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# Self-injection of kerosene with chemical pneumonitis and abscess formation – a case report and literature review

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**ABSTRACT**

**Introduction and aim.** Kerosene, a widely available household fuel in Sri Lanka, is a common cause of accidental poisoning, especially in children, and is occasionally used for self-harm, which can cause complications such as chemical pneumonitis, abscesses, and thrombosis. Its unsafe storage practices increase the risk of accidental exposure.

**Description of the case.** A 16-year-old Sri Lankan male self-injected kerosene into the left cubital fossa. Although initially stable, he later developed chemical pneumonitis, left cephalic vein thrombosis, and a sterile abscess at the injection site.

**Conclusion.** Early multidisciplinary intervention and close clinical monitoring led to a favorable outcome. A review of the literature reveals that intravenous hydrocarbon injection, although rare, can lead to significant local and systemic toxicities.

**Keywords.** abscess, kerosene, pneumonitis, self-injection

## Introduction

Kerosene, a widely used household fuel and solvent in low-resource settings such as Sri Lanka, poses significant public health risks due to its toxic properties and frequent involvement in accidental poisonings, particularly among children.[1,2] While ingestion and inhalation are well-documented routes of exposure, intravenous self-injection of kerosene remains a rare and underreported method of deliberate self-harm with severe systemic complications. Chemically, kerosene consists of a complex mixture of hydrocarbons, including paraffins, naphthenes and aromatics, as well as potentially toxic compounds such as n-hexane, naphthalene and benzene.[1] Its low viscosity, low surface tension, and high volatility facilitate rapid absorption into tissues, leading to local necrosis, systemic toxicity, and, in cases of aspiration or hematogenous spread, chemical pneumonitis, a life-threatening complication.[2,3] Although the previous literature has described kerosene-induced pneumonitis after inhalation or ingestion, reports of intravenous injection leading to concurrent complications, such as deep vein thrombosis, sterile abscess formation, and acute lung injury, are exceedingly rare, particularly in previously healthy adolescents.

## Aim

This case presents a unique clinical scenario in which a 16-year-old man developed multisystem involvement after self-injection of kerosene, highlighting the need for increased clinical awareness and prompt intervention in such atypical presentations.

By detailing this case, we aim to emphasize the novelty of this presentation, underscore the pathophysiological mechanisms of intravenous kerosene toxicity, and improve the recognition and management of similar cases in emergency and clinical settings.

## Description of the case

A 16-year-old right-handed school-going adolescent male was admitted to the Teaching Hospital Anuradhapura, Sri Lanka, on February 2, 2024, at 6:50 PM, approximately one hour and 20 minutes after self-injecting 4 ml of kerosene into his left cubital fossa. He was preparing for the Ordinary Level upcoming national exam, the General Certificate of Education, conducted throughout the island.

On admission, he was conscious and rational, with a noticeable kerosene odor on his breath and an erythematous patch over the injection site. His blood pressure was 130/80 mmHg, his heart rate was 90 beats per minute and he was tachypnoeic with a respiratory rate of 28 breaths per minute and a Glasgow Coma Scale of 15. His oxygen saturation, as measured by pulse oximetry, was 100% while breathing room air, with clear lung fields on auscultation. Empirical broad-spectrum intravenous antibiotics were

started, including ceftriaxone 1 g twice a day and metronidazole 500 mg every eight hours with normal intravenous normal saline for hydration.

On day 2, arterial blood gas analysis revealed type 1 respiratory failure ($PaO_2$ 7.53 kPa, $PaCO_2$ 3.02 kPa, pH 7.508) with respiratory alkalosis, indicating early pulmonary involvement despite a normal initial chest radiograph. This discrepancy likely reflects the limited known sensitivity of plain radiography in early chemical pneumonitis. Intravenous hydrocortisone (100 mg six-hourly) was initiated alongside oxygen therapy (2 L/min via face mask). A repeat chest X-ray (Figure 1B) on day 3 showed widespread, multiple, poorly defined, small opacities over both lung fields consistent with pneumonitis, confirming kerosene-induced pneumonitis. During the next 24 hours, the patient developed worsening respiratory distress, fever, and cellulitis at the injection site.

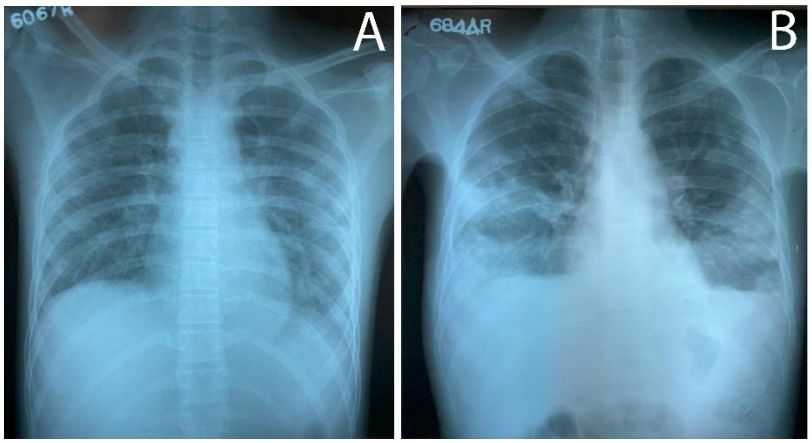


**Fig. 1**. Chest radiographs taken during the hospital stay, A: February 3, 2024 (day 2), normal chest X-ray, B: February 4, 2024 (day 3), evidence of pneumonitis by widespread bilateral poorly defined small opacities

