

Ischaemic strokes and myocardial infarctions in a young male cannabis user

Annabelle Culling, Eluzai Hakim, Oliver Pearce and Michelle Dharmasiri

Author Affiliation:

University Hospitals Dorset, UK

Correspondence:

Eluzai A Hakim

eluzaihakim@gmail.com

Submitted: March 2024

Accepted: April 2024

Published: May 2024

Citation: Culling et al, Ischaemic strokes and myocardial infarctions associated with regular cannabis use in a young man, South Sudan Medical Journal, 2024;17(2):61-65 © 2024 The Author (s) **License:** This is an open access article under [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) DOI: <https://dx.doi.org/10.4314/ssmj.v17i2.4>

ABSTRACT

Ischaemic cerebral infarctions are seen in young people but, under the age of 30, multiple bilateral infarcts are uncommon; genetic pre-disposition and comorbidities often underlie them. There is growing awareness of the potential impact of modifiable risk factors, such as cannabis, for those experiencing stroke and other cardiovascular events. A case of a 29-year-old man is described who presented with sudden onset occipital headache and right eye vision loss. Computerised axial tomographic scanning (CT) of the brain demonstrated multifocal bilateral areas of low attenuation. A brain magnetic resonance imaging (MRI), confirmed bilateral acute cerebral infarctions. In view of a significant elevation in troponin levels at a previous admission, cardiac viability magnetic resonance imaging (cvMRI) was carried out and demonstrated acute infarction affecting the left ventricular apex and multiple smaller infarcts elsewhere within the myocardium. On this occasion he did not complain of chest pain. The electrocardiogram (ECG) showed ischaemic changes. The patient denied a family history of ischaemic heart disease, diabetes mellitus, hypertension and hypercholesterolaemia, but admitted to daily use of cannabis and cigarette smoking. We considered the regular use of cannabis as a possible aetiology in the development of multi-territory cerebral and myocardial infarcts, previous myopericarditis and left ventricular dysfunction

Key words: cannabis, cerebral infarctions, myocardial infarction

Introduction

Ischaemic cerebral infarctions are seen in young people but, under the age of 30, multiple bilateral infarcts are uncommon;^[1] genetic pre-disposition and comorbidities often underlie them. There is growing awareness of the potential impact of modifiable risk factors, such as cannabis, for those experiencing stroke and other cardiovascular events.

Nearly 200 million people worldwide report using recreational cannabis and its popularity is rising.^[2] In the UK there are debates about the drug's legality, and different types of cannabis are being prescribed to relieve pain in conditions such as cancer and neuropathy^[2] and in the management of multiple sclerosis.

