

# Atypical Cerebral Infarction in a Patient Suspected Ingestion of Synthetic Cannabinoids

JAE HEE LEE<sup>1</sup>, KEON KIM<sup>1</sup>, DONG HOON LEE<sup>2</sup>, YOON HEE CHOI<sup>1</sup>

<sup>1</sup> Department of Emergency Medicine, Ewha Womans University Mokdong Hospital, Seoul, Korea

<sup>2</sup> Department of Emergency Medicine, Chung-Ang University, College of Medicine, Seoul, Korea

Corresponding Author:

Yoon Hee Choi (ORCID: 0000-0001-5807-748X)

Ewha Womans University Mokdong Hospital, 1071 Anyangcheon-ro, Yangcheon-gu, Seoul, 07985, Republic of Korea

Tel: +82-2-2650-5860, Fax: +82-2-2650-5060, Mobile: +82-11-797-8480

E-mail: like-lemontea@hanmail.net

## ABSTRACT

**Background.** Synthetic cannabinoids are recreational street drugs with many known adverse effects.

**Case presentation.** Here we present the case of an atypical cerebral infarction in a patient with a suspected ingestion of synthetic cannabinoids.

**Conclusion.** Although synthetic cannabinoids use is not conventionally associated with stroke, some case reports describe cerebral infarction and myocardial infarction with significant synthetic cannabinoids intake. Emergency physicians should know the association of synthetic cannabinoids with seizures, myocardial infarction, and now possibly ischemic stroke.

**Key words:** stroke; cannabinoids; synthetic cannabinoids; case report

## INTRODUCTION

Synthetic cannabinoids are recreational street drugs with many known adverse effects, including tachycardia, vomiting, agitation, confusion, hallucinations, diaphoresis, seizures and myocardial infarction (1). Some authors reported seizures, supraventricular tachycardia, and acute myocardial infarction following synthetic cannabinoid use (2). Several reports suggested that cases of cerebral ischemia were associated with the use of synthetic cannabinoid (3). Here we present the case of an atypical cerebral infarction in a patient with a suspected ingestion of synthetic cannabinoids.

## CASE PRESENTATION

A 47-year-old woman was referred to our Emergency Department (ED) due to right

gaze preponderance and neglect to left side symptom. She had visited another hospital ED before due to vaginal bleeding and headache which had lasted for 2 days. 1 hour and 30 minutes after admission, right gaze preponderance and neglect to left side symptom were developed. The National Institutes of Health Stroke Scale was 10 (Best gaze 2/ Visual 2/ Facial palsy 2/ Sensory 2/ Extinction 2). Brain Computed Tomography (CT) showed low attenuation of right posterior cerebral artery territory, choroid plexus, and periventricular white matter. However, CT findings were not correlated with patient's symptoms, Magnetic Resonance imaging (MRI) was performed. The perfusion delay with near occlusion of the distal M1 of the right middle cerebral artery and the basilar artery territory were observed. Based on these findings, hemodynamic and embolic infarction were suspected. Intra-arterial (IA) thrombectomy was planned due to intravenous tissue. Plasminogen Activator could not be used because of vaginal bleeding. It was not possible to perform IA thrombectomy in that hospital, so the patient was transferred to our hospital.

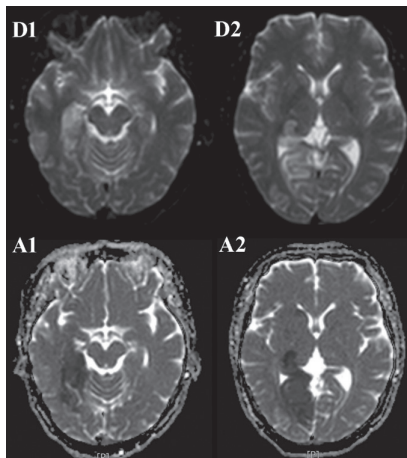
The patient was admitted to our ED 3 hours and 40 minutes after right gaze preponderance and neglect to left side symptom occurred. Mental status was alert at that time, vital signs were stable. On neurologic examination, motor grade was IV in left upper extremity, sensory was decreased on left side. Laboratory findings showed metabolic acidosis (pH 7.219, HCO<sub>3</sub>-8.9 mmol/L, Base excess -19 mEq/L) and anemia (hemoglobin 6.9 g/dL), others were not remarkable. To observe interval change, MRI including angiography were performed. It revealed acute infarction at the right temporo-occipital lobe, parietal lobe, basal ganglia and thalamus (Figure 1). However, it was slightly different from the stenosis site of the intracranial artery