Despite initial stabilization, his respiratory status deteriorated, and he was transferred to the intensive care unit (ICU) for close monitoring. In the ICU, oxygen therapy through a 60% venturi device, intravenous antibiotics, fluid, hydrocortisone, and subcutaneous enoxaparin.

On the fourth day of admission, acute cephalic vein thrombosis, along with soft tissue inflammation, was observed on ultrasound and Doppler imaging of the left forearm without any evidence of compartment syndrome. Intravenous heparin therapy was started to prevent further propagation of the thrombus.

On the sixth day, he was discharged from the ICU and moved to the ward. Before discharge, a psychiatrist and was prescribed sertraline 50 mg once a day. On admission, the patient was evaluated using the SAD PERSONS scale for suicidal risk,[4] with a score of 3/10 (indicating that the risk of

suicidality is low and discharge may be safe). However, no formal suicide risk assessment tool (for example, C-SSRS) was administered before discharge.

On the seventh day, he developed pain and swelling at the injection site, and an ultrasound confirmed an abscess at the cubital fossa and the biceps muscle. The incision and drainage of the abscess was performed under general anesthesia on the ninth day. The culture did not yield bacterial growth, suggesting sterile abscess formation.

Management presented a significant therapeutic challenge, requiring concurrent administration of systemic corticosteroids for chemical pneumonitis and anticoagulation for cephalic vein thrombosis. This was further complicated by the subsequent development of a sterile abscess at the injection site, raising concerns about (1) the potential risk of bleeding from combined anticoagulant and high-dose steroid therapy and (2) the possible abscess rupture with anticoagulation. We successfully managed these competing risks through clinical follow-up and maintaining therapeutic anticoagulation goals. The patient did not experience bleeding complications, and the abscess remained contained until surgical drainage on day 9.

He was discharged from the hospital on the eleventh day with a tapering course of prednisolone. His lungs were clear two weeks later and the wound healed. Refer to Table 1 for a summary of the investigations and Table 2 for the timeline.

**Table 1.** Investigations summary

| | **February 3** | **February 6** | **February 8** | **February 10** | **February 12** |
|---|---|---|---|---|---|
| White blood cells (4–10 x$10^9$ /L) | 5.06 | 12.21 | 12 | 15.6 | 14.65 |
| Neutrophils (40–60%) | 84 | 86 | 81 | 82.7 | 60 |
| Lymphocytes (20–40%) | 12 | 7 | 13 | 12.1 | 32 |
| Hemoglobin (12–16 g/dL) | 13 | 13.3 | 13 | 12.6 | 12 |
| Platelets (150–450 x$10^9$/L) | 192 | 238 | 198 | 308 | 388 |
| Blood urea (2.5–6.5 mmol/L) | – | – | 3.3 | – | – |
| Serum creatinine (45–120 micromoles/L) | 73 | 56 | 52 | – | – |
| Serum sodium (135–148 mmol/L) | 137 | 137 | 138 | 144 | – |
| Serum potassium (3.5–5.5 mmol/L) | 3.5 | 4.1 | 3.4 | 4.4 | – |

| | | | | | |
|---|---|---|---|---|---|
| Aspartate transaminase (0–50 U/L) | 28 | 21 | – | – | – |
| Alanine transaminase (0–45 U/L) | 10 | 11 | – | – | – |
| Gamma-glutamyl transferase (0–40 U/L) | – | 16 | - | 18 | - |
| Total bilirubin (3–20 micromoles/L) | – | 8.6 | – | – | – |
| Direct bilirubin (0–14 micromoles/L) | – | 4.3 | – | – | – |
| Albumin (35–55 g/L) | – | 38 | – | – | – |
| Globulin (15–35 g/L) | – | 33 | – | – | – |
| International normalized ratio (<1.4) | – | 1.01 | 1.28 | – | – |
| Activated partial thromboplastin time (<25 seconds) | – | 34.4 | 37.2 | – | – |
| C-reactive protein (0–6 mg/L) | – | 382 | 109 | 49 | 19 |