Case Report

29-year-old male was admitted to the emergency department with a sudden onset

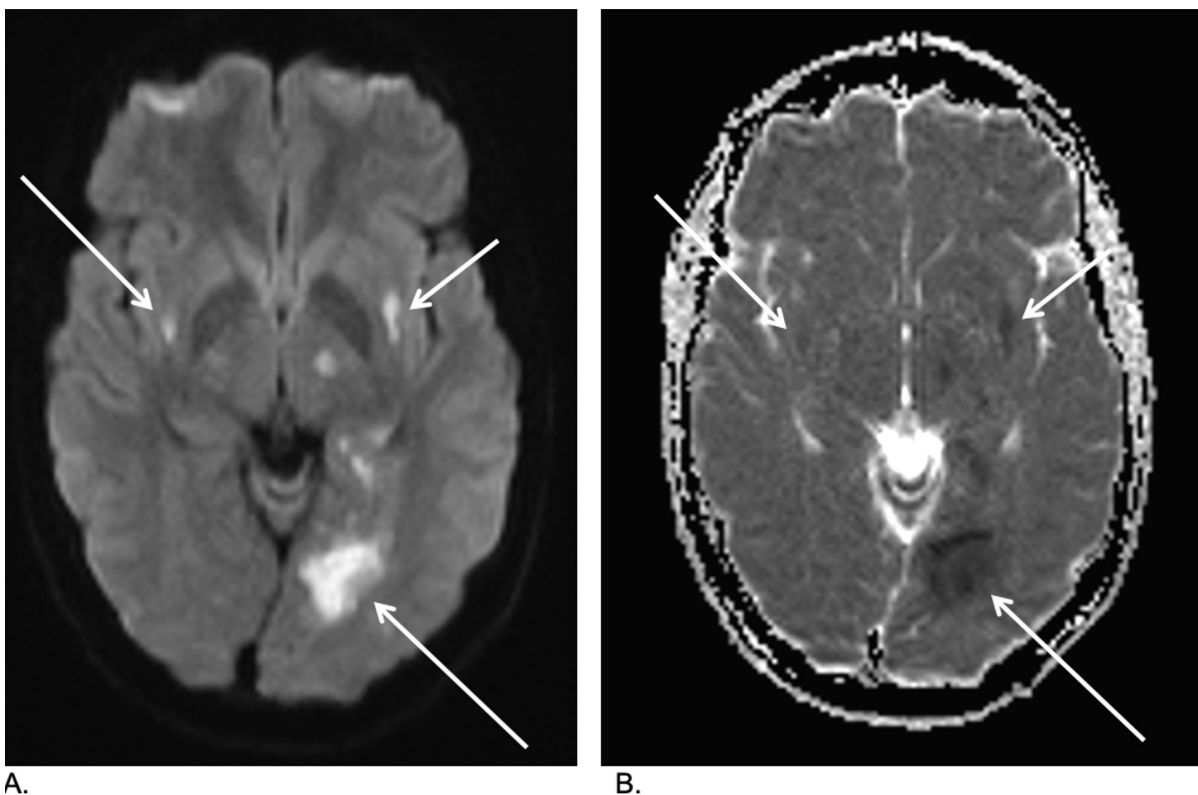
Case Report

of painless vision loss in his right eye and mild occipital headache lasting about ten minutes associated dysarthria and right sided paraesthesia. There were no premonitory features apart from several episodes of diplopia in the previous year. Following this episode vision returned to normal. Clinical examination on this admission demonstrated right homonymous hemianopia (with central sparing). The patient denied a family history of ischaemic heart disease, diabetes mellitus, hypertension and hypercholesterolaemia. He admitted to daily use of cannabis (an estimated four self-rolled cannabis cigarettes per day), and tobacco smoking (roughly 10 cigarettes per day), without the use of all other recreational drugs (including cocaine and methamphetamines). He also denied alcohol use (his liver function tests were normal) and his urine toxicology screen was negative. He did not test positive for coronavirus, and was not aware of recent coronavirus infection.

Three years prior to this event, the patient had presented with a 5-day history of central chest pain and a syncopal event. His troponin at the time was raised at 200ng/L

(reference range <14ng/L). This was treated as likely myopericarditis and he was managed with ibuprofen, paracetamol and discharged. His electrocardiogram (ECG) one week following that event displayed new ischaemic changes and his serum troponin level- at this time was 900ng/L. Cardiac MRI demonstrated mild global systolic dysfunction with an ejection fraction of 53%, appearances which were reported to be in keeping with a myocarditis. He was prescribed ramipril and bisoprolol due to the left ventricular dysfunction. Twelve weeks following this scan, a follow up MRI showed that left ventricular function had resolved. He described no family history or features of rheumatological disease. Follow up by a rheumatologist concluded no demonstrable cause for his symptoms.

The patient underwent a brain CT scan, which displayed a region of low density within the left occipital lobe, no acute intra-cerebral haemorrhage and no space occupying lesions. This finding was confirmed by MRI scan, which demonstrated multiple areas of acute cerebral infarction namely areas of high signal with associated restricted diffusion involving the left occipital lobe, left hippocampus



A.

B.

Figure 1.

A. DWI sequence (b1000 image) showing multifocal areas of increased signal from different vascular territories.

B. The ADC map demonstrates low signal corresponding with the foci of high signal on the diffusion weighted imaging, consistent with acute infarcts.

and left thalamus. There were several foci of restricted diffusion within the left frontal and parietal lobes as well as the right external capsule and right corona radiata (Figure 1- DWI (Diffusion-weighted Imaging) sequence and ADC (Apparent Diffusion Coefficient)). This suggested a possible central embolic source or possibly a vasculitic aetiology. He was admitted to the acute stroke unit for further evaluation and management. Full blood count, urea and electrolytes, liver function tests were normal with a troponin level of 33ng/L (reference range <14ng/L). The 12 lead ECG at this point demonstrated ischaemic changes (T wave inversion in anterolateral leads).

Transthoracic echocardiogram did not demonstrate any intracardiac thrombi. Young stroke blood screen which included complement C3, C4, rheumatoid factor, immunoglobulins (IgG, IgA, IgM), vitamin B12, folate, lupus anticoagulant, anti-cardiolipin antibodies, anti-neutrophil cytoplasmic antibodies tested to exclude vasculitis, anti-beta glycoprotein 1 IgG antibody, hepatitis B and C, HIV, homocysteine, syphilis antibody and viral antibody screen, demonstrated no aetiology for his multiple strokes. Tests for prothrombotic conditions, connective tissue disease screen, erythrocyte sedimentation rate and HbA1C were normal, but random serum cholesterol was 5.4mmol/Litre (reference range <5mmol/L). Urine toxicology screen was negative for recreational drugs (including morphine, codeine, dihydrocodeine, 6-MAM (heroin), methadone, cocaine (BZE), amphetamine, 3,4-methylenedioxymethamphetamine, diazepam, pregabalin, ketamine and cannabis).

cvMRI demonstrated acute infarction affecting the left ventricular apex associated with oedema and hypokinesia/akinesia on a background of multiple smaller infarcts elsewhere within the myocardium. Telemetry demonstrated sinus rhythm with ischaemic changes. CT cardiac coronary angiogram demonstrated a single fleck of right distal coronary artery plaque, but otherwise the coronary arteries were normal in calibre without significant atherosclerosis.

