



# The Bulletin of Legal Medicine

## Adli Tıp Bülteni

Case Report

### Lighter Fluid Inhalation and Neurological Sequelae as a Forensic Case

Ahsen Kaya, Selen Can Temürkol\*, Burcu Özçalışkan, Hülya Güler

**Abstract:** The use of volatile substances, also known as inhalant substances, is increasing all over the world. One of the most often encountered misuses of these substances is lighter fluid; which is easily accessible, legally and cheaply purchased, and which has a pleasurable effect in a short period of time.

In this report; 18 years-old case who was found in cardiac arrest on a street after lighter fluid inhalation nearly three years ago, which had been generalized tonic seizure during intensive care monitoring, observed changes in cranial Magnetic Resonance Imaging secondary to hypoxic-ischemic damage and butane gas inhalation and detected a severe motor and mental neurological sequelae was presented.

To our knowledge, in the literature, there were more autopsy studies on sudden death cases due to lighter fluid inhalation. Therefore, this presented case would contribute to the literature as it clearly reveals the neurological sequelae, as a result of lighter fluid inhalation.

**Keywords:** Lighter Fluid, Volatile Substance, Inhalation, Forensic Medicine, Ventricular Fibrillation.

**Öz:** Uçucu maddelerin, bir diğer adıyla inhalan maddelerin tüm dünyada kullanımları giderek artmaktadır. Bu maddelerden kötüye kullanımıyla en sık karşılaşılanlardan biri, kolay ulaşılabilmesi, yasal olarak ve ucuza satın alınabilmesi, kısa sürede keyif verici etki göstermesi nedenleriyle çakmak gazıdır.

Bu olgu sunumunda, yaklaşık üç yıl önce çakmak gazı inhalasyonu sonrası sokakta kardiak arrest halinde bulunan, yoğun bakım izlemi sırasında jeneralize tonik nöbet geçiren, kranial Manyetik Rezonans Görüntülemesinde hipoksik iskemik hasar ve bütün gazı inhalasyonuna sekonder değişiklikler izlenen, ağır motor ve mental nörolojik sekelleri saptanan 18 yaşındaki olgu sunuldu.

Literatür taramasında daha çok çakmak gazı inhalasyonuna bağlı ani ölüm olguları ile ilgili otopsi çalışmaları olduğu görüldü. Sunulan olgunun, çakmak gazı inhalasyonu sonucu meydana gelebilecek nörolojik sekelleri belirgin bir şekilde ortaya koyması nedeniyle literatüre katkı sağlayacağı düşünüldü.

**Anahtar Kelimeler:** Çakmak Gazı, Uçucu Madde, Inhalasyon, Adli Tıp, Ventriküler Fibrilasyon.

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Ahsen Kaya: Assoc. Prof., Ege University Faculty of Medicine Department of Forensic Medicine, İzmir

Email: pekcanahsen@yahoo.com

ORCID iD: <https://orcid.org/0000-0002-6969-1562>

Selen Can Temürkol: Res. Asst. Dr., Ege University Faculty of Medicine Department of Forensic Medicine, İzmir

Email: selen.can.91@gmail.com

ORCID iD: <https://orcid.org/0000-0002-1074-405X>

Burcu Özçalışkan: Res. Asst. Dr., Ege University Faculty of Medicine Department of Forensic Medicine, İzmir

Email: burcuozcaliskan@windowslive.com

ORCID iD: <https://orcid.org/0000-0001-6112-8989>

Hülya Güler: Asst. Prof. Dr., Ege University Faculty of Medicine Department of Forensic Medicine, İzmir

Email: drhulyaguler@yahoo.com

ORCID iD: <https://orcid.org/0000-0002-3205-4113>

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\* Corresponding Author

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#### Ethical Declaration

Informed consent was obtained from the participant and Helsinki Declaration rules were followed to conduct this study.

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## 1. Introduction

The volatile substances, also known as inhalant substances, are defined as substances that can easily evaporate at room temperature (1). Among these substances, butane and propane are the most common substances to be abused because of their pleasurable properties, and these fluids are also used in air freshener sprays, deodorants and lighters (2).

There are different ways of administration in the misuse of inhalant substances. They can be used by breathing through the nose of the container they are in, squeezing aerosol sprays directly into the mouth and/or nose, pouring the substance into plastic or paper bag and then breathing through nose and mouth and pouring the substance onto a piece of cloth and sniffing it (3).

Inhaled substances are increasingly being used all over the world due to their ease of access, being legally and cheaply available, having a pleasurable effect in a short period of time (3). In recent years, there have been studies showing an increase in lighter fluid misuse, especially among adolescents in Turkey (4-6).

Volatile substances cause many problems, including acute and/or chronic, physical and/or mental problems (7). Volatile substances may lead to sudden death due to their effects; such as cardiac arrhythmias, hypoxia, and respiratory depression in the acute period, and often cause neuropsychiatric disorders in the chronic period (7,8).

This case report aims to evaluate the findings and neurological sequelae that arise from lighter fluid inhalation from a forensic-medical perspective.

