolving. The patient rejected treatment and was lost to follow-up for 4 months. A control chest CT examination obtained at that time revealed (Fig. 3).

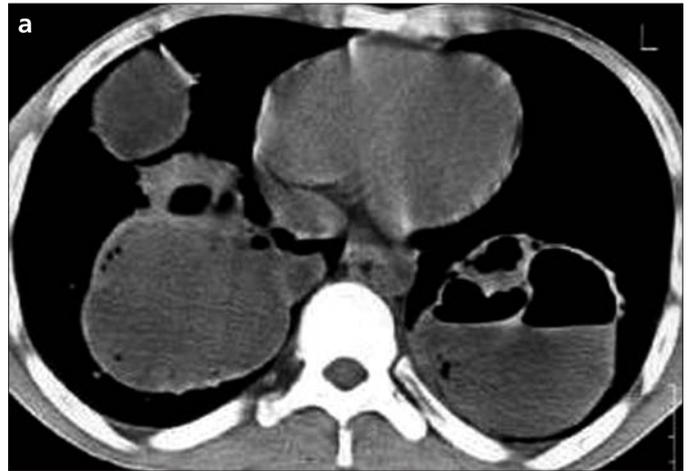
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**Figure 1.** Frontal chest radiograph shows basilar opacities with air-fluid levels.



**Figure 2. a, b.** Axial chest CT images on admission displayed in the soft tissue (a) and lung (b) windows show multiple, bilateral basilar cystic lesions containing air-fluid levels and measuring 4–8 cm in diameter.



**Figure 3. a, b.** Axial chest CT images four months later displayed in the soft tissue (a) and lung (b) windows show complete regression of cystic-cavitary lesions demonstrated in Fig.2.

## Discussion

Aspiration of low-volatility and high-viscosity hydrocarbons can lead to pseudotumoral exogenous lipoid pneumonia, which becomes chronic and is often asymptomatic. The most common example is the aspiration of paraffin oil. Aspiration of high-volatility and low-viscosity hydrocarbons can lead to acute pseudoinfectious pneumonia. The most frequently aspirated hydrocarbon is kerosene, but cleaning products including white spirit and petroleum-derived fuels are also reported to be aspirated (9, 10).

Grossi et al. reported necrotising acute bronchiolitis and necrotising acute fibrinous pneumonia as the histological findings in lung tissue obtained one week after ingestion of pyrofluid, according to the features previously reported in experimental models (7, 11). Burkhardt et al. showed inflammatory reactions by electron microscopy

in their case report, which is the only study showing that the reaction could be the result of a pseudoinfection (3). The clinical and radiological evolution and laboratory findings of our case support the diagnosis of fire-eater's pneumonia although invasive tissue sampling and thorough microbiologic evaluation are lacking.

Pulmonary manifestations may occur due to any degree of hydrocarbon exposure. Clinical signs are not specific and include fever, cough, dyspnea and gastrointestinal irritation with vomiting (5, 7). Cyanosis, hemoptysis, thoracic pain and/or diarrhea have also been described as symptoms which disappear in 2–3 weeks. Hydrocarbon pneumonia can be fatal in 1–2% of the cases, with cyanosis, apnea and cardiac arrest (12, 13). Diagnosis is straightforward if there is a history of liquid hydrocarbon exposure.

Patients with a history of liquid hydrocarbon aspiration pneumonia may show a range of radiological findings. In a series of exogenous lipid pneumonia cases due to paraffin oil aspiration reported by Gondouin et al., the most frequent radiological findings were alveolar consolidation (51%), ground-glass opacities (39%), and alveolar nodules (23%) (14).

High resolution CT is the best imaging method for lipid pneumonia diagnosis. It may demonstrate alveolar consolidations, ground-glass attenuation, interstitial abnormalities including thickening of interlobular septa and intralobular interstitium, and small, ill-defined centrilobular nodules. It also demonstrates possible complications, such as pneumatocele formation and pneumothorax (15, 16).

Imaging findings on chest radiographs usually resolve within 2 weeks to 8 months, leaving only minimal scarring (4, 5). In our case, chest radiograph and CT revealed smoothly circumscribed lower zone masses with

air-fluid levels. After one month, the symptoms regressed and there was remarkable radiological recovery. The control screening at the fourth month showed merely sequelae.

Pneumothorax and pneumomediastinum rarely complicate hydrocarbon pneumonia. In a series of 3,462 Iranian children with accidental hydrocarbon poisoning, chest radiographs demonstrated pneumothorax in 6 and pneumomediastinum in 2 of the cases (17). Treatment is usually supportive and may require ventilatory support. The utility of antibiotics and corticosteroids in the treatment is still a matter of debate. Borer and Koelz reported that symptomatic treatment is sufficient and, in case of any complication, addition of antibiotic treatment would be beneficial, whereas in other published literature, antibiotics and steroids were used in routine management (18).

In conclusion, we presented a case of lamp-oil aspiration in a showman whose radiological findings included multiple thin-walled cavities with and without air-fluid levels. Spontaneous resolution of clinical and radiological manifestations is noteworthy.

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