He was diagnosed with left occipital infarction, left ventricular apex acute myocardial infarction and multiple previous infarcts.

He was given 300mg of aspirin on admission, followed by dual antiplatelet therapy of 75mg aspirin and 75mg clopidogrel with gastric protection (lansoprazole 15mg) orally daily for a three-weeks, with atorvastatin 80mg. He was scheduled for review a fortnight later at the ambulatory clinic. During his time as an inpatient, his symptoms improved. Although he had residual right

homonymous hemianopia. A referral to the optometrist was made. Fortunately, two months after onset, the visual impairment had improved such that the patient was left with no neurological deficit and was able to return to full time work.

Discussion

Although ischaemic cerebral infarctions are not rare in young people, it is certainly unusual to experience multiple bilateral infarcts under the age of 30.^[1] Increasing age is a significant stroke risk factor, the incident risk of experiencing an ischaemic stroke doubles every 10 years after the age of 55.^[1] In younger patients, genetic pre-disposition and co-morbidities often underlie these diagnoses. Increasingly however, we are aware of the potential impact of modifiable risk factors for these young patients experiencing stroke and other cardiovascular events.

Cannabis is the most popular recreational illicit drug in the world, with the number of people admitting to usage nearing 200 million and rising.^[2] Its legality in the UK remains controversial and is regularly debated within law and politics, particularly since it has been prescribed more frequently for conditions such as cancer pain and neuropathy.^[2] For example, Sativex (nabiximols) is used widely as part of the management of multiple sclerosis. This partial cannabinoid receptor agonist is thought to exert its effect through increase of inhibition of the spinal interneurons resulting in symptom control of spasticity. This medication is not recommended in patients with serious cardiovascular co-morbidities.^[3]

Previous case reports have described similar scenarios in which patients have experienced multi-territory infarctions (cerebral and myocardial), likely associated with regular cannabis use.^[4-6] Pertinent to this case study, many reviews have demonstrated this link to be particularly strong in young adults.^[6] For example, Rumalla et al. carried out a large population-based analysis in the USA and demonstrated that recreational and regular use of cannabis was independently associated with 2.26 relative risk of ischaemic stroke among 25-34 year olds.^[6] Similarly, several recent systematic reviews have demonstrated an association between cannabis use and prevalence of ischaemic and haemorrhagic stroke along with other cardiovascular diseases (e.g. myocardial infarction incidence).^[7,8] Currently, cannabis use is not a recognised risk factor for stroke according to the National Institute for Health and Care Excellence (NICE), however cocaine and methamphetamine are considered risk factors,

therefore cannabis is not included in patient counselling.^[9]

The mechanism of regular cannabis use, as a risk factor for myocardial infarction and ischaemic stroke, may be due to the sympathomimetic effect of the 9-tetrahydrocannabinol component (THC).^[10] THC affects CB1 receptors within the cardiovascular system, leading to haemodynamic changes: increase in blood pressure, vasodilation, alteration of coronary blood flow and tachycardia. These changes may predispose to ischaemia.^[10,11] Similarly, increased vascular tone leads to reduced cerebral blood flow, which may be associated with increased risk of stroke.^[11] Research is ongoing into both the potential pro-thrombotic effect of cannabis and the inflammatory potential of cannabis to contribute to the development of atheroma (both mediated via CB1 and CB2 receptors).^[11] A notably difficult aspect and limitation of this case study, is the potential for an unreliable history from the patient (pertaining to both family history and recreational drug use other than cannabis). Similarly, unfortunately we are unable to demonstrate and prove historical recreational drug use, as investigations are limited, which may restrict diagnostic certainty.

