Cases of cerebrovascular disease caused by drug addiction

Madde kullanımı nedenli serebrovasküler hastalık vakaları

Abstract

Illicit drug use is an important cause of stroke in young adults and poses a serious public health problem. The use of psychostimulants such as cocaine and methamphetamine has been found to be associated with higher rates of stroke, and the risk of hemorrhagic and ischemic strokes increases through different mechanisms. In this report, we discuss the possible pathophysiological pathways of cerebrovascular damage in three patients using cocaine, methamphetamine, and cannabis.

Keywords: cannabis; cocaine; drug addiction; methamphetamine; stroke

Öz

Yasadışı madde kullanımı genç erişkinlerde önemli bir inme nedenidir ve ciddi bir halk sağlığı sorunu teşkil etmektedir. Kokain ve metamfetamin gibi psikostimülanların kullanımı daha yüksek inme oranları ile ilişkilendirilmiş olup hemorajik ve iskemik inme riski farklı mekanizmalarla artmaktadır. Bu sunumda kokain, metamfetamin ve esrar kullanan üç hastada serebrovasküler hasarın olası patofizyolojik mekanizmaları tartışılmıştır.

Anahtar sözcükler: esrar, inme; kokain, madde bağımlılığı; metamfetamin

Hasan Huseyin Karadeli[1], Ruken Simsekoglu[1]

[1] Department of Neurology, Istanbul Medeniyet University

Received/*Geliş* : 12.02.2021
Accepted/*Kabul*: 15.03.2021

DOI: 10.21673/anadoluklin.878392

Corresponding author/*Yazışma yazarı*

Hasan Hüseyin Karadeli

Fahrettin Kerim Gökay Caddesi, Eğitim Mah., Kadıköy, 34722 İstanbul, Turkey
E-mail: hhkaradeli@yahoo.com

ORCID

H. Huseyin Karadeli: 0000-0002-0470-8247
Ruken Simsekoglu: 0000-0002-2127-2545

INTRODUCTION

Drug addiction is a common life-threatening condition, with 271 million drug users and 31 million addicts worldwide according to the 2017 United Nations data (1). Drugs have multiple routes of administration, each of which can lead to different complications. Cocaine users were reported to have a 4–8 times higher mortality compared with age- and sex-matched peers in the general population (2). Overdose, suicide, HIV/AIDS, and violence are among the major causes of death in drug addicts. Repeated drug use is associated with adverse effects on neuron functions and neurotransmitters, complex behavior such as addiction and craving, blocking of the central nervous system, promoted release of dopamine and norepinephrine, and effects on the serotonergic and endogenous opiate systems (3). The complications vary according to the type of drug used, the way and duration of use, and the amount used. Hemorrhagic and ischemic strokes are among the most important complications of the central nervous system, especially in young people. Neuroimaging findings can be predictive and distinctive as cerebrovascular damage occurs by various mechanisms according to drug contents and intake route (oral, inhaled, intravenous) (4). In this report, we present 3 cases of cerebrovascular disease caused by cocaine, methamphetamine, and cannabis use.

CASES

Case 1

A 27-year-old man presented to the emergency clinic with the complaint of blurred vision. The patient had no medical history or known allergies. The neurological findings on physical examination were normal. Laboratory values showed normal renal function and no sign of infection. Cranial computed tomographic (CT) scan was normal. In magnetic resonance imaging (MRI), diffusion coefficient images showed acute restricted water diffusion in splenial lesions of the corpus callosum (Figure 1). While extensive etiological investigation found no abnormality, in the following days of hospitalization it was learned that the patient had been using cocaine for five years.

Case 2

A 68-year-old woman presented to the emergency clinic with the complaints of nausea, vomiting, and loss of balance. She had a history of hypertension and diabetes mellitus, which were under control. She smoked 50 packs of cigarettes per year and consumed alcohol on a daily basis for 10 years. In addition, she had been using cannabis for 15 years. It was learned that her cannabis inhalation considerably increased in the last few months.

Systemic examination of the patient was normal. Neurological examination revealed dysarthria, dysmetria, dysdiadochokinesia, and ataxia. Cranial CT showed a hypodense area in the left cerebellar hemisphere. Diffusion MRI showed extensive acute diffusion restriction in the same area. Pronounced compression in the fourth ventricle and enlargement in both lateral ventricles and third ventricle secondary to obstruction were observed (Figure 2). Decompressive surgery was performed by the neurosurgeon. The patient, whose consciousness deteriorated during the follow-up, died on the 2nd postoperative day.

