

Eucalyptus Oil Inhalation-Induced Seizure: A Case Report

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Abstract

Background:

Eucalyptus oil is widely used as an over-the-counter remedy for respiratory congestion, yet concentrated preparations can exert rapid neurotoxic effects. Although commonly perceived as safe, even minimal exposure through inhalation may precipitate acute symptomatic seizures in individuals without pre-existing neurological illness. Such events are frequently underrecognized in clinical practice, leading to diagnostic uncertainty and avoidable treatment escalation.

Case Presentation:

A 48-year-old man with no prior medical or neurological history presented with a sudden-onset generalized tonic-clonic seizure immediately after inhaling steam containing eucalyptus oil. The convulsive episode lasted approximately two to three minutes, followed by transient post-ictal confusion. Vital signs were stable, and examination revealed a lateral tongue bite without focal neurological deficits. Laboratory investigations, including serum electrolytes, calcium, magnesium, glucose levels, and renal and hepatic panels, were within normal limits. Neuroimaging (MRI brain), cerebrospinal fluid analysis, and electroencephalography performed on day two were unremarkable. He was treated with intravenous levetiracetam and remained seizure-free during 48 hours of in-hospital monitoring. Avoidance of eucalyptus oil was advised, and the patient remained seizure-free over one year of follow-up after discontinuation of antiepileptic therapy.

Discussion:

The case demonstrates the capacity of eucalyptus oil inhalation to provoke an acute symptomatic seizure in an adult with no seizure predisposition. The immediate temporal association, normal diagnostic evaluation, and absence of recurrence strongly support a toxic mechanism rather than epilepsy. Similar reports highlight that eucalyptus oil constituents can induce neuronal hyperexcitability, and inhalational exposure provides rapid access to the central nervous system. Underrecognition of this trigger may result in misclassification as idiopathic epilepsy and unnecessary long-term antiepileptic medication.

Conclusion:

Eucalyptus oil exposure should be actively considered in the differential diagnosis of unexplained first-episode or breakthrough seizures. Targeted history-taking, avoidance counselling, and improved public and product-label awareness are essential to prevent recurrent or misdiagnosed events associated with this commonly used household agent.

Keywords: Eucalyptus oil; Seizures; Inhalation exposure; Essential oils; Neurotoxicity syndromes; Adult; Case Reports

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INTRODUCTION

Essential oils have become widely popular as alternative medical products especially in the treatment of respiratory congestion, musculoskeletal pain and as an aromatherapy product. Although most of the essential oils are natural, they contain some strong bioactive constituents that have the potential to cause severe adverse effects in case of consumption in their pure states. One of the most common preparations is Eucalyptus oil, the product of which is mainly the leaves of Eucalyptus globulus, and it is generally not regarded as a dangerous substance, which contributes to a lack of awareness of its toxic properties in clinical practice. Preclinical toxicological evaluation demonstrated that essential oils including the eucalyptus oil have the potential to induce a range of systemic and neurological effects, which have not been properly valued by the consumers and medical practitioners¹. Focusing on the compositional analysis of eucalyptus oil it is possible to note that the oil is highly concentrated in monoterpenes - especially 1,8-cineole - that are the source of the mucolytic advantage of the oil and the same effect of neurotoxicity. Modern literature still confirms that the ingestion, inhalation or dermal contact with eucalyptus oil can lead to central nervous system excitation, loss of consciousness and seizures particularly when undiluted or highly concentrated preparations are used². Despite the fact that in any case, toxicity has been more widely reported in the pediatric group, there is an increasing number of reports that adults are also prone to acute neurological responses to slight exposure.

Cases of eucalyptus-oil-related seizures have started to be isolated in India and elsewhere, as an underrecognized phenomenon. The inhalational route, namely steam inhalation using eucalyptus oil has gradually been implicated as an acute immediate precipitant of symptomatic seizures. Kasinathan and Sharawat mentioned that plant-oil inhalation was an unfamiliar yet a clinically significant source of convulsions in children and clinicians should take into account essential-oil exposure as a potential cause of the convulsions that remain unexplained³.

In the same vein, previous toxicology reports in

India also reported acute onset of seizures following consumption of eucalyptus oil, and that even the low doses of the toxicant can cause acute neurotoxicity⁴. This entity was better characterized in a systematic way when Mathew et al. described a group of adults who underwent generalized tonic-clonic seizures as a direct consequence of inhaling steam enriched with eucalyptus, and all of them were found to have nonexistent neurological conditions and normal neuroimaging, metabolic, and electroencephalographic investigations⁵. These observations are in line with the experimental results: laboratory models demonstrate that eucalyptol triggers neuronal hyperexcitability and epileptiform discharges, which is a mechanistic basis of the clinical phenomenon of the eucalyptus induction of seizures⁶.

