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【 CASE REPORT 】

# Potentially Life-threatening Arrhythmia Triggered by an Excessive Consumption of Dried Sweet Potato "Hoshi-Imo"

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**Abstract:**
We herein report two cases of potentially life-threatening arrhythmia due to hyperkalemia triggered by the excessive consumption of "Hoshi-Imo" (dried sweet potato). Both patients with chronic renal disease on renin-angiotensin-aldosterone system inhibitors presented at the emergency room with non-specific symptoms. Electrocardiograms revealed potentially life-threatening arrhythmia due to hyperkalemia in both cases: sinus arrest with a ventricular escape rhythm, tall and peaked T waves; and a widened QRS complex in a nearly sine-wave configuration without discernible P wave. Both patients fully recovered after intensive care for hyperkalemia. Physicians should recognize the excessive consumption of "Hoshi-Imo" may lead to the development of life-threatening arrhythmia, especially in patients with risk factors for hyperkalemia.

**Key words:** Hoshi-Imo, excessive consumption, hyperkalemia, life-threatening arrhythmia, dried sweet potato

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## Introduction

Hyperkalemia is a potentially life-threatening electrolyte disorder that occurs with greater frequency in patients with renal disease especially on hemodialysis (HD), heart failure, and use of certain medications such as renin-angiotensin-aldosterone system inhibitors (1). The electrocardiographic findings caused by hyperkalemia commonly include peaked T-waves, a widening of the QRS-complex, a flattening or absence of P waves, and a sine-wave pattern (2). As a result, hyperkalemia may degenerate into a potentially life-threatening ventricular fibrillation (3). We herein report two patients who developed potentially life-threatening arrhythmia due to hyperkalemia which was caused by the excessive consumption of dried sweet potato "Hoshi-Imo".

## Case Reports

### Case 1

A 78-year-old man on HD for end-stage renal disease presented at the emergency room with persistent dizziness 2 days after the last HD. His medications were as follows: linagliptin and insulin aspart for diabetes mellitus; azilsartan, nifedipine and doxazosin for hypertension; atorvastatin for dyslipidemia; carvedilol for chronic heart failure; sarpogrelate and eicosapentaenoic acid for arteriosclerosis obliterans. The dosage of the medications had not changed for at least a year prior to the onset of hyperkalemia. His latest blood test had been performed by his family physician 20 days prior to presentation were blood urea nitrogen (BUN) 45.8 mg/dL, creatinine 8.15 mg/dL, estimated glomerular filtration rate (eGFR) 6 mL/min/1.73 $m^2$, and potassium 5.1 mEq/L. A thoroughly taken history revealed that he consumed "Hoshi-Imo" on a daily basis, and he had consumed 300 grams in the past two days. A physical examination revealed that he was alert and oriented. His respiratory rate was 16 breaths per minute, oxygen saturation was 98% on room air. His pulse rate was 32 beats per minute, systolic blood pressure was 109 mmHg. His heart sounds and lung sounds were clear. There was no peripheral edema on his extremities. Blood tests revealed BUN 30 mg/dL, creatinine 7.93 mg/dL, eGFR 5.8 mL/min/1.73 $m^2$, and potassium 8.3