Case 3

A 22-year-old man presented to the emergency clinic with the complaints of numbness and weakness in the right arm and leg. It was learned that 2 months ago the patient experienced speech disorder and weakness on

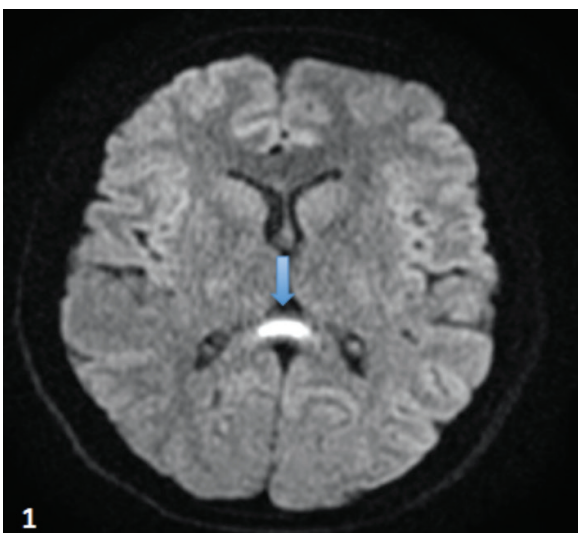

Figure 1. In magnetic resonance imaging (MRI), diffusion coefficient images showed acute restricted water diffusion in splenial lesions of the corpus callosum

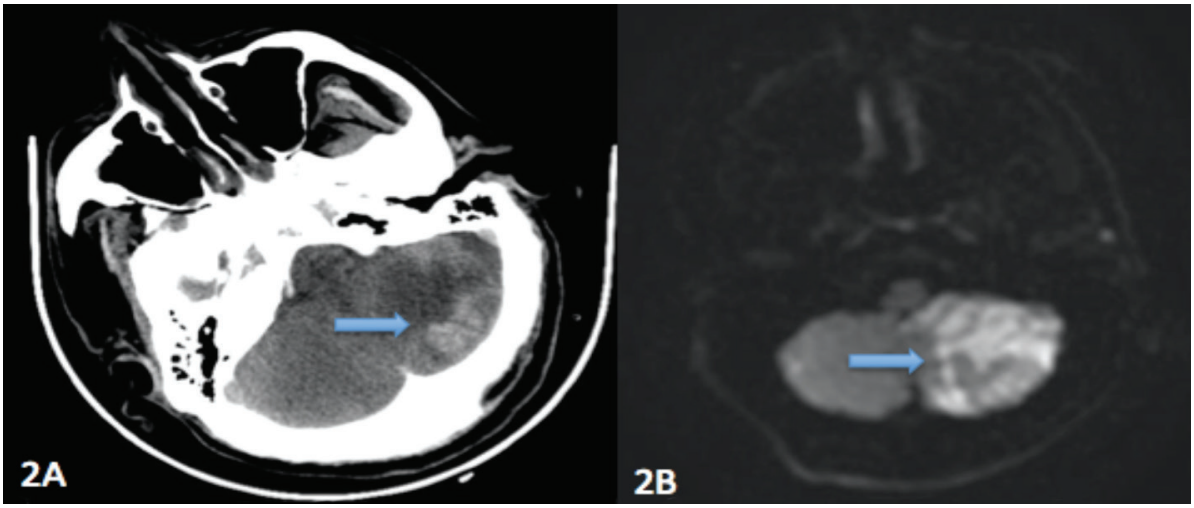

Figure 2. (A) Acute diffusion restriction in the left cerebellar hemisphere; **(B)** the hemorrhagic transformation.

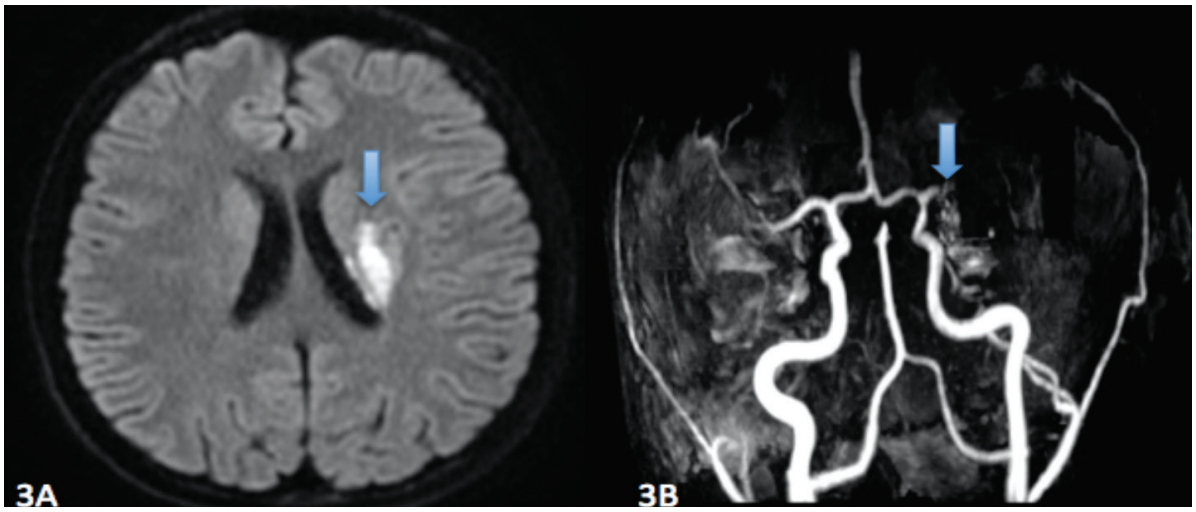

Figure 3. Acute diffusion restriction in the left periventricular white matter.

the right side of his body for 15–20 minutes, which he ignored. His medical and family history revealed no other risk factors. Neurological examination revealed left hemiparesis and hemihypoesthesia. Cranial CT scan was normal. Diffusion MRI showed acute diffusion restriction in the left periventricular white matter (Figure 3). While extensive etiological investigation found no abnormality, it was learned from the patient's relatives that he had been using methamphetamine at least four days a week for the last two months.

