

Reversible Cardiomyopathy Associated with Acute Inhaled Marijuana Use in a Young Adult

Keywords: Cardiomyopathy; Ventricular dysfunction; Marijuana

To the Editor:

Marijuana is the most frequently abused illicit drug globally (1,2). It is rarely associated with cardiovascular events after acute administration (3,4). Cardiac failure may result from chronic use (5). Marijuana's pervasive use may lead to a significant burden of cardiovascular sequelae, which includes, with this report, the potential for toxic cardiomyopathy.

A 31-year-old woman presented to the Emergency Department with agitation (E = 4, V = 2, M = 5; GCS 11). She became confused after having smoked a large amount of marijuana. She was combative, with blood pressure 125/60 mm Hg; heart rate 110/min in sinus rhythm, respiratory rate 25/min; temperature 36.3° C. Both pupils were 1 mm and sluggish. Scleral injection was present.

The patient had known hepatitis C, smoked marijuana occasionally and 20 cigarettes a day, and was newly diagnosed to be pregnant. She last used IV heroin five years previously and was a social drinker (no binging). There was no ingested overdose leading to this presentation. Methadone maintenance at a daily pharmacy-dispensed dose of 65 mg was her only prescribed medication.

Initial investigations included serum salicylate <10 mg/L, paracetamol <4mg/L, normal electrolytes/urea/creatinine/ liver function tests, and serum glucose 8.5 mmol/L. There was a high white cell count of 27 (RR 4.5-11.0 × 10⁹/L) with predominant neutrophilia 22.84 (RR 1.8-7.7 × 10⁹/L). Venous blood gas revealed mild metabolic acidemia [venous pH7.33 (RR 7.35-7.45), pCO₂ 37 (RR 35-45 mm Hg), pO₂ 47 mm Hg, bicarbonate 19 (22-27 mmol/L), base excess -5.8 (RR -3.0 to +3.0 mmol/L)]. Serum BhCG level was 107889 U/L, consistent with being 6-9 weeks pregnant.

She remained combative after receiving IV 20 mg diazepam and 9 mg droperidol. To attain behavioral containment to facilitate ongoing management, the patient was intubated after induction with thiopentone 100 mg, fentanyl 100µg, and succinylcholine 100 mg.

Post-intubation chest X-ray showed no cardiomegaly, pulmonary oedema, pneumomediastinum, or consolidation. Non-contrast CT brain and lumbar puncture (CSF chemistry, leucocyte and erythrocyte count, viral studies, cultures) were normal. Propofol (100-150 mg/h) and fentanyl (50-100 µg/h) infusions were commenced. The patient received 12 hours of mechanical ventilation.

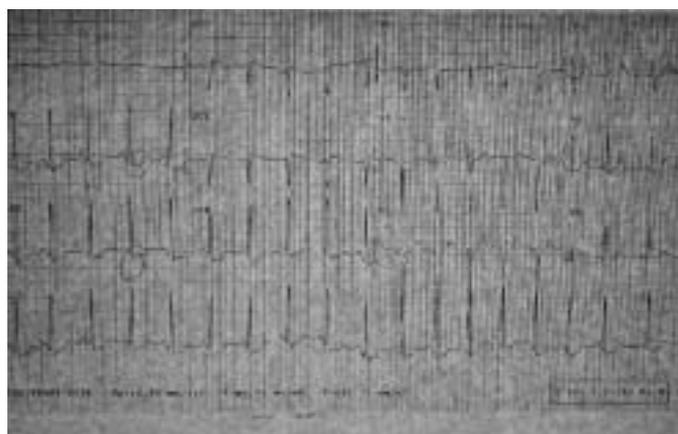


Fig. 1. Post-intubation ECG showing inferior ST segment depression.

Electrocardiogram (ECG) (Fig. 1) following stable anaesthetic induction for intubation showed inferior ST depression which resolved over the next 12 hours (Fig. 2), coinciding with a troponin-I leak which peaked at

15.93 (RR<0.05 µg/L). Serum total CK total peaked 12 hours after admission, at 1233 (RR<160 U/L), with CK MB of 44 (0–10 U/L). Transthoracic echocardiogram performed 48 hours after admission to exclude valve infection showed severe left ventricle (LV) systolic dysfunction and an ejection fraction (EF) of 29%. The LV had normal filling pressures and wall thickness but was mildly dilated. There was moderately impaired right ventricular (RV) systolic function with mild dilatation and moderate tricuspid regurgitation. Follow-up echocardiogram six days after admission demonstrated improved LVEF of 49% and only mild global hypokinesis, normal RV size with good systolic function, and resolution of tricuspid regurgitation. No valve vegetations were seen on either occasion.

