Synthetic cannabinoid (‘bonsai’) induced rhabdomyolysis; two case reports

Sentetik kannabinoid (‘bonzai’) kullanımına bağlı rabdomyoliz: İki olgu sunumu

**Keywords:** Bonsai, rhabdomyolysis, synthetic cannabinoid

**Abstract:** Synthetic cannabinoid (SC) products are called “Spice” in Europe, “K2” in the United States and “Bonsai” in Turkey and sold under the counter. Widespread uses of these substances and lack of specific regulations about them cause serious problems. It is not very clear what these psychoactive products contain and how much and how often they can be given. Their metabolic effects are not known well either. There is not much known about the effects of SCs other than the ones on the neurological and cardiovascular systems. In this report, we presented two cases of rhabdomyolysis developing after bonsai consumption and requiring dialysis. Two bonsai users have been brought to our emergency department in an unconscious state. Their physical examinations were normal except tachicardia. Laboratory investigations revealed increased urea, serum creatinine, creatinine phosphokinase, lactate dehydrogenase and transaminase levels. The histories of the cases suggested that they had rhabdomyolysis due to cannabinoid use. A single session hemodialysis was performed for both cases. Their clinical appearance reached to stabilisation in the second hospital day and blood tests were normalised in one week. The patients were discharged at the end of the week with the normal laboratory results and psychiatric recommendations. These two cases underline the risk of rhabdomyolysis development, apart from well-known side effects of SCs.
Anahtar Kelimeler: Bonzai, rhabdomyoliz, sentetik kannabinoid

Introduction

Rhabdomyolysis is a clinical condition in which skeletal muscle cells are destructed and their constituents including creatinine phosphokinase (CPK), lactate dehydrogenase (LDH), aspartate aminotransferase (AST) and potassium have been released into blood stream. The cell damage could be caused by direct or indirect reasons such as trauma, crush syndromes, status epilepticus, extreme exercise, some toxins and chronic hypokalemia. Drug abuse is also an important issue for development of this complex condition [1].

In medical literature, there are a few case reports describing rhabdomyolysis in synthetic cannabinoid (SC) users [2,3]. Synthetic cannabinoid receptor agonists are the agents which mimic the effects of cannabis. A member of the group, named as “bonsai”, is being sold under the counter in our country and consumption rates grow among especially young population. The exact content of this psychoactive product is not well known. Agitation, lethargy, hallucination, tachycardia-bradycardia, hypertension-hypotension, chest pain and syncpe are well established side effects of this substance [4].

In this report, we presented two rhabdomyolysis cases developed after bonsai consumption.

Patients and Methods

Case 1

A 24-year-old male was brought to emergency department in an unconscious state with a blood pressure of 130/85 mmHg, a heart rate of 116/minute, a respiratory rate of 19/minute, body temperature of 37°C and oxygen saturation of 96% (Table 1). Systemic physical examination was normal except tachycardia. Any sign of trauma including ecchymosis was absent. There was no nuchal rigidity or paralysis in extremities. His neurological reflexes were normal and glascow coma scale was 9. His past history was unremarkable except the consumption of bonsai in the previous week, three to five times per day. The results of the laboratory investigations were as follows: hemoglobin was 13.6 g/dl (normal ranges (NR): 13.5–17.5 g/dl), white blood cell count was 6000/mm³ (NR: 4500–11000/mm³), platelet count was 320000/mm³ (NR: 130000–400000/mm³), urea was 120 mg/dl (NR: 17–43 mg/dl), creatinine was 1.6 mg/dl (NR: 0.6–1 mg/dl), CPK was 8600 U/L (NR:<190 U/L), LDH was 1730 U/L (NR: 120–246 U/L), potassium (K) was 7.2 mEq/L (NR: 3.5–5.5 mEq/L), AST was 65 U/L (NR: 9–48 U/L) and alanine aminotransferase (ALT) was 55 U/L (NR:10–49 U/L). Arterial blood pH was 7.33 (NR: 7.35–7.44), partial carbon dioxide pressure was 44 mmHg (NR: 36–43 mmHg), bicarbonate (HCO₃⁻) was 23 mEq/L (NR: 20–26 mEq/L), lactate was 3.2 mmol/L (NR: 0.3–1.3 mmol/L). Urinalysis revealed 5 white cells and 1 red cell per high power field, with a density of 1015 and protein of 100 mg/dl. Baseline electrocardiography showed sinus tachicardia, peaked T waves and prolonged QRS interval.

Case 2

A 19 years old female with a history of SC abuse has been brought to emergency department in an unconscious position by her family members. On physical examination, she had a blood pressure of 130/80 mmHg, a heart rate of 120/minute, a respiratory rate of 18/minute, a body temperature of 36.5°C and oxygen saturation of 98% (Table 1). Systemic examination revealed only tachycardia as pathological sign. No nuchal rigidity was detected. Her glascow coma scale was 8 and reflexes were normal. Her family members reported that she has been using bonsai for a few months. Hemoglobin was 12.6 g/dl, white blood cell count was 7000/mm³, platelet count was 220000/mm³, urea was 180 mg/dl, creatinine was 3 mg/dl, CPK was 12000 U/dl, LDH was 1420 U/L, K was 7 mEq/L, AST was 72 U/L, ALT was 60 U/L, arterial pH was 7.36, partial carbon dioxide pressure was 40 mmHg, HCO₃⁻ was 20 mEq/L and lactate level was 3.4 mmol/L. Urinalysis revealed 2 white blood cells and 2 red blood cells per high power field, with a density of 1015 and a protein of 300 mg/dl. Electrocardiography showed sinus tachicardia, flattened P waves, prolonged QRS interval and peaked T waves.