seen in the previous time-of-flight image, the neurologist decided not to perform IA thrombectomy. Cerebral infarction was treated with aspirin and atorvastatin, metabolic acidosis treated with hydration and continuous sodium bicarbonate infusion. The patient was transferred to the intensive care unit. Despite sodium bicarbonate infusion, metabolic acidosis with the high anion gap got worse and Continuous Renal Replacement Therapy (CRRT) was initiated. Urine toxicology screening test was performed under possibility of substance induced metabolic acidosis. The results showed Delta-9 tetrahydrocannabinol positive findings. According to the family's statement, the patient took herbal medication, an unknown ingredient for her diet. Despite treatment for stroke and CRRT for metabolic acidosis, brain herniation progressed to comatose mental status and the patient was declared brain-dead on the sixth day of admission.

## DISCUSSION

Synthetic cannabinoids are easily obtainable at convenience stores, smoke shops, gas stations, and on the internet, and labeled as "herbal blends", "air fresheners" or "incense", often with the warning "not for human consumption" (1). Both on the internet and at head shops, they are generally sold in the form of chemical sprayed on plant materials in United States., Synthetic cannabinoids have recently been increasingly used in Asia as novel psychoactive agents. In Korea, it is not surprising that the lack of experience in synthetic cannabinoids raises concerns regarding their toxicities.

Public health risks of synthetic cannabinoids are of great concern due to known variability in potency in "K2" and "SPICE" products (4). As marijuana is the most fre-



**Figure 1.** MR image of the patient. Diffusion-weighted (D1, D2) and apparent diffusion coefficient (A1, A2) images showed acute infarction at the right temporo-occipital lobe, parietal lobe, basal ganglia and thalamus.



**Figure 2.** Angiography revealed severe stenosis from the right distal ICA to proximal M1 and A1, severe steno-occlusion from the distal BA to right PCA and left proximal P1.

dial infarction, and now possibly ischemic stroke. History regarding the possibility of synthetic cannabinoids use should be explored carefully in the case of unexplained stroke events, especially in young patients with low risks of presenting stroke symptoms.

## ACKNOWLEDGMENTS

We would like to acknowledge our ED staff for their support.

## Funding

The authors received no financial support for the research, authorship, and/or publication of this article

## Availability of data and material

Please contact author for data requests.

## Author's contributions

Y H Choi, J H Lee, K Kim and D H Lee drafted the case presentations and edited the manuscript. All authors read and approved the final manuscript.

Ethical approval and consent to participate Not applicable.

## Consent for publication

We could not obtain a written consent from a patient because the patient had already died. We could not contact her kin despite the effort. Patient identifiable data has been withheld.

## Competing interests

The authors declare that they have no competing interests.

quently abused illicit drug in the US (5), the continued availability of a legal marijuana substitute to both users and retailers may result in consequential exposures to a novel drug that is likely more dangerous than the illicit one it supplants.

Although synthetic cannabinoids use is not conventionally associated with stroke, some case reports describe cerebral infarction and myocardial infarction with significant synthetic cannabinoids intake typically soon after smoking synthetic cannabinoids (6).