**Table 2.** Timeline*

| **Date and time** | **Day** | **Clinical sequence** |
|---|---|---|
| February 2, 2024 | 01 | 5:30 PM – self-injection of kerosene oil |
| | | 6:50 PM – admitted to Teaching Hospital Anuradhapura |
| February 3, 2024 | 02 | first chest X-ray performed – normal<br>ABG – type 1 respiratory failure<br>supplementary oxygen started |
| February 4, 2024 | 03 | second chest X-ray done – evidence of acute pneumonitis |
| February 5, 2024 | 04 | USS/Doppler – acute thrombosis of the left cephalic vein<br>transferred to the ICU for close monitoring |
| February 6, 2024 | 05 | sertraline started after a psychiatric evaluation |
| February 7, 2024 | 06 | discharged from the ICU to the ward |
| February 9, 2024 | 08 | large abscess over the injection site |
| February 10, 2024 | 09 | incision and drainage of abscess |
| February 12, 2024 | 11 | discharged |
| February 27, 2024 | | review healed wound, no lung signs |

* ABG – arterial blood gas analysis, USS – ultrasound scan, ICU – intensive care unit



**Discussion**

We present a patient who attempted to inject kerosene intravenously, which caused chemical pneumonitis and the formation of sterile abscesses at the injection site, probably caused by accidental extravasation. There is no history of mental illness or drug addiction.

A review of kerosene or hydrocarbon injections based on a PubMed search and references (Table 3) analyzed 65 case reports and series involving 114 patients and 117 incidents (including three attempts by a single individual). Hydrocarbon injections predominantly affected men (67%, 10% unspecified gender), and 12 fatalities were reported (two unspecified genders, one female). The findings suggest that intentional hydrocarbon injections (mainly suicidal) are most common among young men with a history of substance abuse or mental illness. The route of administration had a significant influence on clinical outcomes. Subcutaneous or intramuscular routes (76%) caused localized tissue damage (e.g., abscesses), while intravenous or intrathoracic injections (36%) led to systemic toxicity (eg arrhythmias, acute lung injury).

However, nine patients who reported intravenous injections (including five deaths) did not show evidence of pulmonary involvement. Among the deaths, four were attributed to cardiac arrhythmia, which occurred before chemical pneumonitis could develop.[5–8] The other death was from a 39-year-old man who injected kerosene into his hemorrhoids in the mistaken belief of its therapeutic potential. He died one month later due to a myocardial infarction, a day after major surgery.[9] In particular, two of the four deaths due to arrhythmia resulted from accidental injection of kerosene by healthcare workers.[5,8] Only one patient was confirmed as a suicidal attempt,[6] while the other was a homicidal act.[7] The remaining four survivors without pulmonary involvement probably attempted intravenous self-administration but instead injected subcutaneously, as evidenced by local tissue reaction.[10–14]

Further analysis of fatalities revealed that five of the other seven deaths were reported in a case series of 10 patients with substance use disorder,[15] had multiorgan failure and acute respiratory distress,[16] and in the other death, we could not obtain the full text for further analysis.[17] Geographically, seven out of the 12 deaths are from Iran. Systemic complications, though rare, were severe in intravenous cases, with mortality associated with rapid absorption or high-volume injections.

Three studies from Iran and Iraq represent the most extensive documented case series of intentional kerosene injection.[15,18,19] All three articles contextualize the sociocultural and psychological landscape of the socioeconomically strained environment of postwar Iran and Iraq, where stigma, limited psychiatric care, and war-related trauma appear to fuel such self-destructive behaviors.

Furthermore, a case report describes the injection of mineral oil for cosmetic purposes in the USA, leading to sclerosing lipogranulomatosis.[20] Although only one case report was included in this review, numerous other case reports document similar complications with the injection of mineral oil subcutaneously for cosmetic purposes.

**Table 3.** Summary of literature (references are in supplementary file S1)[a]

| No | Reference | Age | Sex | Injection | | | | Complications and outcome | Pulmonary involvement and imaging | Intention | Comorbidity, attempts, and other info |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Route | Site | Vol | Chemical | | | | |
| 1 | Green 1977 USA[1] | 21 | M | IV | L & R cubital fossa | 3–4 mL | Naphtha | Sterile abscess. Discharged on day 6 | Lung involvement was not observed | Suicidal | Substance use disorder, intoxicated |
| 2 | Neeld 1978 USA[2] | 31 | M | IV | – | 2–6 mL | Hydrocarbon insecticide | No local reaction. Left against medical advice after 3 days | Pneumonitis with patchy consolidation & atelectasis | Suicidal | Substance use disorder for 12 years |
| 3 | Vaziri 1979, 1980* USA[3,4] | 40 | M | IV | L cubital fossa | 3 mL | Naphtha | No local reaction. Discharged on day 5 | Pneumonitis, bilateral ground glass shadows, L pleural effusion | Suicidal | – |
| 4 | Erichsen 1979#^ Denmark[5] | – | – | SC | – | – | – | – | – | – | – |
| 5 | Kósa 1981#^ Hungary[6] | NS | | IV | Arm? | 20 mL | Petrol | The patient died 45 minutes after repeated seizures | Probably died before pneumonitis | Accidental injection by health care worker | After surgery |

