Possible Reversible Cerebral Vasoconstriction Syndrome Associated with Eucalyptus: Case Report

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Abstract

Background—Reversible cerebral vasoconstrictive syndrome (RCVS) has characteristic clinical features, brain imaging and Angiographic features. The majority of RCVS cases are associated with the use of antidepressants, polysubstance abuse, and nasal decongestants. We here present a case that highlights the use of eucalyptus herbs as a possible precipitant factor for RCVS formation.

Case Presentation—A 42-year-old woman presented to the emergency department with a tingling sensation on the right-hand side of her body and a two-week progressive throbbing severe holocranial headache radiating to the neck, with associated nausea, photophobia, and phonophobia. She denied any seizures and recent trauma or fevers. She was not taking scheduled medications, but she had used inhaling vapors obtained from boiling eucalyptus leaves to alleviate sinus congestion. Initial imaging revealed subarachnoid hemorrhage at bilateral posterior parietal convexity leading to her admission into the intensive care unit. Further work up disclosed the presence of findings consistent with RCVS.

Conclusion—In conclusion, we hereby postulate that some herbal remedies used in alternative medicine, including eucalyptus, could play a role in causing serotonergic symptoms including dizziness, diarrhea, and cerebral vasoconstriction. Understanding that eucalyptus has the potential to contribute to RCVS due to its serotonergic activity may be of importance in the diagnosis and management of these patients.

Keywords

Reversible cerebral vasoconstrictive syndrome (RCVS); herbs; vasoconstriction; serotonergic symptoms

Introduction

Reversible cerebral vasoconstrictive syndrome (RCVS) is clinically characterized by a sudden onset thunder-clap-like headache or severe headache over 1–4 weeks. Focal neurological deficits and occasionally seizures are present. It is more common in women (3:1 ratio) between the ages of 20 and 50 years old. On computerized tomography (CT) of the head or magnetic resonance imaging of the brain, there are areas of ischemia or subarachnoid hemorrhage confined to the convexity. About 63% of cases are associated with certain antidepressants [selective serotonin reuptake inhibitors (SSRIs) and TCAs], polysubstance abuse (cannabis, cocaine, methamphetamine, heroin, and so on), nasal decongestants, and postpartum, while about 37% of cases are thought to be truly idiopathic or spontaneous onset [1]. The ischemic pathophysiology is related to vasoconstriction of the cerebral arteries; however, the mechanism behind the subarachnoid hemorrhage is not well understood. Segmental vasodilation leading to small vessel rupture or reperfusion injuries has been proposed [2]. Cerebral angiography may demonstrate diffuse, multifocal, and segmental narrowing of the large- and medium-sized arteries in the anterior and posterior circulations, resembling a “beaded” or “sausage on a string appearance” [3–6]. We present a case of RCVS in which the use of vapor from eucalyptus leaves as a serotonin agonist could have acted as a contributor of RCVS.
Case Presentation

A 42-year-old woman presented to the emergency department with a tingling sensation on the right-hand side of her body and a two-week duration of progressive throbbing type of severe headache in the occipital region radiating to the neck, with associated nausea, photophobia, and phonophobia. An initial head computed tomography (CT) revealed bilateral posterior parietal convexity subarachnoid hemorrhage (Figure 1), leading to her admission into the intensive care unit. She denied any seizures and recent trauma or fevers. Her past medical history was unremarkable, except for occasional headaches interpreted as sinus headaches and borderline high blood pressure. She was not taking scheduled medications, but she had been inhaling vapors obtained from boiling eucalyptus leaves to alleviate sinus congestion. Right before her symptoms exacerbated, she inhaled the vapors for a period of approximately 5 min while covering her head with a towel to maximize vapor inhalation. However, she had been using an ointment containing eucalyptus oil to alleviate sinus congestion.

Laboratory tests including those for complete blood picture, comprehensive metabolic panel, hypercoagulability, and comprehensive drug screening including cannabinoids, barbiturate, amphetamine, benzodiazepine, cocaine, and opiates were unremarkable. CT angiography (CTA) and magnetic resonance angiography (MRA) revealed subarachnoid hemorrhage confined to convexity and irregularities of the threatened lumen. Upon further investigation, a cerebral angiogram revealed diffuse vessel irregularities in both the anterior and posterior circulations (Figure 2), but no evidence of an intracranial aneurysm, a cerebral venous thrombosis, or an arte-
rial dissection. The patient was suspected to have RCVS overexposure to the eucalyptus oil, and eucalyptus vapor inhalation might have contributed to its development.