The increase in interest in synthetic cannabinoids -related stroke has occurred simultaneously with an increase in the use of spice. Proposed mechanisms of synthetic cannabinoids associated cerebral and myocardial infarctions include hypotension, arrhythmia, and vasospasm (7). Synthetic cannabinoids is known to affect cerebral auto-regulation and vascular tone leading to vasoconstriction and acute ischemic stroke (8). Decreased blood supply, vasoconstriction, increased myocardial oxygen consumption, and increased platelet

aggregation have been reported to be the possible pathophysiologic mechanisms of cardiovascular effects of synthetic cannabinoids (9).

Some authors also suggest that all young adults with stroke should consider about their drug consumption including synthetic cannabinoids, to screen urine for cannabis or to include specific diagnostic tests to detect synthetic cannabinoids and to obtain non-invasive intracranial arterial investigations (i.e. CT-angiography or cerebral Magnetic Resonance Angiography) in order to search for cerebral vasoconstriction (10). Arterial imaging is needed to evaluate the reversibility of these stenosis, consistent with a reversible vasoconstriction as a cause of stroke in the absence of other possible etiologies (10).

In this case, our patient did not have any significant stroke risk factors, such as hypertension, smoking history, family history of stroke, cardiac arrhythmias, or coagulopathy disorder. Emergency physicians should know the association of synthetic cannabinoids with seizures, myocar-

## REFERENCES

1. Seely KA, Prather PL, James LP, Moran JH. Marijuana-based drugs: innovative therapeutics or designer drugs of abuse? *Mol Interv* 2011;11(1):36-51.
2. Lapoint J, James LP, Moran CL, Nelson LS, Hoffman RS, Moran JH. Severe toxicity following synthetic cannabinoid ingestion. *Clin Toxicol (Phila)* 2011;49(8):760-4.
3. Freeman MJ, Rose DZ, Myers MA, Gooch CL, Bozeman AC, Burgin WS. Ischemic stroke after use of the synthetic marijuana "spice". *Neurology* 2013;81(24):2090-3.
4. Dresen S, Ferreiros N, Putz M, Westphal F, Zimmermann R, Auwarter V. Monitoring of herbal mixtures potentially containing synthetic cannabinoids as psychoactive compounds. *J Mass Spectrom.* 2010;45(10):1186-94.
5. Adams IB, Martin BR. Cannabis: pharmacology and toxicology in animals and humans. *Addiction* 1996;91(11):1585-614.
6. Wolff V, Armspach JP, Lauer V, Rouyer O, Bataillard M, Marescaux C, et al. Cannabis-related stroke: myth or reality? *Stroke*

2013;44(2):558-63.

7. Ince B, Benbir G, Yuksel O, Koseoglu L, Uluduz D. Both hemorrhagic and ischemic stroke following high doses of cannabis consumption. *Presse Med* 2015;44(1):106-7.
8. Golcuk Y, Golcuk B, Sozen S. Effect of regular marijuana smoking on platelet function. *Am J Emerg Med* 2015;33(5):721-2.
9. Goyal H, Awad HH, Ghali JK. Role of cannabis in cardiovascular disorders. *J Thorac Dis* 2017;9(7):2079-92.
10. Wolff V, Jouanjus E. Strokes are possible complications of cannabinoids use. *Epilepsy Behav* 2017;70(Pt B):355-63.

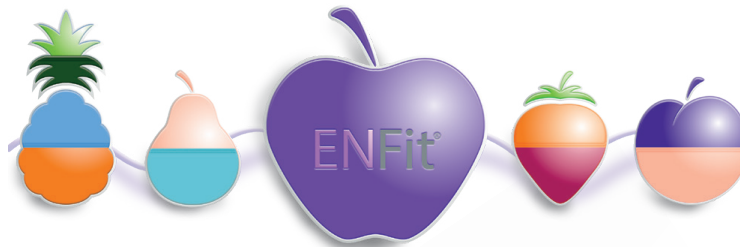


## NeutraClear™

The closed system which guarantees **neutral displacement** and **complete transparency** to prevent catheter-related blood stream infections



## NUTRICAIR™ ENTERAL



*Enteral nutrition  
safely*