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| 6 | Beck 1981 UK[7] | 27 | M | IV & SC | L arm | 4–9 mL | Hydrocarbon insecticide | Extensive necrosis, sterile abscess discharged on day 25 | Pneumonitis, alveolar & interstitial infiltrates in both lungs. | Suicidal | Substance use disorder |
| 7 | Goldberg 1982 USA[8] 2 cases | 22 | M | SC | L forearm | NS | Hydrocarbon insecticide | Two sterile abscesses. Discharged on day 9 | Lung involvement was not described | Suicidal. | Substance use disorder & depression |
| | | 24 | M | SC | L forearm | NS | Hydrocarbon insecticide | Sterile abscess discharged on day 9 | Lung involvement was not described | Suicidal | Substance use disorder |
| 8 | Layton 1983 USA[9] | 38 | M | SC & IM | R forearm | 5 mL | Gasoline | Compartment syndrome. Ischemic contracture damage to all three major nerves. Rehabilitation for the R arm discharged on day 44 | Lung involvement was not described | To get 'high' | Substance use disorder amphetamine, barbiturates narcotics |
| 9 | Buseti 1984^# Italy[10] | – | – | IV | – | – | Kerosene | – | Respiratory insufficiency | – | – |
| 10 | Qaryoute 1984 | 18 | F | SC | R inguinal area | 5 mL | Kerosene | Abscess, major surgery, recurrent hospitalizations. | Lung involvement was not described | Non–suicidal, | – |

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| | Jordan 2 cases[11] | | | | | | | | | believed therapeutic | |
| | | 22 | M | SC | L arm | 5 mL | Kerosene | Necrosis, major surgery. Recovered. | Lung involvement was not described | Assault. forceful injection | – |
| 11 | Saulsbury 1984[12] | 9/12 | M | IV | – | NS | Naphtha | Survived, developmental delay, cerebral palsy and cortical blindness | Respiratory arrest, pneumonitis | Mother injected | Child unresponsive before injection |
| | 2 admissions | 11/12 | | IV | Injected into IV line | | | | Respiratory arrest, | Mother injected | Child placed in foster care. Mother guilty for manslaughter |
| 12 | Wedin 1984 USA | 23 | M | SC | R forearm | NS | Hydrocarbon insecticide | Sterile abscess. Discharged on day nine | Lung involvement was not observed | Suicidal | Paraplegic, IV drug abuse. |
| | 2 cases [13] | 16 | M | SC | R forearm | 1.5–2 mL | Turpentine | Sterile abscess | Lung involvement was not observed | Suicidal | The man came from a psychiatric hospital |
| 13 | Case 1985^ USA[14] | Elderly | M | IV | – | 25–40 mL | Naphtha | Arrhythmia and sudden death from blunt chest trauma. | Probably died before pneumonitis | Homicidal | High concentration of naphtha in cardiac blood |

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| 14 | Rubinstein 1985 Nixon 1985 Israel*[15,16] | 22 | F | SC | Multiple sites | NS | kerosene | Multiple abscesses on the skin, epidural space, knee, etc. Acute arthritis, paraparesis, & sensory loss T8 laminectomy, but paraplegic after 18 months | Lung involvement was not observed | Homicidal. (boyfriend injected after sedating with hypnotics) | He murdered his wife using the same technique |
| 15 | Wason 1986 USA[17] | 22 | M | IV & SC | R cubital fossa | 5 mL | Turpentine | Sterile abscess discharged on day 20 | Pulmonary edema | Suicidal | Depressed, unable to offer sex change operation |
| 16 | Bushe 1986 UK[18] | 18 | F | SC | R cubital fossa | 2 mL | Petroleum lighter fuel | Cellulitis, no abscess, discharged on day 10 | Lung involvement was not observed | DSH | – |
| 17 | Bozzuto 1987 USA[19] | 29 | M | IV | R cubital fossa | 12 mL | Hydrocarbon insecticide | Cellulitis, microscopic hemoglobinuria, and myoglobinuria. Transferred to psychiatric ward | Lung involvement was not observed | To get 'high' | Previous suicidal attempts. Injected previously 4 days ago, multiple injection marks |
| 18 | Sevcik 1992 Czech[20] | 30 | M | IV | – | 8 mL | Xylene | Ventilated, hemodialyzed, GTC seizures, referred to psychiatric facility | ARDS, ventilated | Suicidal | – |

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| 19 | Geoffray 1992 France 2 cases[21] | 24 case 1 | M | SC | Both hands, the elbow folds & neck | 10 mL | Naphtha | SC necrosis with abscess formation. Skin graft Diabetes insipidus. | No lung involvement was observed. | Suicidal | – |
| | | 43 case 2 | M | SC | Both buttocks | 0.5 mL | Petrol | Two abscesses with fistulas formed on the buttocks. Complete cure | No lung involvement was observed. | Sexual stimulation | – |
| 20 | Larsen 1992 USA[22] | 17 | F | SC | Both hands | 3 mL | Hydrocarbon insecticide | Abscess, compartment syndrome | No lung involvement was observed. | Suicidal | – |
| 21 | Rimmer 1993 UK 2 cases[23] | 30 | M | SC | L index finger | 2 mL | White spirits | I&D | No lung involvement was observed. | Accidental | No |
| | | 45 | M | SC | L thumb | NS | White spirits | Abscess ruptured spontaneously | No lung involvement was observed. | Accidental | No |
| 22 | Greenberg 1993 USA[24] | 38 | M | IV | NS | 5–15 mL | Gasoline | Atrial fibrillation. Left against medical advice | Lung involvement was not described | DSH | Substance use disorder (IV & tobacco) |
| 23 | Bindlish 1993 Canada[25] | 23 | M | SC | R forearm and L pectoral muscle | NS | Gasoline | Pectoral muscle necrosis, compartment syndrome, fasciotomy of the arm and chest wall, and psychiatric | Lung involvement was not observed | Suicidal | NS |

