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Letter to the Editor

Successful b-blocker usage to treat a patient with hemodynamic instability caused by severe caffeine poisoning

Severe caffeine poisoning can cause lethal arrhythmias that are often refractory to treatment. In patients with hemodynamic instability who have hypotension and tachydysrhythmia, it may be inadvisable to use β-blockers because of the potential for lethal cardiovascular events. Here, we report the case of a patient with hemodynamic instability following a significant caffeine overdose, in which β-blocker use contributed to hemodynamic stabilization, recovery from hypotension, and successful hemodialysis.

A 24-year-old man with autism spectrum disorder ingested a total dose of 48 g of caffeine (equivalent to 800 mg/kg) in a suicide attempt and was transferred to the emergency department. On arrival, he presented with convulsive status. His vital signs were: the Glasgow Coma Scale, 9 (E4V2M3); heart rate, 169 beats/min; blood pressure, 64/22 mmHg; respiratory rate, 24 breaths/min; and oxygen saturation, unmeasurable. Electrocardiogram showed polymorphic ventricular tachycardia (PVT; Fig. 1a), which was resistant to three

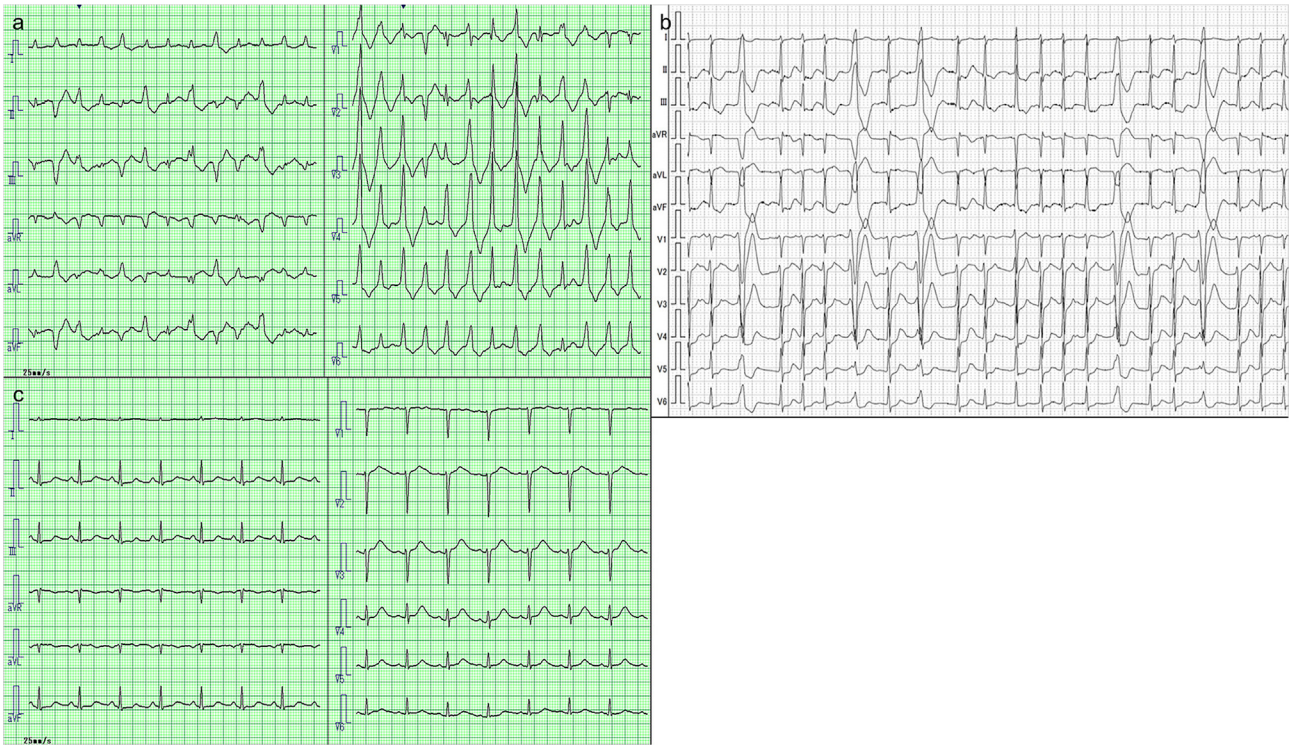

Fig. 1 – (a) Electrocardiogram preformed upon the patient's arrival to the emergency department, showing polymorphic ventricular tachycardia. (b) Electrocardiogram preformed immediately following an intravenous infusion of propranolol at the catheter laboratory, showing a narrow QRS wave, atrial fibrillation, and frequent premature ventricular contractions. (c) Electrocardiogram performed during the continuous intravenous infusion of landiolol and intermittent hemodialysis, showing a narrow QRS wave and sinus rhythm.