The literature on classic pediatric toxicology also adds to the issues of the safety of the eucalyptus oil. Indeed, in a study, Tibballs has shown that infants and young children exposed to eucalyptus oil could experience sudden neurological depression, or epileptic seizures usually within minutes of exposure, and this indicates the high strength of the oil and its fast absorption throughout the body⁷. All of these studies point towards one similarity, i.e. the rapid onset, no other etiologies, normal-investigations, and the complete recovery with no further exposure.

The current case report is a valuable contributor to the existing literature that includes the description of an adult who sustained a generalized tonic-clonic seizure immediately after inhalation of the eucalyptus -oil steam and had no previous medical comorbidities and did not have any problems with biochemical, neuroimaging, and electrophysiological measures. The time linkage, lack of metabolic and other structural abnormalities and full recovery following avoidance are great indicators in favor of the diagnosis of acute symptomatic seizure induced by eucalyptus-oil.

Since application of eucalyptus oil in households is common in India, specifically in treating symptoms of the upper respiratory system, the role of this product as a neurotoxic agent should be noted. Misdiagnosis with epilepsy and unnecessary

antiepileptic long-term treatment may be prevented with an improved clinical awareness, specific history-taking, and education of the population. This case has demonstrated that there is a need to categorize eucalyptus oil as a potentially harmful product notwithstanding its availability as over-the-counter.

CASE REPORT

A 48-year-old male with no previous medical or neurological history was presented in the emergency department with a sudden-onset generalized tonic-clonic seizure. The convulsive attack took about two to three minutes and was succeeded by the post-ictal confusion. As indicated by the relative accompanying the patient, the seizure was onset right after the patient inhaled the steam of the eucalyptus oil in hot water, something he was using to alleviate the symptoms of an infection in his upper respiratory tract. He had neither drunk alcohol, nor taken drugs, nor was he exposed to other possible agents that may induce seizures.

Upon arrival, the patient was oriented but not focused. There was an evident case of lateral tongue bite. His physical condition was not emergent, a temperature of 99 O F, pulse of 110/min, blood pressure of 130/80 mmHg and respiration rate of 24/min. No focal neurological abnormalities, meningeal or systemic abnormalities were observed. No sign of trauma or intoxication was seen on physical examination.

Laboratory tests, such as complete blood count, serum electrolytes, calcium, magnesium, random blood glucose, renal and liver function tests were normal. There were no abnormalities in electrocardiography or chest radiography. Brain magnetic resonance imaging and cerebrospinal fluid examination were insignificant, which did not give any structural or infectious account of the incident.

The electroencephalogram that was conducted on the second day of admission in hospital did not reveal epileptiform discharges or focal slowing.

The patient was treated with intravenous levetiracetam 1,000mg as a loading dose, then 500mg twice a day. He was stable in terms of hemodynamics during the period of his stay at the hospital and did not have any additional seizures within the 48 hours of in-patient monitoring. Since it was clearly temporally related to the breach of the eucalyptus oil intake and the onset of seizures, and no other etiologies were identified, an acute symptomatic seizure caused by the exposure to the eucalyptus oil was regarded as the most probable diagnosis.

He was sent home having been advised not to use eucalyptus oil and corresponding essential oil preparations. The short-term oral levetiracetam was maintained then tapered in the course of follow-ups. During the following year, the patient was free of seizures, and no other risk factors or the reoccurrence of neurological symptoms were reported.

Table 1. Objective Clinical and Laboratory Parameters of the Patient

Parameter	Value / Finding
Age / Sex	48-year-old male
Exposure	Eucalyptus oil steam inhalation (immediate pre-seizure)
Seizure Duration	2–3 minutes
Post-ictal Status	Confused; obeying commands
Temperature	99°F
Pulse Rate	110/min (regular)
Blood Pressure	130/80 mmHg
Respiratory Rate	24/min
Tongue Bite	Present
Hemoglobin	13 g/dL
Total Leukocyte Count	9,000/cumm
Random Blood Glucose	98 mg/dL
Serum Creatinine	0.8 mg/dL
Electrolytes	Within normal limits
Calcium / Magnesium	Normal
Liver Function Tests	Normal
ECG	Normal
Chest X-ray	Normal

MRI Brain	Normal
CSF Analysis	Normal
EEG (Day 2)	No epileptiform activity
AED Given	IV levetiracetam 1000 mg loading → 500 mg BD
Hospital Observation	48 hours; no recurrence
Follow-up Outcome	Seizure-free for 1 year (off medication)

DISCUSSION

Eucalyptus oil has a strong mix of volatile terpenoids, the most important of which is eucalyptol. When breathed in, absorbed through the skin, or taken by mouth, these terpenoids can quickly cause neurotoxic effects. Although frequently employed as a domestic remedy, numerous clinical observations have indicated that even minimal exposures can trigger acute neurological symptoms, especially seizures. The risk was first noted in early paediatric literature. Webb and Pitt recorded that the ingestion of eucalyptus oil in children could lead to sudden seizure onset, frequently occurring without prodromal symptoms, highlighting that its potency is often underestimated by both carers and clinicians.⁸ Later work confirmed this worry. Day and colleagues elucidated the mechanisms through which children accessed eucalyptus oil preparations, emphasising that insufficient packaging and the absence of warnings were significant factors leading to preventable toxic exposures⁹.