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| | | | | | | | | evaluation. discharged on day 12 | | | |
| 24 | Grimmet 1996 Australia[26] | 28 | F | IV | NS | 1 mL | Endosulfan in xylene 30% | Status epilepticus, rhabdomyolysis, proximal myopathy, hypoxic brain injury, discharged on day 21 | Ventilated. R lower lobe pneumonia | Suicidal | Substance use disorder (IV) & 2 previous suicide attempts |
| 25 | Khammash 1997^ Jordan 3 cases[27] | – | – | SC | – | – | – | Severe necrotizing inflammation skin grafting | – | – | – |
| 26 | Rush 1998 USA[28] | 33 | M | SC | L cubital fossa | 4 mL | Naphtha | Cellulitis & large abscess. Discharged on day 20 | Lung involvement was not observed | Suicidal | A previous suicide attempt, depression, substance use disorder (IV) |
| 27 | Shustermann 1999 USA[29] | 34 | M | SC | L cubital fossa | 1.5 mL | Dripless oil | Cellulitis. Discharged with psychiatry review | Lung involvement was not observed | Suicidal | Psoriasis with folliculitis, HIV, depression, two suicidal attempts |

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| 28 | Guerguerian 2000 Canada[30] | 18 | M | IV | Cubital fossa (Side NS) | NS | Hydrocarbon | Acute lung injury discharged on day 15 | Xray increased vascular markings. pulmonary oedema | Suicidal | Self–inflicted hematuria. |
| 29 | Aguemon 2000# Benin[31] | 18 | M | IV | R upper limb | 2.5 mL | Paraffin oil | Local thrombophlebitis. Necrosis and shock, Recovered | Cough & Chest pain | DSH | Anxiety neurosis |
| 30 | Federmann 2000^# Germany[32] | 26 | M | SC | L cubital fossa | – | Heating oil | Necrosis & abscess. Surgical debridement with mesh graft | Lung involvement was not observed | – | – |
| 31 | Mussoff 2000# Germany[33] | 26 | M | SC | Surgically treated site of an inguinal hernia | – | Petroleum distillates | Significant localized painful swelling of the soft tissues, large colliquation necrosis of the subcutaneous tissue with petroleum odour. | Lung involvement was not observed | Self–mutilating behaviour | Recent surgical treatment of an inguinal hernia. |
| 32 | Buchman 2000 USA 5 cases[34] | 54 | F | IM & SC | L & R forearms | – | Raid Roach Killer | Swelling in both forearms and hands, liquefaction necrosis in multiple sites. | Lung involvement was not observed | Suicidal | History of hypertension, diabetes mellitus, alcohol abuse, and suicide attempts |

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| | | 38 | M | SC & ? IV | Cephalic vein by another substance abuser | – | Unknown insecticide contains hydrocarbon | Incision and drainage, the thrombosed portion of the cephalic vein was resected. Referred to a drug rehabilitation centre | Lung involvement was not observed | Not suicidal | Substance use disorder |
| | | | | IM | Upper extremity | | Ant & roach killer | Muscle & fat necrosis, multiple debridement | Lung involvement was not observed | Suicidal | |
| | | | | IM | Upper extremity | | Roach killer | Muscle & fat necrosis, multiple debridement | Lung involvement was not observed | Suicidal | |
| | | | | IM | Upper extremity | | Roach killer | Muscle & fat necrosis, multiple debridement | Lung involvement was not observed | Suicidal | |
| 33 | Perings 2001# Germany[35] | 20 | M | IV | NS | 20 mL | Lamp oil (Liquid paraffin) | R heart failure, mild DIC, psychiatric therapy | Lipoid pneumonia | Suicidal | – |
| 34 | Awe 2003 Saudi Arabia[36] | 33 | M | SC | Both side of his R leg | 5 mL | Kerosene | Acute necrotizing fasciitis with compromised venous return. Skin grafts were applied. Discharged cured | Lung involvement was not observed | DSH | Injected twice with kerosene, ingested razor blades. Diagnosed with personality disorder. |

