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A Life-threatening Adverse Effect of Taurine-containing Energy Drink: Thrombocytopenia

Taurin İçeren Enerji İçeceğinin Hayatı Tehdit Eden Yan Etkisi: Trombositopeni

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ABSTRACT Due to the significantly increased consumption of energy drinks worldwide, reports of toxicity and adverse events related to these beverages are emerging in the literature. We report a 40-year-old male patient who consumed eight to ten cans (2000 to 2500 mL) of taurine-containing energy drinks per day during the two weeks prior to hospitalization. The patient applied at the hospital with loss of consciousness and in the physical examination, petechia is detected in whole body. Laboratory values except platelet count were normal. We applied the plasmapheresis with a platelet count of 1300 mm³. On the fourth day, we extubated the patient whose clinical findings improved. On the sixth day, we measured the platelet count was 136,000 mm³, and transferred the patient to the hematology service. In conclusion, clinicians need to be aware of any potential side effects from using energy drinks.

Keywords: Thrombocytopenia, taurine, energy drink

ÖZ Dünya çapında enerji içeceklerinin önemli ölçüde artan tüketimi nedeniyle, literatürde bu içeceklerle ilgili toksisite ve yan etki raporları ortaya çıkmaktadır. Hastaneye yatmadan önceki iki hafta boyunca günde sekiz ile on kutu (2000 ile 2500 mL) taurin içeren enerji içeceği tüketen 40 yaşında bir erkek hastayı sunuyoruz. Hastaneye bilinç kaybı ile başvuran hastanın yapılan fizik muayenesinde tüm vücutta peteşi saptandı. Trombosit sayısı dışındaki laboratuvar değerleri normaldi. 1300 mm³ trombosit sayısı ile plazmaferez uyguladık. Dördüncü gün klinik bulguları düzelen hastayı ekstübe ettik. Altıncı gün trombosit sayımızı 136.000 mm³ olarak ölçtük ve hastayı hematoloji servisine sevk ettik. Sonuç olarak, klinisyenlerin enerji içeceklerini kullanmanın olası yan etkilerinin farkında olmaları gerekir.

Anahtar Kelimeler: Trombositopeni, taurin, enerji içeceği

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Introduction

In recent years, there has been a significant increase in the consumption of energy drinks that usually contain caffeine, taurine, vitamins, and sometimes other ingredients such as guarana, ginseng, etc. (1). As this increase is worldwide, there have been reports published of adverse events such as central nervous system (CNS) toxicity, hemodynamic instability, and acute kidney failure (1,2). However, reports

of thrombocytopenia induced by taurine-containing energy drinks are rare (3).

Thrombocytopenia, a pathological state with potentially fatal results, may be caused by various mechanisms, some of which are decreased production in the bone marrow, increased peripheral degradation, and deposition in the spleen (3). Several medications including non-steroid anti-inflammatory drugs, and antibiotics such as sulfonamides can cause thrombocytopenia via these mechanisms.



Taurine, an antioxidant and energizing substance that is commonly present in energy drinks, has a chemical structure similar to that of sulfonamides and has been related to thrombocytopenia (3). Thus, the case is here reported of a patient with thrombocytopenia who consumed eight to ten cans (2000-2500 mL) of energy drinks per day in the two weeks prior to administration.

Case Report

A 40-year-old male with no underlying diseases was admitted to the emergency department with a sudden loss of consciousness. Physical examination showed petechiae in whole body. On neurological examination, the Glasgow coma scale score was 10, and the patient was agitated, uncooperative, and disoriented. Laboratory analyses showed severe thrombocytopenia with a platelet count of 1300 mm^3 , while other values were normal. The cranial computed tomography scan revealed nothing abnormal. The patient was admitted to the intensive care unit (ICU).

In ICU, respiratory and hemodynamic parameters were observed to be stable. The dexmedetomidine infusion was initiated for sedation. Following a detailed investigation, it was learned that the patient had consumed eight to ten cans of energy drinks per day in the two weeks preceding hospitalization.

On the second day in ICU, electroencephalogram (EEG) and cranial magnetic resonance imaging (MRI) examinations were applied. The EEG showed a slightly diffuse cerebral dysfunction, and the MRI showed hyperintense signal abnormalities in the putamen, lentiform, and left caudate nuclei. These findings were thought to be due to toxic involvement or metabolic disorders. Diffuse schistocytes were observed in the peripheral blood smear test. Therefore, plasmapheresis was applied for an initial diagnosis of thrombotic thrombocytopenic purpura (TTP). The patient was then endotracheally intubated and mechanically ventilated due to worsening symptoms and loss of consciousness. The hemodynamic parameters remained stable following intubation.