electrical defibrillation attempts (biphasic 100, 150, and 270 J), as well as intravenous infusions of amiodarone (150 mg) and magnesium sulfate (2 g). We administered an intravenous infusion of propranolol (0.8 mg) and prepared a veno-arterial extracorporeal membrane oxygenation (VA-ECMO) system on stand-by, owing to concerns regarding circulatory collapse. Then, the patient's PVT improved significantly (Fig. 1b), and his hemodynamic indicators stabilized (heat rate, 117 beats/min; blood pressure, 104/76 mmHg). We therefore administered a continuous intravenous infusion of landiolol (an ultra-short-acting selective β1-blocker) starting at 4 μg/kg/min and progressing to a maximum dose of 8 μg/kg/min. Three hours following the patient's arrival to hospital, intermittent hemodialysis was initiated and continued for 12-h (blood flow rate, 120 mL/min; dialysate flow rate, 500 mL/min). The patient's arrhythmias did not reappear during hemodialysis (Fig. 1c). Landiolol was discontinued 48-h after its initiation.

β-blockers are often used to treat tachycardia and tachydysrhythmia caused by caffeine overdose, owing to their negative chronotropic effect.[1] However, in some cases of hemodynamically unstable and refractory tachydysrhythmia caused by severe caffeine poisoning, the use of β-blockers may be inadvisable because of their negative inotropic effect.[2] β-blockers are often used to control tachycardia in cases of thyroid storm,[3] but should be used with caution because they can also cause cardiovascular collapse even in small dose.[4] There is a previous report of propranolol being used to improve refractory ventricular tachydysrhythmias with hemodynamic instability caused by severe caffeine poisoning.[5] In our case, propranolol and landiolol may have contributed to improving tachydysrhythmia without drop in blood pressure, owing to blockage of β1-agonist.

β-blockers may represent a useful supportive therapy, when the initiation of VA-ECMO is being considered, in patients with hemodynamic instability and potentially lethal arrhythmias caused by massive caffeine overdose.

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Ethics approval and consent for publication

Ethics approval is not required for a de-identified single case report based on institutional policies. Consent for publication was obtained from patient in accordance with the journal's patient consent policy.

Submission declaration

This manuscript has not been published elsewhere yet.

CRediT authorship contribution statement

Yasuyoshi Miyamura: Conceptualization, Writing – original draft. **Tetsuhiro Takei:** Conceptualization, Supervision, Writing – review & editing. **Taketo Suzuki:** Supervision. **Takahiro Tachibana:** Supervision. **Itaru Sasamoto:** Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

1. Price KR, Fligner DJ. Treatment of caffeine toxicity with esmolol. Ann Emerg Med 1990;19:44–6. https://doi.org/10.1016/s0196-0644(05)82139-0.
2. Zimmerman PM, Pulliam J, Schwengels J, MacDonald SE. Caffeine intoxication: a near fatality. Ann Emerg Med 1985;14:1227–9. https://doi.org/10.1016/s0196-0644(85)81035-0.
3. Satoh T, Isozaki O, Suzuki A, et al. Guidelines for the management of thyroid storm from The Japan Thyroid Association and Japan Endocrine Society (First edition). Endocr J 2016;63:1025–64. https://doi.org/10.1507/endocrj.EJ16-0336.
4. Dalan R, Leow MK. Cardiovascular collapse associated with beta blockade in thyroid storm. Exp Clin Endocrinol Diabetes 2007;115:392–6. https://doi.org/10.1055/s-2007-971065.
5. Laskowski LK, Henesch JA, Nelson LS, Hoffman RS, Smith SW. Start me up! Recurrent ventricular tachydysrhythmias following intentional concentrated caffeine ingestion. Clin Toxicol (Phila) 2015;53:830–3. https://doi.org/10.3109/15563650.2015.1075247.

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