Management and Outcome

Treatment management included verapamil HCl 40 mg one tablet three times daily, pain management, and avoidance of eucalyptus containing remedies. Patient was discharged with the diagnosis of RCVS, and the sinus headaches she suffered for years were later diagnosed as migraines. She was followed as outpatient, and verapamil was discontinued after three months. Migraines were managed with NSAIDs, regular exercise and diet. The patient was followed up regularly in clinic and in the last appointment, three years after her presentation, the patient reported being headache free for more than a year and no neurological deficits after the presenting event. A follow-up vessel imaging was not possible due to the patient’s poor financial status. The patient no longer uses the eucalyptus inhalation for alleviation of her sinus congestion.

Discussion

We here present a case of RCVS with a typical clinical presentation, with headaches and a convexity subarachnoid hemorrhage in possible relation with the use of serotonin agonists derived from eucalyptus, not previously described.

In 2007, Calabrese and colleagues decided that it would be beneficial to group several diseases with similar clinical and angiographic features into one large group called “RCVS.” The previous names included: (1) isolated benign vertebral vasculitis; (2) acute benign cerebral angiopathy; (3) reversible cerebral segmental vasospasm; (4) call or call-Fleming syndrome; (5) Central Nervous System (CNS) pseudovasculitis; (6) benign angiopathy of the CNS; (7) post-partum angiopathy; (8) migraine angiitis; (9) migrainous vasospasm; (10) primary thunderclap headache; (11) cerebral vasculopathy; and (12) vasospasm in fatal migrainous infarction [7,8].

RCVS is described by prolonged but reversible vasospasm of cerebral arteries that resolve spontaneously within several weeks, and is typically associated with acute-onset, severe, recurrent headaches, or with other neurological symptoms [7]. The headache is acute or hyperacute and severe in nature. Occasionally with its intensity peaking within seconds like the clap of thunder; thus, the term “thunderclap headache,” mimicking that of a ruptured aneurysm, and is the most characteristic type in subarachnoid headache [7].

CT scan of the head is often normal in many cases or may show subarachnoid hemorrhage usually confined to the convexity as it was found in our case. MRA and CTA are first-line in diagnosing RCVS; however, catheter-based angiography is still considered the gold standard. On cerebral angiography, alternating areas of arterial constriction and dilation are noted resembling “beading” or “sausage on a string” appearance. These findings are noted along the anterior and posterior arterial circulations. Finally, the most specific evidence of RCVS is the normalization of the vasoconstriction usually within 12 weeks [7].

About 63% of RCVS cases are associated with secondary causes, especially serotonin modulating antidepressants (SSRIs and TCAs) and other serotonergic agents [1]. Eucalyptus oil is commonly used to treat nonpurulent rhinosinusitis [8]. It has been shown to improve symptoms and decrease C-reactive protein levels [8]. It reduces inflammation, likely by decreasing levels of pro-inflammatory cytokines TNFα and IL-1β [9]. It has successfully been used in pain management, alleviating pain in patients after a total knee replacement [10]. Ellagic acid, a polyphenolic compound found in eucalyptus, has an antidepressant effect like that of SSRIs [11].

Previous studies have also found specific molecules within eucalyptus that may potentially increase the amount of serotonin in the nerve terminals [11]. The postulated mechanism by which eucalyptus interacts with the serotonergic system is by inhibiting the monoamine oxidase enzymes, thereby increasing the amount of monoamines, such as serotonin, stored, and released from the nerve terminals [11].

Though the mechanism still remains uncertain, have a strong temporal association between the use of eucalyptus oils and the inhalation of eucalyptus vapors and the constriction of the cerebral vasculature, thus contributing to RCVS.

The main limitation of our case report is that the reversible component is not demonstrated by a follow-up serial vascular imaging study, and only her clinical evolution made us feel reassured about her condition being reversible. The patient no longer uses the eucalyptus inhalation for alleviation of her sinus congestion.

Conclusion

In conclusion, we postulate that herbal remedies containing eucalyptus could play a role in causing serotoninergic symptoms. Understanding that eucalyptus has sero-
toninergic activity, contribution to RCVS is possible and the physician should be aware during the diagnosis and management of patients with RCVS.

Clinical Implications
1. Eucalyptus has the potential to precipitate RCVS due to its serotoninergic activity, and it should be considered in the diagnosis and management of patients with RCVS.
2. Careful attention should be paid while using some nasal decongestants, since its overuse may lead to severe complications.

Conflict of Interest
None of the authors have any conflicts of interest or financial ties to disclose.

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None.

Informed Consent
Written informed consent was obtained from the patient for the publication of the case report.

References