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| 35 | Solak 2006 Turkey[37] | 53 | M | IT | L hemithorax through the 5th intercostal space | 10 mL | Thinner | No local effects. Discharged on day 35. CT after 1 year of pleural thickening. | Atelectasis with massive effusions (chemical empyema) L lung CT L pleural effusion, atelectasis in the L lower lobe, and pleural thickening. | Suicidal | Major depression |
| 36 | Domej 2007 Austria[38] | 26 | M | IV | L cubital vein. | 10 mL | Gasoline | Atrial fibrillation, multiorgan failure, BL hemorrhagic effusions ARDS, ventilated, AKI, CVVH, rhabdomyolysis. Discharged for psychiatric care. 6 months after restrictive lung diseases with nodular & reticular opacities | FOB Hemorrhagic bronchopneumonia diffuse mucosal hemorrhage. X–ray interstitial & BL alveolar opacities CT severe, patchy consolidations, ARDS, BL pleural effusions. | Suicidal | – |
| 37 | Thaha 2007 UK | 35 | F | SC | L cubital fossa (June 1998) | 3–5 mL | Lighter fluid | Compartment syndrome. surgical decompression | Lung involvement was not observed | Suicidal | Psychiatric illness |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 attempts[39] | | | SC | L Femoral vein (October 1998) | 10 mL | | Local inflammation, sterile abscess, and extensive fat necrosis. Incision and drainage done. Left to heal by secondary intention | Lung involvement was not observed | Suicidal | |
| | | | | SC | Volar aspect of the right arm (March 1999) | NS | | Multiple stab wounds were made on the skin under local anesthesia and a thorough 'saline flush out' done | Lung involvement was not observed | Suicidal | |
| 38 | Hazari 2008 USA[40] | 34 | M | IM | Thighs and buttocks | 5 L | Mineral oil | Multiple abscesses in the lower extremities, multiple surgeries, pneumonia, effusion & septicemia (sclerosing lipogranulomatosis) discharged after 6 months | Developed effusion and pneumonia, unlikely to be direct effect | Aesthetic | – |
| 39 | Amiri 2009 Iran 10 cases[41] | mean 20.3 (16–26) | 9 M 1F | IV | Cubital vein | five > 5mL | kerosene | 5 died & 4 of them injected more than 5 ml. 7–phlebitis | All had pneumonitis. No soft tissue injuries | Suicidal | All had substance use disorder (IV), 4 had previous suicidal attempts |

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| | | | | | | | | 6–arrhythmia<br>8–loss of consciousness | | | |
| 40 | Farahvash 2009 Iran 21 cases[42] | 16–85 | 15 M 6 F | 8 SC 10 IM 3 SC & IM | All injected into arm but one injected into arm & abdomen | 1–30 mL mean 4.9 mL | Hydrocarbon | Compartment syndrome–13 (fasciotomy 5 skin graft 10)<br>Abcess–5<br>No surgery3<br>4 had long–term deformity | Lung involvement was not observed | Suicidal | 14/21 had comorbidities.<br>4 Major depression<br>2 schizophrenia<br>1–epilepsy<br>1–migraine<br>7 Substance use disorder opium<br>5 previous suicide attempt. |
| 41 | Fink 2010 Germany[43] | 22 | M | IV, SC & IM | L cubital vein | 7 mL | Gasoline | Cellulitis 10 cm around the injection area. Surgical debridement. Referred to psychiatrist | Multiple opacities on X-ray in the bases of the lung with bilateral effusion<br>CT basal ground–glass opacities | Suicidal | Asperger syndrome, suicidal attempt by benzodiazepine overdose. |
| 42 | Rostami 2010 Iran[44] | 39 | M | SC | Haemorrhoids. | NS | Kerosene | Necrosis in the perineal region & scrotum oedema. | Lung involvement was not observed | Suicidal | – |