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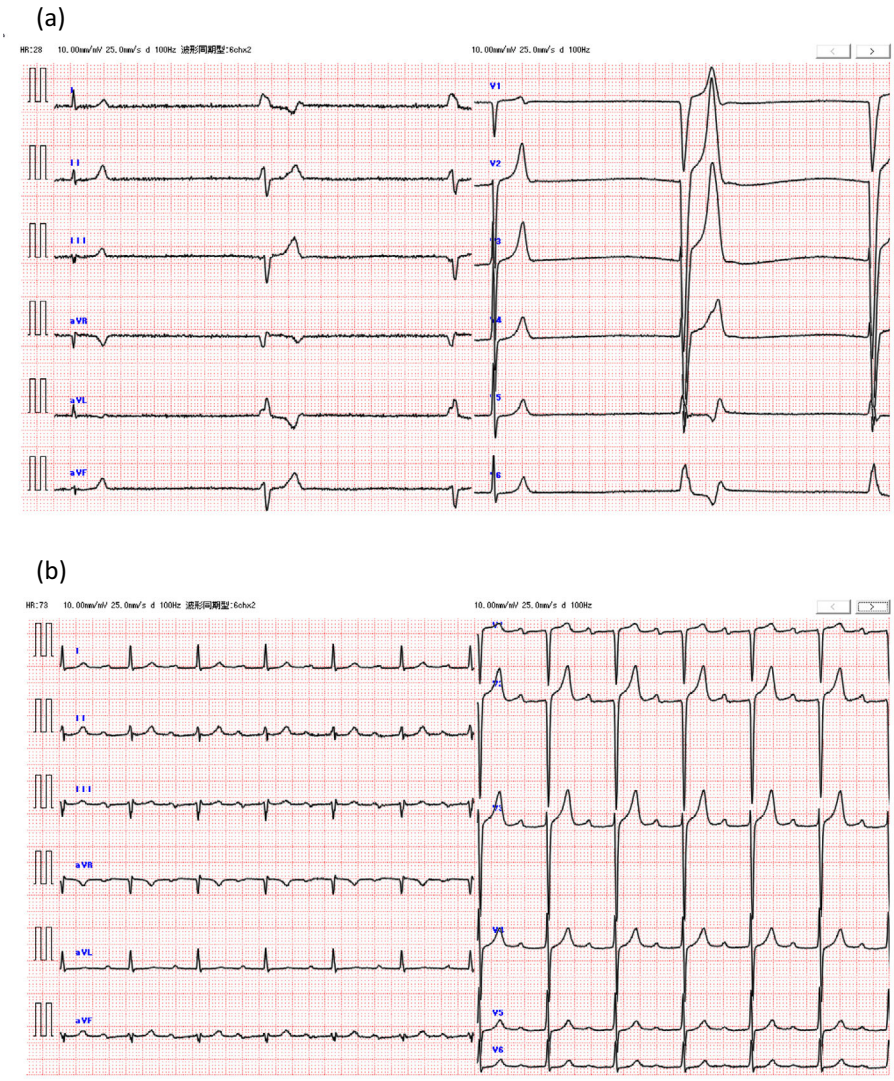


**Figure 1. An electrocardiogram of case 1 at diagnosis revealed sinus arrest with a ventricular escape rhythm of 28 beats per minute, tall and peaked T waves (a), tall and peaked T waves but it returned to sinus rhythm with heart rate of 73 beats per minute after treatment for hyperkalemia (b).**

mEq/L. Electrocardiograms revealed sinus arrest with a ventricular escape rhythm of 28 beats per minute, tall and peaked T waves (Fig. 1a).

As therapy for his hyperkalemia, he was immediately treated with calcium gluconate infusion, glucose/insulin infusion, oral sodium zirconium cyclosilicate, and life-saving emergency HD. Two and a half hours after the treatment, his serum potassium level decreased to 5.4 mEq/L, and his heart rate on electrocardiogram improved to 73 beats per minute, sinus rhythm with first degree atrioventricular block (Fig. 1b). He was discharged in good condition after he had undergone hemodialysis three times during his admission. Against the background of end-stage renal disease on HD, azilsartan and carvedilol intake, and insulin shortage, excessive consumption of "Hoshi-Imo" most likely was the factor that triggered his hyperkalemia.

## Case 2

70-year-old woman presented to the emergency department at a local hospital with nausea and vomiting after defecation. Her pulse rate was 20 beats per minute and her blood tests revealed serum potassium level of 6.8 mEq/L. Then she was brought by ambulance to our tertiary referral hospital with bradycardia caused by hyperkalemia. Her medications are as follows: amlodipine, irbesartan and carvedilol for hypertension, nicorandil for angina pectoris, carbamazepine and phenytoin for history of epilepsy because of epidural hematoma and right putamen hemorrhage. The dosage of the medications had not changed for at least a year prior to onset of hyperkalemia. Her latest blood test done with the family physician 75 days prior to presentation were BUN 27 mg/dL, creatinine 1.3 mg/dL, eGFR 31.9 mL/min/1.73 $m^2$, and potassium 5.1 mEq/L. A carefully taken medical history showed she had a habit to consume "Hoshi-Imo" and had consumed 100 grams per day for the last month. She was alert and oriented, her respiratory rate was 15 breaths per minute, oxygen saturation was 100% under 5 L/min of oxygen by reservoir face mask. Her heart rate on the