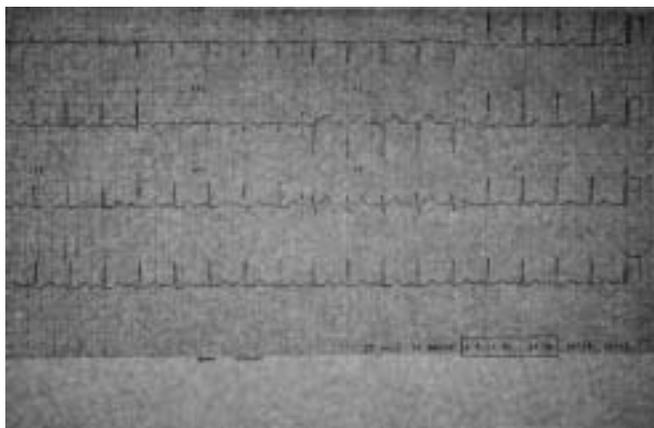


Fig. 2. ECG at 12 hours showing resolution of ST segment depression.

Investigations for cardiomyopathy, including thyroid function tests, serum Vitamin B₁₂, red blood cell folate, serum copper and iron studies as well as serum globulin pro-file, were normal. There was no serological evidence of recent CMV or enterovirus infection. Hepatitis serology did not reveal recent or past hepatitis A or B infection, and the patient was hepatitis B non-immune. Reactive anti HCV IgG confirmed known hepatitis C infection.

Cannabinoids were detected on extended urine drug analysis using gas chromatography/ mass spectrometry immunoassay, as was methadone and agents used for medical management (propofol, thiopentone, metabolites of diazepam). Urine immunoassay was negative for cocaine, sympathomimetic amines, and opiates. However, positive urine drug assays may reflect remote illicit drug use not related to the acute event. Carbon monoxide toxicity was unlikely as carboxyhemoglobin level was 0.6% (RR 0.5-1.5) immediately after intubation.

At no stage did the patient have clinical signs of cardiac failure. There was no personal or family history of ischemic heart disease, cardiomyopathy, exertional dyspnea, or syncope. The patient denied any previous symptoms of angina or cardiac failure. She made an uneventful recovery and was discharged home after 11 days. The patient remains well, with an LVEF of 60% and normal RV function 8 weeks after discharge.

There is no clear evidence that marijuana is related to cardiovascular events in healthy adults or older patients with pre-existing heart disease (3,4). Physiologically, acute marijuana use leads to dose-dependent tachycardia, raised blood pressure and cardiac output, for which tolerance rapidly develops (3,4). Decreased peripheral vascular resistance and hypotension frequently occur (4). These effects are mediated by the central autonomic nervous and cannabinoid receptor systems (3).

Although long-term cannabis smoking may lead to cardiac failure (5), cardiomyopathy temporally related to acute marijuana use has not been described previously. In our patient, non-ST elevation MI and cardiomyopathy followed acute marijuana use.

Although cardiovascular effects of marijuana are well tolerated in young healthy users (4), acute exposure may cause myocardial infarction (MI) (6) and reduces coronary blood flow (7). Despite marijuana smoking being a rare trigger of MI, a case-crossover study involving 3,882 patients with MI demonstrated a 4.8 times increased risk above base-line of MI for 60 mins after marijuana use (8), although high prevalence of cigarette smoking may have confounded this association (3). Ventricular tachycardia (7) and atrial fibrillation (9) have occurred with marijuana use.

Cardiovascular sequelae results from marijuana-induced increased myocardial oxygen consumption, reduced oxygen delivery from carboxyhemoglobinemia, hypotension, reduced angina perception, and

impaired judgement in seeking medical assistance (3,4). Increased cellular oxidant stress worsens platelet activation and dyslipidemia (3).

Although cardiomyopathy followed acute marijuana use in this patient and may therefore be associated with it, other potential contributors to cardiac dysfunction require consideration. Propofol infusions at >5 mg/kg/h for >48 h may result in cardiomyopathy, metabolic acidemia, and myopathy; the propofol infusion syndrome (10). Our patient received a total of 1740 mg of propofol over 13 h at a mean rate of 133 mg/h, equivalent to only 2.2 mg/kg/h. In addition to fulfilling only the first of the clinical criteria for propofol infusion syndrome, it is unlikely that low-dose propofol used for short periods would predispose to this syndrome. Antipsychotic agents such as clozapine (11), but not droperidol (12), are rarely associated with cardiomyopathy and myocarditis. Urine drug immunoassay did not detect any sympathomimetic amines well known to cause cardiovascular sequelae (13). There are no reports of an association between maintenance methadone dosing and cardiomyopathy.

Although cardiac dysfunction in this case cannot conclusively nor solely be attributed to marijuana, acute cardiomyopathy appeared to follow use of inhaled marijuana in a woman with no previous cardiovascular disease. This temporal association adds to the small body of literature on cardiovascular morbidity associated with marijuana.

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