## Ethical Declaration

Informed consent was obtained from the participant and Helsinki Declaration rules were followed to conduct this study.

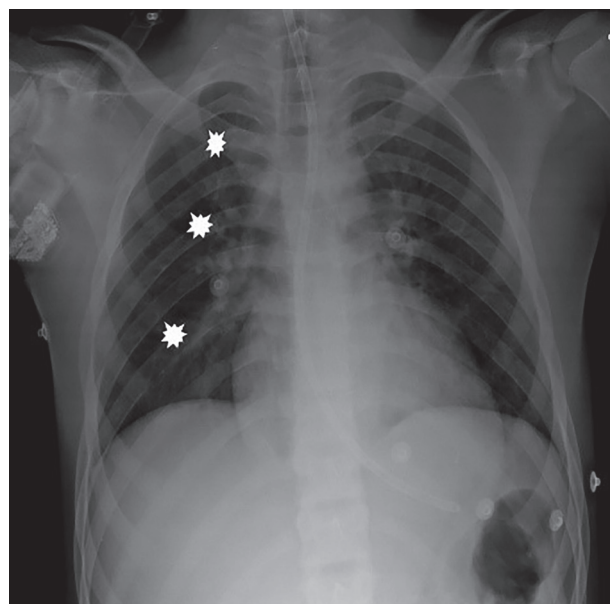
## 2. Case

After the lighter fluid inhalation, 18 years old male case consulted our Forensic Medicine outpatient clinic with the request to be arranged the forensic report.

From the examined document, it was noted that the patient smelled lighter fluid about three years ago before he consulted the clinic, he was found in cardiac arrest on a street, intervened by 112 ambulance services, defibrillated upon taking ventricular fibrillation rhythm in cardiopulmonary resuscitation, then, he was taken to a State Hospital Emergency Department. He was intubated, and activated charcoal was applied. The case was defibrillated twice more during follow-up, returned to a normal rhythm. His general medical condition was not good and

was transferred to the University Hospital on the same day.

In Child Intensive Care Service documents after referral, it was noted that the case was followed up as intubated, the light reflexes were bilaterally taken, there were the coarse crackles (rales) in the lung auscultation, activated charcoal was present in the tracheal aspiration, and the appearance was consistent with possible charcoal aspiration on the right side of the chest X-ray (Picture 1). It has been observed in Echocardiography (Echo) that there was a minimal smear type of pericardial fluid, and ventricular functions were normal.