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| | | | | | Repeatedly injected for 6 days | | | Laparotomy and colostomy performed. Died of MI | | | |
| 43 | Eskandarlou, 2010 Iran[45] | 31 | M | IT & SC | 40 mL into the L hemithorax 10 mL into the L cubital fossa | 50 mL | Petroleum | Decortication & segmentectomy recovered after 2 months of being sent to a psychiatric facility | Pyothorax, empyema, collapse, necrosis of the chest wall. Xray airfluid level in the L hemithorax. Complete CT collapse L lung with mediastinum shift and bronchopleural fistula. | Suicidal | – |
| 44 | Ra, 2011 Republic of Korea[46] | 23 | M | IV | NS | 1 mL | Isoparaffin | Cellulitis and necrosis site of injection. Complete resolution of lung findings | X–ray ill–defined pulmonary nodules BL CT multiple, wedge–shaped, ill–defined ground glass opacities BL consolidations and BL pleural effusion | Suicidal thoughts | – |
| 45 | McGeary 2011 UK[47] | 40 | M | IV | L cubital vein | 10 mL | White spirit | Soft tissue abscess in the arm– I&D | Bilateral X-ray opacities CTPA– air space consolidation | Suicidal thoughts | Substance use disorder (IV) Psychiatric history |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | Wiper 2011 UK[48] | 27 | M | SC | L arm and both buttocks | 40 mL | Petrol | Necrosis. Excised necrotic muscle and fat. Discharged | Lung involvement was not observed | Suicidal | Schizophrenia, sectioned (detained in hospital) |
| 47 | Mahmoodpoor 2012 Iran[49] | 58 | M | IV & SC | R arm | 10 mL | Gasoline | cellulitis R forearm fasciotomy, ventilated ARDS AKI multi–organ failure, died day 21 | Symptoms of acute lung injury | Suicidal | Previous suicidal attempts. |
| 48 | Godarad 2012[50] | 19 | F | IT | Chest | 15 mL | white spirit | R effusion consolidation, pneumothorax ARDs | Symptoms of acute lung injury | Suicidal | Substance abuse disorder & depression |
| 49 | Nelson, 2013 USA 2 cases[51] | 23 Case–1 | M | IV | Arm R injected over 12 hours (1 mL at a time) | 15 mL | Lubricant (WD–40) | The necrosis and abscess R arm. Was discharged on day 9 to inpatient psychiatric care | Xray pulmonary edema with right lower lobe infiltrate | Suicidal (with his fiancée, case 2) | Substance use disorder IV heroin, depressed. Homeless |
| | | 29 Case–2 | F | SC | Dorsal aspect of R hand & wrist dorsal aspect | NS | Lubricant (WD–40) | Necrotic tissue, compartment syndrome, psychiatry unit after 12 days | Lung involvement was not observed | Suicidal (with her fiancé, case 1) | Substance use disorder IV heroin. Homeless |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | Liu 2013 China[52] | 33 | M | IM | Distal region of the left arm | 10 ml | Phoxim (although an OP, it is a complex hydrocarbon) | The distal L arm was swollen cellulitis I&D | Lung involvement was not observed | Suicidal | Past craniocerebral trauma |
| 51 | Omori 2013 Japan[53] | 21 | M | SC | L cubital fossa | 5 mL | Spot remover fluid (hydrocarbons as solvents) | Pain, oedema, and erythema of L upper limb I&D | Lung involvement was not observed | Suicidal | Psychiatric treatment for previous suicide attempts |
| 52 | Jayaprasad 2013 India[54] | 34 | M | SC | L hand at two sites | 5 ml | Kerosene | Cellulitis left against medical advice | Lung involvement was not observed | Suicidal | Chronic alcoholic |
| 53 | Sharquie 2014 Iraq 11 cases[55] | 17–25 | 1 M 10 F | SC | Arm–8, thigh–1 buttock–1 | | Kerosene | Ulcer and cellulitis, one developed contracture | Lung involvement was not observed | DSH | Severe emotional tension due to social, economic and psychological problems |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 54 | Zirwes 2015^# Germany[56] | – | | IV | – | 2 mL | Benzene | Died | – | Suicidal | Chronic pain syndrome. Drug intoxication & strangulation |
| 55 | Hasan 2016^ Bangladesh [57] | – | | IV | – | | Kerosene | – | – | Suicidal | – |
| 56 | Bidaki 2016 Iran[58] | 17 | M | SC | L forearm | 5 mL | Gasoline | Necrotising fasciitis and abscess | Lung involvement was not observed | Suicidal | Cluster B personality air injection into vein, touching electrical wires, cutting body 3 times, pill overdose |
| 57 | Pouwels 2018 Netherlands[59] | 52 | M | IT | L hemithorax | NS | Benzene & paracetamol 25g | Discharged from psych care after 23 days | A respiratory insufficiency hydropneumothorax CT empyema in the L lung and pectoral abscess | Suicidal | Substance use disorder, alcohol & tobacco, multiple TIA. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | Murphy 2018 Ireland[60] | 26 | M | SC & IM | L forearm | 15 mL | Petroleum | Compartment syndrome. | Lung involvement was not observed | Suicidal | Depression, weakness of flexors |
| 59 | Alquraish 2018 Saudi Arabia[61] | 30 | M | SC | L cubital fossa | 6 mL | Kerosene | Cellulitis | Lung involvement was not observed | Suicidal | Prisoner |
| 60 | Asiimwe 2021 Uganda[62] | 23 | M | IM | L wrist & cubital fossa. | 5 mL | Kerosene & rodenticide | Seizure & compartment syndrome L wrist contractures, discharged on day 42 | Lung involvement was not observed | DSH | Relationship conflict, depression, |
| 61 | An 2021 China[63] | 14 | M | IV | Forearm? | 5 mL | Insecticide (kerosene & propyl butane) | Ventilated with complete recovery | Pneumonitis | Suicidal | Depression, suicide attempts |
| 62 | Arafat 2024 Bangladesh[64] | 30 | F | IV | Forearm? | 10 mL | Kerosene midazolam amitriptyline | VT, electrolyte abnormalities, DVT, & multi–organ failure. Died | Probably died before pneumonitis | Suicidal | Major depressive disorder. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 63 | Bubalo 2024^ Croatia[65] | 62 | M | IV | Through HD catheter | – | Medical Kerosene | Respiratory, metabolic, lactic acidosis, hypotension, & tachyarrhythmia. Died | Died before pneumonitis | Accidental injection by HCW | CKD on hemodialysis |