Report ethics

Written informed consent was obtained from the patients for the publication of this case report and the accompanying images.

DISCUSSION

Illicit drug use is associated with hemorrhagic and ischemic strokes in young patients. Even when clinical and radiological findings are uncertain, toxicological examination should be considered in all patients.

As the pathogenesis of ischemic strokes in drug users varies considerably, the elucidation of the pathways is important for a patient-specific approach. Young drug users with strokes were reported to have lower rates of hypertension and diabetes mellitus compared with non-drug users with higher levels of cigarette and alcohol consumption (5).

Cocaine use tends to lead to thrombosis by causing vasoconstriction with calcium channel blockage, low

levels of thromboxane, increased platelet aggregation, and decreased levels of angiotensin III and protein C (6). In addition, arteriolar fibrosis and degeneration of the tunica media can cause hemorrhagic strokes (7). Underlying vascular pathologies such as aneurysms and vascular malformations were observed in approximately 50% of patients with hemorrhagic complications caused by cocaine use (6). Therefore, angiographic examination can be useful in terms of monitoring vascular irregularities in chronic drug users (6).

Although cocaine and methamphetamine have similar physiological and pharmacological effects, methamphetamine has a longer half-life and therefore more prolonged systemic effects (8), which usually (80%) manifest with hemorrhagic strokes (as a result of direct vascular toxicity), vasculitis and hypertension (8). Ischemic strokes due to vasospasm can also be seen (6,8,9).

Hypoperfusion infarcts secondary to orthostatic hypotension are observed mostly in cannabis use (10). It has been shown that intracranial stenosis develops especially in the case of long-term use. Arrhythmia, vasospasm, vasculitis, and increased carboxyhemoglobin levels were shown to be other causes of stroke in cannabis users (11).

Bacterial endocarditis should also be kept in mind in injection drug users (12). Care should be taken that non-specific symptoms such as transient paraesthesia, headaches, speech disorders, and visual defects in patients with a history of drug use may be associated with drug-induced cerebral vasospasms and perhaps be a precursor to stroke (4,7). The use of psychostimulants such as cocaine and methamphetamine has been shown to be associated with higher rates of stroke.

In conclusion, illicit drug use, often overlooked in clinical practice, should be toxicologically investigated in young stroke patients, even if not reported anamnestically. The preventive medicine efforts should include raising awareness of addiction-related complications.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

REFERENCES

1. The United Nations Office on Drugs and Crime. World Drug Report 2017 (2017). Available at: www.unodc.org/wdr2017 (accessed: 01.02.2021).
2. Sordo L, Indave BI, Barrio G, Degenhardt L, de la Fuente L, Bravo MJ. Cocaine use and risk of stroke: a systematic review. Drug Alcohol Depend. 2014;142:1–13.
3. Neiman J, Haapaniemi HM, Hillbom M. Neurological complications of drug abuse: pathophysiological mechanisms. Eur J Neurol. 2000;7(6):595–606.
4. Montoya-Filardi A, Mazón M. The addicted brain: imaging neurological complications of recreational drug abuse. Radiologia. 2017;59:17–30.
5. Caplan LR, Hier DB, Banks G. Current concepts of cerebrovascular disease—stroke: stroke and drug abuse. Stroke. 1982;13:869–72.
6. Hagan IG, Burney K. Radiology of recreational drug abuse. Radiographics. 2007;27(4):919-40.
7. Fonseca AC, Ferro JM. Drug abuse and stroke. Curr Neurol Neurosci Rep. 2013;13:325.
8. Lappin JM, Darke S, Farrell M. Stroke and methamphetamine use in young adults: a review. J Neurol Neurosurg Psychiatry. 2017;88:1079–91.
9. Indave BI, Sordo L, Bravo MJ, Sarasa-Renedo A, Fernández-Balbuena S, De la Fuente L, Sonego M, Barrio G. Risk of stroke in prescription and other amphetamine-type stimulants use: A systematic review. Drug Alcohol Rev. 2018;37(1):56-69.
10. Barber PA, Pridmore HM, Krishnamurthy V, Roberts S, Spriggs DA, Carter KN, et al. Cannabis, ischemic stroke, and transient ischemic attack: a case–control study. Stroke. 2013;44:2327–9.
11. Westover AN, McBride S, Haley RW. Stroke in young adults who abuse amphetamines or cocaine. Arch Gen Psychiatry. 2007;64:495–502.
12. Sloan MA, Kittner SJ, Feeser BR, Gardner J, Epstein A, Wozniak MA, et al. Illicit drug-associated ischemic stroke in the Baltimore–Washington Young Stroke Study. Neurology. 1998;50:1688–93.