Many studies have determined a relation that is temporal in nature, suggesting that myocardial infarction incidence was almost five times higher than average in the hour after cannabis use.^[12] Reports of left ventricular dysfunction associated with regular cannabis use are reported in the literature, but rarer than those of myocardial infarction.^[13] The regularity of cannabis usage does impact upon risk according to recent studies. One large retrospective study demonstrated a significant increased risk of recurrent stroke in young patients (18-44) with regular cannabis use (cannabis use disorder), and another demonstrated a 3.3-fold increase in risk of stroke/ transient ischaemic attack, but only in patients who used cannabis at least once weekly.^[14,15]

Conclusion

Despite cannabis being a possible risk factor for the development of stroke, research continues to consider the effect of the endocannabinoid system as a therapeutic target for various pathologies. There are over 100 cannabinoids and the mechanism of action of many of these is yet to be understood.^[5] CBD is the major non-psychoactive component of cannabis.^[5] It has been suggested that CBD may be involved in a mechanism that limits the adverse cardiovascular effects of THC.^[5] However, as cannabis is often used recreationally, CBD content of cannabis is variable and often low, whilst the THC component (the

psychoactive element and cardio-adverse component) is trending upwards in concentration.^[5] At present, there is no 'standard' of medical cannabis, the term is used to describe any product with derivatives of cannabis.^[10] With the use of cannabis worldwide increasing, it is vital for further research to be focused on this association and its potential effects going forward.

Learning points

- Internationally, the use of cannabis is rising, with many countries and states legalizing/decriminalizing its use.
- Adults (particularly young adults/males) using cannabis could be at a higher risk of experiencing myocardial infarction, stroke, and left ventricular dysfunction.
- There is increasing use of recreational cannabis in developing countries where the average population age is younger than many developed countries, this could impact sickness-related economic inactivity.
- Despite evidence within the literature regarding the link between myocardial infarction, stroke, and cannabis use, this is not documented as a risk factor by NICE. Currently, the counselling from healthcare professionals regarding risk factors for ischaemic events does not include caution with cannabis use, therefore the general public may not be aware of the true nature of the risks of cannabis use.
- This case highlights the importance of a detailed recreational drug history when considering morbidity and risk factor reduction in adults

Contributions

AC drafted the case report and carried out the literature search. EH identified the case, reviewed the manuscript and followed the patient up in ambulatory clinic. OP reported and selected the images. MD was the named consultant whilst the patient was treated on the stroke unit.

References

1. Yousufuddin M, Young N. Aging and Ischaemic stroke. *Aging* 2019;11(9):2542-44.
2. Goyal H, Award H, Ghali J. Role of cannabis in cardiovascular disorders. *Journal of Thoracic Disease* 2017;9(7).
3. Russo M, Calabrò R, Naro A, et al. Sativex in the Management of Multiple Sclerosis-Related Spasticity: Role of the Corticospinal Modulation. *Neural Plasticity* 2015;2015(656582).

4. Pinedo M, Gomez-Beldarrain M, Basterretxea J, et al. Recurrent stroke associated with cannabis use. *Neurology, Neurosurgery and Psychiatry* 2005;76(3).
5. Choi S, Mou Y, Silva A. Cannabis and Cannabinoid Biology in Stroke. *Stroke* 2019;50:2640-45.
6. Rumalla K, Reddy A, Mittal M. Recreational marijuana use and acute ischemic stroke: A population-based analysis of hospitalized patient in the United States. *Journal of the Neurological Sciences* 2016;15(364):191-96.
7. Zhao J, Chen H, Zhuo C, et al. Cannabis Use and the Risk of Cardiovascular Diseases: A Mendelian Randomization Study. *Frontiers in Cardiovascular Medicine* 2021;8(676850).
8. Swetlik C, Migdady I, Hasan L, et al. Cannabis Use and Stroke: Does a Risk Exist? *Journal of Addiction Medicine* 2022;16(2):208-15.
9. NICE CKS. What are the risk factors for stroke and TIA? National Institute for Health and Care Excellence 2022.
10. Pasha A, Clements C, Reynolds C, et al. Cardiovascular Effects of Medical Marijuana: A Systematic Review. *The American Journal of Medicine* 2021;134(2):182-93.
11. Subramaniam V, Menezes A, DeSchutter A, et al. The Cardiovascular Effects of Marijuana: Are the Potential Adverse Effects Worth the High? *The Journal of the Missouri State Medical Association* 2019;116(2):146-53.
12. Mittleman M, Lewis R, Maclure M, et al. Triggering myocardial infarction by marijuana. *Circulation* 2001;103:2805-09.
13. Ting J. Reversible cardiomyopathy associated with acute inhaled marijuana use in a young adult. *Clinical Toxicology (Philadelphia)* 2007;45:432-34.
14. Desai R, Went T, Sultan W, et al. Higher Frequency And Odds Of Recurrent/subsequent Stroke Admissions In Young (18-44 Years) Patients With Prior Stroke/transient Ischemic Attack With Versus Without Cannabis Use Disorder: A Nationwide Inpatient Analysis. *Stroke* 2022;53.
15. Page R, Allen A, Kloner R, et al. Medical Marijuana, Recreational Cannabis, and Cardiovascular Health: A Scientific Statement From the American Heart Association. *Circulation* 2020;142(10).