[a] AKI acute kidney injury, ARDS – acute respiratory distress syndrome, BL bilateral, CT – computed tomography, CTPA pulmonary angiogram, CVVH – continuous venovenous hemofiltration, DIC disseminated intravascular coagulation, DSH deliberate self-harm, DVT – deep vein thrombosis, F female, FOB – fiber optic bronchoscopy, GTC generalized tonic-clonic, HIV human immunodeficiency virus, IM intramuscular, IT intrathoracic, I&D – incision and drainage, IV intravenous, L – left, M male, MI – myocardial infarction, NS not stated, OP – organophosphorus pesticides, R right, SC – subcutaneous, TIA transient ischemic attack, VT ventricular tachycardia, HD – hemodialysis, HCW – health care worker, CKD – chronic kidney disease, # – non-English, * – same patient, ^ – only abstract, original case report cannot be found, in some cases data obtained from secondary sources

When kerosene is taken orally, aspiration occurs due to its low viscosity, high volatility, and low surface tension. As little as a milliliter of aspirated kerosene can cause significant lung injury.[3] In the absence of aspiration, chemical pneumonitis will not occur.[3] It is poorly absorbed through the gastrointestinal tract and, even if absorbed, does not cause pneumonitis.[3] Due to the risk of aspiration, gastric lavage is contraindicated in case of kerosene poisoning.[3]

The mechanism of pneumonitis after hydrocarbon injection was elucidated in an elegant animal experiment.[21] Lungs selectively absorb hydrocarbons and excrete them through the alveoli, which is why the kerosene odor is present in the patient's breath. Increasing the minimum surface tension in the alveoli is the central mechanism of pneumonitis caused by injected and aspirated kerosene. This may be due to a direct physical action that interferes with the action of the surfactant or damage to the type 2 pneumocytes, which produce the surfactant. Type 2 pneumocytes are inactivated by kerosene oil, leading to surfactant deficiency, intra-alveolar hemorrhage, inflammation, necrosis and alveolar collapse.[2,3]

Deep vein thrombosis may develop after large vein thrombophlebitis due to the presence of hydrocarbons.[22] In addition, damage to the endothelium caused by intravenous kerosene may have facilitated the formation of thrombuses, a finding that requires further research to validate. Hydrocarbons destroy membrane lipids and disrupt their integrity. It acts as a defatting agent, causing liquefaction necrosis, and can spread along tissue planes.[18] The formation of an abscess at the injection site indicated the consequence of kerosene, leading to inflammatory reactions. Tissue damage and activation of innate immunity will aid in the formation of an abscess. The combination of local tissue damage and impaired immune response creates an ideal environment for abscess formation, requiring surgical intervention for drainage and wound debridement. The abscess was considered sterile based on negative results from aerobic culture.

As kerosene poisoning by injection can lead to multiple complications, vigilance for the development of such issues and prompt intervention may help to minimize morbidity and mortality. Given the widespread availability of kerosene in developing regions, greater awareness, accurate reporting, and more research are needed to understand better the complications, risk factors, and preventive strategies associated with such intentional or accidental injections.

Several limitations should be acknowledged in this case. First, the diagnosis of pneumonitis was solely on clinical presentation and serial chest radiographs, as advanced imaging (CT/HRCT) and lavage-free bronchoscopy were not performed. The patient's rapid clinical improvement justified their omission. Second, although the abscess was presumed to be sterile based on negative aerobic cultures, our setting did not have a comprehensive microbiological evaluation, including anaerobic cultures and PCR for atypical pathogens. These diagnostic limitations underscore the challenges of managing complex toxicological presentations in resource-limited environments, where clinical judgment must often supplement incomplete laboratory data.

## Conclusion

Kerosene is a common household chemical that can be used for self-harm, particularly in the developing world. Injection is one of those methods, which can lead to significant morbidity and mortality due to local and systemic complications. Chemical pneumonitis is a common consequence when kerosene enters the circulation, contributing to morbidity. A multidisciplinary approach is crucial for reducing associated complications and improving outcomes. Preventive measures are equally important and require an evaluation of the underlying psychological triggers to identify the root causes. This case highlights the complications of intravenous kerosene injection, including chemical pneumonitis, thrombosis, and abscess formation.

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### *Author contributions*

Conceptualization, A.W., P.W. and S.S.; Methodology, S.S.; Software, H.S. and S.S.; Validation, A.W. and T.R.; Formal Analysis, S.S. and T.R.; Investigation, A.W. and P.W.; Resources, A.W., H.S. and P.W.; Data Curation, T.R. and S.S.; Writing – Original Draft Preparation, A.W. and S.S.; Writing – Review & Editing, A.W., P.W., T.R., H.S., and S.S.; Visualization, A.W. and T.R.; Supervision, S.S.; Project Administration, S.S.

### *Conflicts of interest*

The authors have no conflicts of interest to declare.

### *Data availability*

The data that support the findings of this study are available from the senior authors upon request.

### *Ethics approval*

Informed written consent has been obtained from the patient's mother, and ethics approval is not applicable for this manuscript.

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