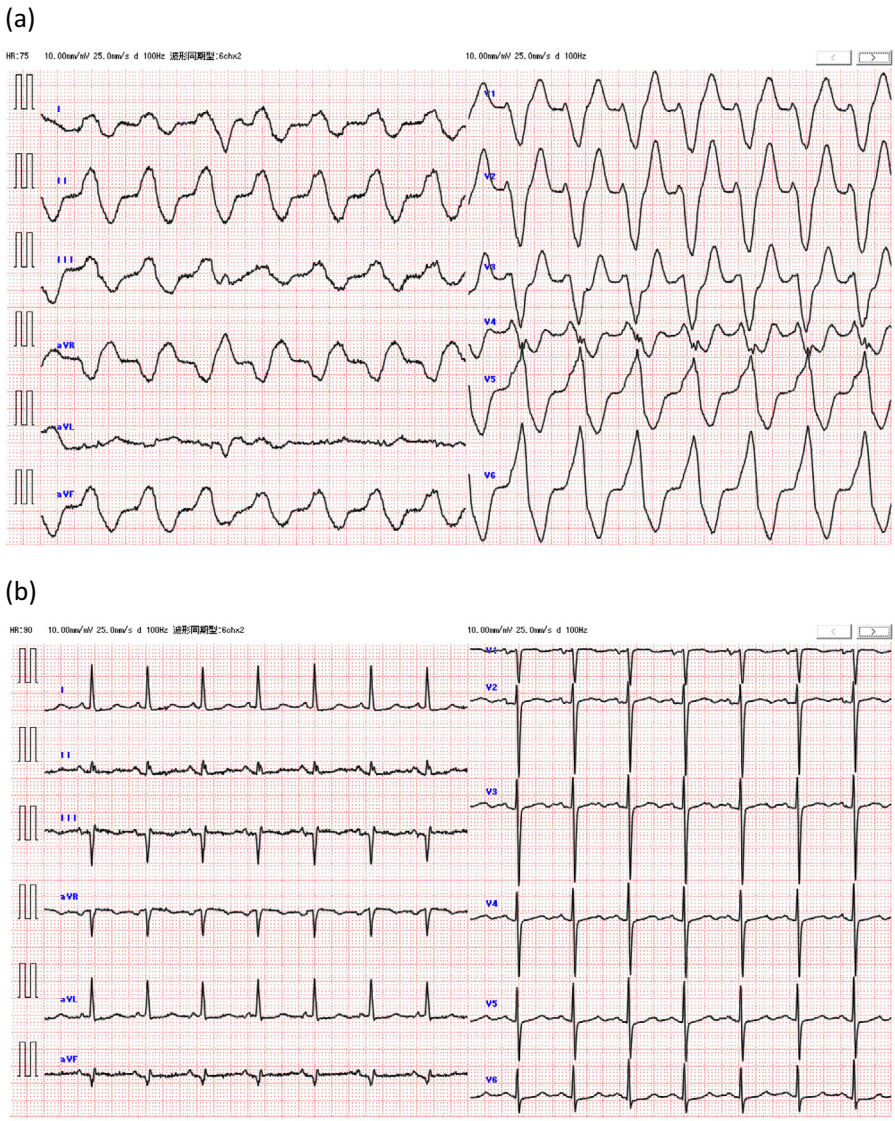


**Figure 2. An electrocardiogram of case 2 at diagnosis revealed a regular rhythm with widened QRS complexes in a nearly sine-wave configuration and there was no discernible P wave (a), but it returned to a sinus rhythm with heart rate of 90 beats per minute after treatment for hyperkalemia (b).**

electrocardiogram (ECG) monitor was 84 beats per minute, her blood pressure was 136/65 mmHg. Her heart sounds were clear. Her lung sounds were clear and there were no rales. Her extremities did not show peripheral edema. Blood tests revealed BUN 41 mg/dL, creatinine 1.48 mg/dL, eGFR 27.6 mL/min/1.73 $m^2$, and potassium 7.0 mEq/L. Her electrocardiogram showed a regular rhythm with widened QRS complexes in a nearly sine-wave configuration and there was no discernible P wave (Fig. 2a).