On the third day, plasmapheresis was continued and the platelet count increased to $49,000 \text{ mm}^3$. No bacteria were detected in the blood, urine, and tracheal culture tests. The patient was weaned off mechanical ventilation and was subsequently extubated as he regained consciousness and the clinical manifestations regressed on the 4th day in ICU. On

the sixth day, the patient was transferred to the hematology ward with a platelet count of $136,000 \text{ mm}^3$.

Discussion

Together with the increasing consumption of energy drinks worldwide, there has been an increase in reports in the literature of adverse events. These adverse events associated with energy drink consumption are mostly related to caffeine content (4). A bottle/can of energy drink may contain up to 300 mg of caffeine, whereas even 50 mg of caffeine can induce tachycardia and agitation (2). Furthermore, caffeine overdose can cause palpitations, hypertension, diarrhea, CNS stimulation, nausea-vomiting, marked hypocalcemia, metabolic acidosis, convulsion, and even death (4,5).

Energy drinks also contain several substances including guarana, taurine, glucuronolactone, and B vitamins other than caffeine. The acute and long-term effects of these substances are not well known, and reports regarding adverse health effects related to these ingredients are few (3).

Impairment in endothelial function plays an important role in the pathogenesis of TTP. Worthley et al. (6), in their study on 50 volunteers, detected endothelial dysfunction and platelet aggregation in subjects after energy drink intake. In addition, in the study by Khayyat et al. (7), they found a decrease in thrombocytopenia, platelet aggregation, and endothelial function in mice given energy drinks for more than two weeks.

Moreover, sulfonamide-type antibiotics causing thrombocytopenia and taurine have similar chemical structures. For this reason, it is claimed that the development of thrombocytopenia after a high intake of an energy drink is due to the taurine substance in its content (3). But, studies investigating taurine on platelets and the plasma coagulation system, have produced conflicting results. Miglis et al. (8) showed that high concentrations of taurine prolonged thrombin time by 9%, and inhibited platelet aggregation by 10%. Santhakumar et al. (9) showed that taurine inhibits platelet hyperactivity in platelet-rich plasma. In contrast, Spohr et al. (10) failed to show any effect of taurine on platelet aggregation in overweight pre-diabetic males.

In the current case, the patient with thrombocytopenia and CNS toxicity had consumed eight to ten cans (2000-2500 mL) of energy drinks per day in the two weeks prior to

hospital admission. The neurological signs of the patient were thought to be caused by caffeine, whereas thrombocytopenia was attributed to taurine consumption. Both the absence of another cause to explain the thrombocytopenia in the patient and the regression of thrombocytopenia with the discontinuation of energy drinks containing taurine support our opinion.

The time to reach peak concentration after oral intake of taurine is 1.5 hours. The plasma elimination half-life is one hour. However, as the amount of taurine taken orally increases, the time to reach maximum concentration becomes longer (11). Therefore, it would be more appropriate to monitor patients in the ICU when taking substances containing high doses of taurine.

In the literature, there is no specific antidote or treatment for energy drinks, and particularly for the substances they contain (such as caffeine, taurine, etc.). When confronted with such intoxications, symptomatic treatment and standard ICU practices can be effective. Therefore, we administered symptomatic treatment to our patient and additionally applied plasmapheresis therapy for TTP. With these treatments, we observed an improvement in the patient's symptoms starting from the fourth day. On the sixth day, our patient was transferred from the ICU to the hematology ward.

As the consumption of energy drinks increases, so there is a growing number of reports regarding the potential adverse effects of their ingredients. Clinicians need to be aware of any potential side effects from using energy drinks. We reported the case of thrombocytopenia that occurred as a result of abuse of taurine-containing energy drinks. Studies on volunteers related to energy drinks may be a guide to enlighten the side effects.

Ethics

Informed Consent: Written informed consent required for the case report as obtained from the patient.

Authorship Contributions

Surgical and Medical Practices: E.Ö., H.P., K.I., Concept: E.Ö., Design: E.Ö., Data Collection and/or Processing: E.Ö., H.P., K.I., N.K.Ö., S.Ö., Analysis and/or Interpretation: E.Ö., H.P., K.I., N.K.Ö., S.Ö., Literature Search: E.Ö., H.P., K.I., N.K.Ö., S.Ö., Writing: E.Ö., H.P., K.I., N.K.Ö., S.Ö.

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