Case Report

Fear the reaper: reversible cerebrovascular vasoconstriction syndrome after hot pepper ingestion

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Abstract

The Carolina Reaper pepper is one of the spiciest edible peppers in the world. While localized symptoms such as mouth burning, mouth numbness, and even vomiting are the main risks of eating these peppers, recent case reports have revealed more serious complications of these potent foods. A 15-year-old healthy male ingested a Carolina Reaper pepper on a dare. Two days later, he developed an acute headache during football practice and was subsequently diagnosed with an acute cerebellar infarct and reversible cerebrovascular vasoconstriction syndrome. Reversible cerebral vasoconstriction syndrome should be considered in patients who present with severe headache after ingestion of ultraspicy peppers, and early treatment of reversible cerebral vasoconstriction syndrome should be initiated in patients with severe headache after pepper ingestion.

Keywords:
Childhood stroke
Headache
Reversible cerebrovascular vasoconstriction syndrome
Hot pepper ingestion

Introduction

The Carolina Reaper pepper is one of the spiciest edible peppers in the world [1]. Similar in size to the habanero pepper, these bright red little peppers are commercially available in raw form as well as seeds, dried peppers, and flavoring for sauces. Hot pepper eating contests have grown in popularity and often feature ingestion of raw Carolina Reaper peppers as the pinnacle challenge. While localized symptoms such as mouth burning, mouth numbness, and even vomiting are the main risks of eating these peppers, recent case reports have revealed more serious complications of these potent foods. Reversible cerebral vasoconstriction syndrome (RCVS), myocardial infarction, and esophageal rupture have all been reported [2-4]. We present a very rare case of RCVS with an associated infarct after ingestion of a Carolina Reaper pepper.

Case report

A 15-year-old healthy male ingested a Carolina Reaper pepper on a dare. Two days later, he developed an acute headache during football practice, which did not improve with acetaminophen. His blood pressure at home was elevated at 167/95. After reading an article on the Internet about a case of thunderclap headache after ingestion of these peppers [4], he
became concerned and presented to the emergency department (ED). Computed tomography head only showed sinus opacification, and he was discharged home on antibiotics for presumed sinusitis. The following day, he again presented for headache to his pediatrician who diagnosed him with migraines and started prochlorperazine and diclofenac. The headache improved but persisted, and 6 days after the initial ingestion, worsened with the development of nausea and vomiting. Blood pressure at home was 199/98. He presented to the pediatric ED with a severe (10/10) bandlike headache described as the worst of his life. Blood pressure in the ED was 151/65. He had no lateralizing symptoms or cerebellar signs on physical examination. He denied illicit drug use.

He received normal saline bolus, morphine, and divalproex sodium, which improved his pain to 5/10. Magnetic resonance imaging (MRI) brain revealed a focal acute infarct in the right cerebellar hemisphere and focal cortical edema along the right frontal convexity (Fig. 1). MR angiogram demonstrated multifocal segmental arterial narrowing involving the posterior cerebral arteries and superior cerebellar arteries, as well as the middle cerebral arteries (Fig. 2).

Once admitted, an extensive workup for vasculitis, hypercoagulability, and hypertension was initiated which revealed no major findings. Echocardiogram and renal ultrasound were normal. Based on his imaging findings and negative workup, a diagnosis of reversible cerebral vasoconstriction secondary to pepper ingestion was made. His headache and hypertension both resolved with supportive treatment. Calcium channel blockers were not given. He did not require any medication at discharge. At 3-month follow up, he was normotensive and asymptomatic.

Discussion

Reversible cerebrovascular vasoconstriction syndromes are a group of conditions characterized by multifocal vascular narrowing and a clinical presentation of a sudden, severe headache. Associated neurological deficits may or may not be present. Subarachnoid or lobar hemorrhage, infarcts, and cerebral edema can occur with RCVS [5,6]. Vascular imaging demonstrates segmental narrowing in multiple intracranial vessels. Initial angiographic imaging may be normal in the first 4 to 5 days of symptoms, which may be due to early involvement of small peripheral arterioles with progression proximally over time to involve the medium and larger arteries that are more easily visualized on imaging [7]. Resolution of the angiographic findings and symptoms indicate reversibility, but diagnosis may be made with characteristic clinical and imaging findings, as in our case [5].