Since her electrocardiogram changing was caused by hyperkalemia, she was treated with glucose/insulin infusion, oral sodium zirconium cyclosilicate, suppository calcium polystyrene sulfonate, and intravenous pacing was initiated. Her serum potassium level recovered to 4.3 mEq/L, and her electrocardiogram returned to a sinus rhythm on the following day (Fig. 2b). Two days after admission, the intravenous pacing lead was removed. She required oral calcium polystyrene sulfonate to maintain her serum potassium level. She was discharged without any recurrence of hyperkalemia. An excessive consumption of "Hoshi-Imo" against the background of renal disease, irbesartan and carvedilol intake, and dehydration had most likely caused her hyperkalemia.

## Discussion

We experienced two patients with cardiac arrhythmia due to hyperkalemia, which had most likely been caused by an excessive consumption of "Hoshi-Imo". They both had chronic kidney disease and were on renin-angiotensin-aldosterone system inhibitors. "Hoshi-Imo" (Fig. 3), which is rich of potassium, is widely consumed in Japan and other Asian countries especially among the elderly. There is a report of hyperkalemia induced by excessive consumption of sweet potatoes (more than 500 gram) and two bananas on a daily basis starting a week before the presentation of weakness and gait disturbance (4). Even the same amount of

**Figure 3. "Hoshi-Imo", dried sweet potato, is widely consumed in Japan and other Asian countries especially among the elderly. "Hoshi-Imo" is rich of potassium and contains 980 mg/100 g of potassium, which is nearly equivalent to 3 tablets of aspara potassium tablet 300 mg.**

sweet potato, dried ones contain much more potassium than the traditionally consumed steamed or baked sweet potato per serve. However, there is no report of arrhythmia due to hyperkalemia caused by "Hoshi-Imo" and this is the first such report.

The demand for dried fruit has been influenced by the research studies highlighting the role of the product in healthcare management and disease prevention (5-9). A prospective study involving three separate cohorts that included individuals without obesity and who were free of chronic diseases revealed that 4-year weight change was inversely associated with the intake of vegetables, whole grains, fruits, nuts, and yogurt (5). Another prospective global study including individuals without cardiovascular disease demonstrated that higher fruit, vegetables, and legume consumption was associated with a lower risk of non-cardiovascular disease, and total mortality (6). A meta-analysis of cohort studies indicated increased fruit and vegetables intake in the range commonly consumed were associated with a reduced risk of stroke (7). Furthermore, a systematic review of observational studies concluded that the consumption of dried fruits might be associated with a lower cancer incidence or mortality (8). Finally, systematic review and dose-response meta-analysis of prospective cohort studies found that a higher consumption of fruit and vegetables was significantly associated with a lower risk of all-cause mortality (9). Because of this evidence, the global dried fruit market size was valued at USD 8.94 billion in 2019 and is expected to grow significantly in the forthcoming years (10).

In general, patients with renal disease, heart failure, diabetes mellitus, use of renin-angiotensin-aldosterone system inhibitors and potassium sparring medications develop hyperkalemia due to an excessive consumption of dried fruit, fruit or vegetables. However, there are a few reports to describe the patient who had normal renal function without any predisposing medical conditions or medications but developed hyperkalemia due to excessive consumption food rich in potassium such as dried fruit (11), banana (12) and orange juice (13, 14). Some of the patients had previously diagnosed psychiatric disorders (12, 14). Therefore, eating disorders should also be considered in the differential diagnosis of hyperkalemia due to excessive consumption of dried fruit, fruits or vegetables.

Regarding the sine-wave configuration on ECG in case 2, one might argue that the level of potassium was not high enough to show such a feature. Another question could be whether ECG on this case show life-threatening arrhythmia. In this regard, an acute widening of the QRS complex, especially when associated with a significant shift in the QRS axis and/or the absence of P waves, should always raise the clinical suspicion of severe and potentially life-threatening hyperkalemia and the risk of subsequent pulseless electrical activity (15).

In summary, we herein reported two cases with potentially life-threatening arrhythmia triggered by an excessive consumption of "Hoshi-Imo". Although consuming dried fruit has a positive impact on our health, it is important to recognize that the excessive consumption of dried fruit has a negative impact to develop hyperkalemia leading to life-threatening arrhythmia. In this regard, we should guide food intake limitations or precise nutrient information for each patient, especially to those at high risk for hyperkalemia.

**The authors state that they have no Conflict of Interest (COI).**

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