Results

Both patient had normal cranial computed tomography scans. Renal ultrasonographies showed normal sized kidneys with normal parenchyma and vascular structures; without obstructive lesions. Based on these findings, both patients were diagnosed as acute kidney injury and rhabdomyolysis. We started intravenous sodium bicarbonate in 0.9% saline solution (1 mEq NaHCO₃ for every 5 ml saline)
at a rate of 2 ml/kg/hour and 10% dextrose solution (1 unit regular insulin for every 5 gram of glucose) at a rate of 1 ml/kg/hour. 80 and 100 ml/hour urine output have been achieved on 12th hours of hospitalization. Urine pH has been targeted to maintain over 6.5. The general health status started to be improved, serum creatinine and muscle enzymes have been started to decline on day two (Table 2). However, hyperkalemia (6.8 mEq/L and 7 mEq/L, respectively) was refractory with positive ECG findings and one session hemodialysis through a temporary hemodialysis catheter was performed for both patients on 36th and 24th hours of hospitalization.

We presented here two bonsai users who have been brought to our emergency department in an unconscious state. Their physical examinations were normal except tachycardia. Laboratory investigations revealed acute kidney injury and rhabdomyolysis. The histories of the cases suggested that they had rhabdomyolysis due to cannabinoid use. A single session hemodialysis was performed for both cases. Their clinical appearance reached to stabilisation in the second hospital day and blood tests were normalised in one week (Table 1, 2). The patients were discharged at the end of the week with the normal laboratory results and psychiatric recommendations.

**Discussion**

Cannabis is an illegal substance which has been used widely all over the world. SC products are called “Spice” in Europe, “K2” in the United States and “Bonsai” in Turkey and Jamaica and sold under the counter. In today’s knowledge, little is known about pharmacokinetic and pharmacodynamic effects of SCs on human body [5]. Smoking is the widespread consumption way and they are immediately absorbed through the lungs and distributed to other organs like brain. The duration of clinical action is generally shorter than 8 hours, however, it may last more than 24 hours in occasional cases. Although their excretion pathways have not been clearly elucidated, it is thought that hepatic oxidation of cytochrom P450 is followed by conjugation of glucuronic acid and renal excretion [6]. When evaluating SC toxicity, one should keep in mind that these substances contain fatty acids, herbal constituents and some substances likely to cause sympathomimetic effects. Lack of reliable tests to detect these ingredients, it is difficult to predict clinical outcomes in cases of intoxications [7].

Drug abuse is a frequent cause of rhabdomyolysis [1]. In medical literature, there are a few case reports describing rhabdomyolysis in SC users [2,3]. Here, the presented cases were both bonsai users. On the day of admission, both have had consumed bonsai by smoking and lost their consciousness. The duration of unconscious period was not known. There was no trauma history, chronic diseases and co-ingestion of any medication such as herbal remedies, antibiotics and non-steroidal anti-inflammatory drugs. Our examinations revealed acute kidney injury and rhabdomyolysis.

**Table 1:** Clinical findings of the patients.

|                        | On admission | Day-2 | On discharge |
|------------------------|--------------|-------|--------------|
| **Nervous system**     |              |       |              |
| Unconsciousness        | +            | -     | -            |
| **Cardiovascular system** |            |       |              |
| Sinus tachycardia      | +            | -     | -            |

**Table 2:** Laboratory results of the patients.

|                | Normal ranges | On admission | Day-2 | On discharge |
|----------------|---------------|--------------|-------|--------------|
| **Case 1**     |               |              |       |              |
| CPK (U/L)      | 10–145        | 8600         | 4200  | 180          |
| LDH (U/L)      | 120–246       | 1730         | 980   | 210          |
| AST (U/L)      | 3–35          | 65           | 57    | 46           |
| Potassium (mEq/L) | 3.5–5.1     | 7.2          | 4.5   | 3.9          |
| Creatinine (mg/dl) | 0.66–1.09   | 1.6          | 1.4   | 1            |
| **Case 2**     |               |              |       |              |
| CPK (U/L)      | 10–145        | 12000        | 6800  | 178          |
| LDH (U/L)      | 120–246       | 1420         | 850   | 230          |
| AST (U/L)      | 3–35          | 72           | 60    | 40           |
| Potassium (mEq/L) | 3.5–5.1     | 7            | 4.8   | 4.2          |
| Creatinine (mg/dl) | 0.66–1.09   | 3            | 1.9   | 0.9          |

CPK: Creatinine phosphokinase; LDH: Lactate dehydrogenase; AST: Aspartate aminotransferase.
It is difficult to predict the exact reasons for development of rhabdomyolysis in our cases. The histories of the cases suggested that they had rhabdomyolysis due to cannabinoid use. However, we could make some estimations. First, bonsai or one of its contents could have a direct toxic effect to skeletal muscle cells. However, it was not possible to discriminate neither the exact substance nor the exposed amount for each patient; since SCs are not recorded in spectrometry systems in our country. Secondly, depending on a retrospective analysis which showed that one third of the SC’s toxicity patients developed hypokalemia [8], we speculated that, rhabdomyolysis could have appeared in setting of chronic hypokalemia. Thirdly, in two cases, the period of unconsciousness was not exactly known. Standing immobile for a long time might have let to pressure necrosis of skeletal muscles.

**Conclusion**

The exact content of these SC is not known. Hence, it is difficult to predict the clinical outcome in case of intoxications. Neurological and cardiovascular system associated side effects are well known [9,10]. However, this report highlights the development of rhabdomyolysis as an unusual effect of SC consumption.

**Conflict of Interest:** The authors have no conflict of interest.

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