RCVS may be idiopathic or may be triggered by a variety of causes including ingestion of vasoactive drugs, hypertensive crisis, catecholamine secreting tumors, and postpartum state. Pathophysiology has been hypothesized to be a dysregulation of cerebral vascular tone and excessive sympathetic activity. Treatment is generally supportive. If a triggering substance is identified, withdrawal of the offending agent is paramount. Clinical outcome is usually excellent. Focal deficits at presentation are associated with a worse outcome [5].

In comparison to the other case [4], there is a similarity in the pattern of vessel narrowing in both the anterior and posterior circulation. In both cases, computed tomography head was negative for hemorrhage. Additional features in our case were the presence of acute infarct and focal cortical edema, both of which are associated with RCVS. The finding of hypertension was also unique to our case. Transient hypertension during headache exacerbation in RCVS has been reported [5]. Recurrent thunderclap headaches are associated with RCVS and are exacerbated by Valsalva, coughing, and physical activity. The later onset of headache is also unique to our case, which we hypothesize to result of vasoactive effects of the pepper predisposing the intracranial vascular endothelium towards the dysregulation of vascular tone seen in RCVS, with the onset of severe headache being precipitated by physical

Fig. 1 – Brain MRI. (A) Axial diffusion weighted MRI shows an acute infarct in the right cerebellar hemisphere (arrow). (B) Axial fluid attenuated inversion recovery (FLAIR) MRI shows focal cortical swelling in the right frontal lobe (arrow).
activity. Immediate vomiting after ingestion, not present in our case, may explain the immediate onset of headache in the other case.

The content of capsaicin, the compound that gives peppers their spicy taste, may be measured in Scoville heat units (SHU). The Carolina Reaper pepper boasts up to 2,200,000 SHU. For reference, standard pepper spray contains around 2,000,000 to 5,000,000 SHU, ghost pepper 1,000,000 SHU, and jalapeno pepper 3500 SHU [1]. These ultraspicy peppers may either contain a unique vasoactive substance, or there is a dose-related effect of capsaicin concentration that can trigger RCVS. Further research in this area is needed to determine the exact pathophysiology of this phenomenon. This case provides further evidence that ingestion of hot peppers may lead to serious consequences and that further research is needed to assess their safety.

In conclusion, RCVS should be considered in patients who present with severe headache after ingestion of ultraspicy peppers, and early treatment of RCVS should be initiated in patients with severe headache after pepper ingestion.

**Disclosures**

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**REFERENCES**

[1] Top 10 hottest peppers. 2020, Pepperhead.com, https://pepperhead.com/top-10-worlds-hottestpeppers/; [accessed 20.10.19].

[2] Hansen, Zak. The world’s new hottest pepper can close your airways immediately. 2019, Wideopeneats.com, https://www.wideopeneats.com/new-chilli-pepper-crowns-worlds-hottest/; [accessed 20.10.19].

[3] Arens A, Ben-Youssef L, Hayashi S, Smollin C. Esophageal rupture after ghost pepper ingestion. J Emerg Med 2016;51(6):141–3.

[4] Sogut O, Kaya H, Gökdemir MT, Sezen Y. Acute myocardial infarction and coronary vasospasm associated with the ingestion of cayenne pepper pills in a 25-year-old male. Int J Emerg Med 2012;5(5):5.

[5] Boddhula SK, Boddhula S, Gunasekaran K, et al. An unusual cause of thunderclap headache after eating the hottest pepper in the world The Carolina Reaper Case Reports; 2018. 2018:bcr-2017-224085.

[6] Singhal AB, Hajj-Ali RA, Topcuguo glu MA, Fok J, Bena J, Yang D, et al. Reversible Cerebral Vasospasm Syndromes: Analysis of 139 Cases. Arch Neurol 2011;68(8):1005–12.

[7] Miller TR, Shivashankar R, Mossa-Basha M, Gandhi D. Reversible cerebral vasoconstriction syndrome, part 2: diagnostic work-up, imaging evaluation, and differential diagnosis. Am J Neuroradiol 2015;36(9):1580–8.