Additional paediatric reports broadened the range of toxicity. Webb and Pitt subsequently examined a cohort of 41 childhood poisoning cases, revealing that seizures, altered consciousness, and respiratory distress were persistent clinical manifestations following exposure.¹⁰ More recent case-based studies have shown that this phenomenon is still important in medicine. Dudipala et al. reported paediatric cases in which seizures occurred subsequent to the ingestion or inhalation of eucalyptus oil, observing that the temporal correlation was often immediate and that investigations—including neuroimaging and electroencephalography—were generally normal, indicating a toxic rather than structural aetiology¹¹.

The necessity for strong toxicovigilance has been underscored in the broader poison centre literature. Carpenter et al. demonstrated, utilising national surveillance data, how systematic reporting can elucidate the clinical characteristics of emerging toxic exposures. Their study concentrated on

designer benzodiazepines, yet the methodological principles are equally applicable to essential-oil toxicity, where underreporting continues to obstruct precise risk evaluation and preventive policy formulation¹². Data from South Asia also show that eucalyptus-oil toxicity is clinically important. Sitaraman and Rao's case from New Delhi showed how easy it is for people to accidentally come into contact with dangerous substances at home. This shows how important it is to educate the public and improve labelling.¹³ More broadly, epidemiological trends from North India show that household chemicals and plants are playing a bigger role in acute poisoning cases. This suggests that eucalyptus oil is part of a bigger change in how people are exposed to different things in the area¹⁴.

Adult presentations have also become more popular. Mathew characterised eucalyptus oil inhalation as a frequently overlooked yet preventable aetiology of acute symptomatic seizures in adults, noting that onset typically transpired within minutes of exposure, with affected individuals exhibiting unremarkable neurological assessments and normal diagnostic evaluations.¹⁵ This is very similar to the current case, in which inhalational exposure was followed almost immediately by a generalised tonic-clonic seizure. Neuroimaging and EEG studies were normal, and there was no recurrence after avoiding further exposure.

Overall, these findings show that there are consistent patterns: a quick link between exposure and seizure onset, no structural or metabolic problems, and good results with supportive care and strict avoidance of re-exposure. Our patient's presentation reflects these characteristics and highlights the necessity of routinely assessing essential oil usage in individuals with new-onset or breakthrough seizures. Not being able to find these kinds of exposures could lead to being misdiagnosed with epilepsy and having to take antiepileptic drugs for a long time. It is important to know that eucalyptus oil can cause seizures in order to make an accurate diagnosis, give advice, and stop them from happening.

Table 2. Clinical Scenarios Involving Eucalyptus-Oil-Induced Seizures and Recommended Clinical Approach

Clinical Scenario	Risk of Misdiagnosis	Recommended Approach
Child presenting with seizure shortly after eucalyptus oil ingestion or inhalation	Febrile seizure or idiopathic epilepsy	Obtain targeted exposure history; classify as acute symptomatic seizure when temporally associated; avoid unnecessary long-term antiepileptic therapy; provide caregiver education.
Adult experiencing first-ever generalized seizure after steam inhalation with eucalyptus oil	Cryptogenic epilepsy	Evaluate for recent essential-oil exposure; if investigations are normal and association is immediate, manage as acute symptomatic seizure; advise strict avoidance of re-exposure.
Patient with known epilepsy presenting with a breakthrough seizure despite adherence	Inadequate antiepileptic dosing or drug-resistant epilepsy	Review recent exposure to eucalyptus oil or other aromatherapy agents; identify modifiable triggers prior to escalating antiepileptic therapy.

CONCLUSION

Eucalyptus oil is still a popular home remedy, but people often forget that it can cause acute neurological toxicity. This case demonstrates that inhalational exposure, even in minimal quantities, can trigger a sudden-onset generalised seizure in an otherwise healthy adult. The lack of structural abnormalities on neuroimaging, normal laboratory values, and absence of recurrence after avoidance strongly indicate a direct toxic effect rather than an underlying epileptic disorder.

The case underscores the necessity for clinicians to consistently enquire about essential oil usage when assessing unexplained seizures, as patients may not disclose this information unless explicitly prompted. Early diagnosis stops people from having to take antiepileptic drugs for a long time and makes sure they get the right advice on how to avoid exposure. Enhancing public awareness, improving product labelling, and incorporating essential oil-related toxicity into standard clinical evaluations can substantially diminish preventable neurological incidents linked to these readily accessible products.

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