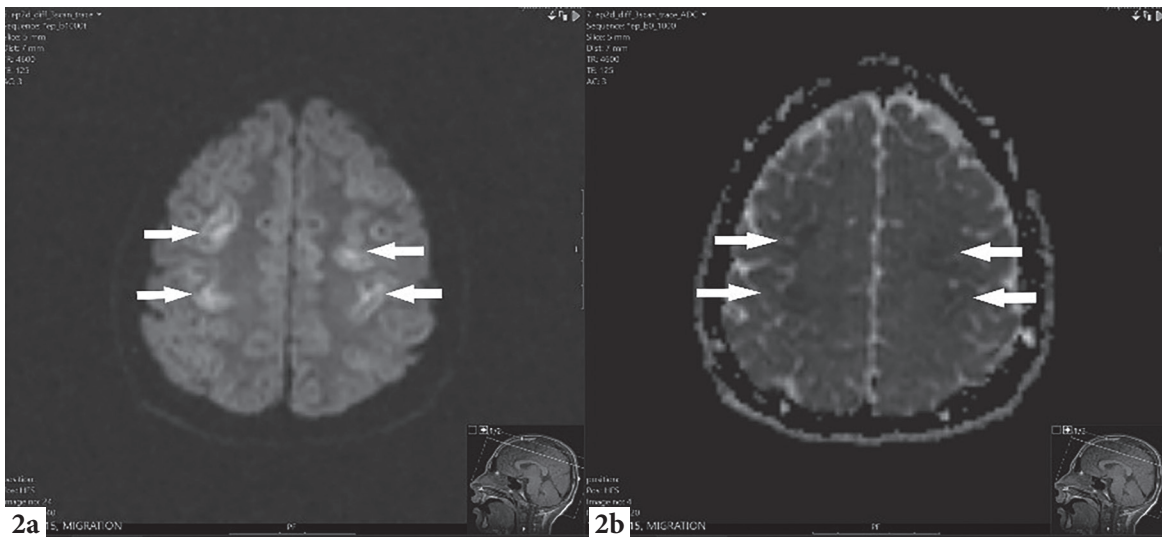


**Picture 1.** Appearance consistent with activated charcoal aspiration in the right lung.

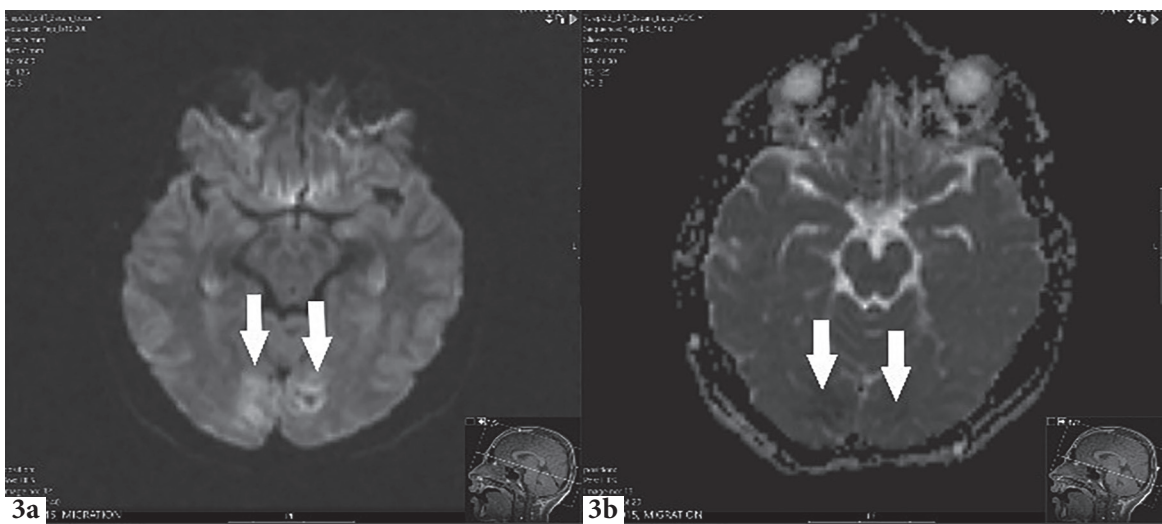
On the fourth day of the follow-up, it was reported that antiepileptic treatment was started due to generalized tonic-clonic seizure lasting 20-30 seconds, contractions increased as a spasm, and he had dystonia in the form of opisthotonos position and the way legs crossed.

In electroencephalography of the case (EEG), it was stated that bilateral synchrony of slow waves at theta frequency was recorded in parietooccipital regions, the basic rhythm was slow, and its clinical movements were thought to be non-epileptic. Deep tendon reflexes decreased, and no pathology was detected in electromyography (EMG).

In the Cranial Magnetic Resonance Imaging (MRI); in the bilateral frontoparietal cortex (Picture 2) and the occipital region, adjacent to calcarine sulcus (Picture 3), there were changes secondary to primarily hypoxic-ischemic damage and in bilateral putamen secondary appearance to inhalation of toxic gas (butane gas) (Picture 4).



**Picture 2.** Hyperintense in the diffusion sequence (2a) and hypointense regions in the ADC map (2b) in the diffusion MRI examination.



**Picture 3.** Hyperintense in the diffusion sequence (3a) and hypointense regions in the ADC map (3b) in the diffusion MRI examination.

Anamnesis and examination of the case were taken in our department (approximately three years after the incident), his family described that he had forgetfulness and we determined gait and speech disorders. No external lesions were observed due to the incident. A neurology consultation was requested. As a result of the consultation, the following problems were detected: dysarthria, dystonic posturing of the extremities and the myocloni, sometimes athetoid movements, impairment in fine hand skills, ataxia and dystonic movements, performance decrease in semantic fluency skills, orientation in space and time, complex attention-concentration, complex calculations, mental flexibility, construction, immediate visual memory, abstraction, disorder of naming skills and significant losses in close memory functions.

It is stated that in the forensic report of the case that the injury due to lighter fluid inhalation causes a situation that endangers the person's life, it can't be cured by a simple medical treatment, it causes an incurable illness and a permanent speech defect.

### 3. Discussion and Conclusions

All over the world, hypnotic substances and drugs are a growing public health problem with the physical and mental problems they cause. This is particularly affecting children-young people who are the future of the societies. In this regard, volatile substances have also been added among the substances commonly used, such as heroin, cocaine, ecstasy and synthetic substances. According to



neurological sequelae were detected. In the literature review, it was noted that mostly studies about lighter fluid inhalation were autopsy studies of sudden death cases (20,21). It was thought that our case would contribute to the literature because it clearly reveals the neurological sequelae that may occur as a result of lighter fluid inhalation.

As in this case, it is thought that the ease of access to addictive substances, such as lighter fluid, especially in the childhood age group, will result in a further increase in the use of such substances. Thus; especially under the age of 18, restriction of access to substances that are or may be abused, controlling the sale of such substances are only a few of the precautions that can be taken. In our country, volatile substances are defined by “*The Regulation on the Protection of Human Health From The Damages of Volatile Substances*” published in the Official Gazette dated 05.08.2010 and numbered 27663 and regulations have been made on the sale and possession of volatile substances. Some governorates have also issued resolutions prohibiting the sale of lighters and lighter fluids to children(22,23). It is also considerable importance that families fulfill their obligations of taking attention and care towards their children.

The situation that occurred in the case presented in this study attracts attention with its permanent neurological sequelae; and it has been endangering a person’s life, causing an incurable illness and a permanent speech defect; caused severe damage (24). Simple and small precautions that can be taken, they will prevent situations that may bring about such a severe disability.

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