

## Cranial Magnetic Resonance Imaging Findings of Bonzai Abuse: A Case Report

### *Bonzai Suistimalinin Kranial Magnetik Rezonans Görüntüleme Bulguları: Bir Olgu Sunumu*

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#### ABSTRACT

Synthetic cannabinoids (SC) are referred such as ‘Spice’ in Europe, ‘K2’ In USA, on the other hand ‘Bonzai’ in Turkey. Bonzai has recently popular SC herbal-drug in Turkey which abuse increasingly, not very well known about its complications and neuro-radiological findings in literature. As a result of this it is substantial for radiologist be aware of neuro-radiological findings may be related to Bonzai or Bonzai like SC complications and thought as a differential diagnosis at unknown or indeterminate patient history. In this case report, we presented Bonzai abuse case neuro-radiological findings that computed tomography showed hypodense areas may be related to ischemia, on the other hand magnetic resonance imaging demonstrated at T2 weighted (T2W) and fluid attenuation inversion recovery (FLAIR) sequence hyperintensities in those areas are compatible with vasogenic edema . In addition, corpus callosum splenium has a signal increase at FLAIR sequence and multifocal intraparenchymal hematomas has periferally edema are also shown.

**Key words:** Bonzai, Pres, RcvS, magnetic resonance imaging

#### INTRODUCTION

Drug abuse makes severe morbidity and mortality, is very crucial problem for societies. It has several subgroups that have different chemical ingredients such as cocaine, heroin, amphetamines, cannabis and medically used drugs. Cannabis is a herbal that use in medical practice for therapeutic purposes whereas it is pleasure-inducing substance which can be consumed illegally worldwide. It consists of three groups; endogen, natural and synthetic. Inside of these groups synthetic cannabinoids (SC) nowadays have a big popularity due to easy accessibility

#### ÖZET

Sentetik kannabinoidler (SK) Avrupa’ da Spice, ABD’ de K2, diğer taraftan Türkiye de Bonzai ismiyle popülerleşmişlerdir. Çağımızın tehlikesi Bonzai, komplikasyonları ve nöroradyolojik bulguları literatürde çok bilinmeyen, son zamanlarda Türkiye’ de popüler olan bir bitkisel kaynaklı sentetik kannabinoid ilaçtır. Bunun sonucu olarak Bonzai veya Bonzai ilişkili komplikasyonlar konusunda radyoloğun nöroradyolojik olarak farkında olması önemlidir. Biz bu olgu sunumunda, bilgisayarlı tomografide iskemi ile ilişkili olabilecek hipodens alanları olan, diğer taraftan magnetik rezonans görüntülemesinde T2 ağırlıklı ve FLAIR sekanslarda vazojenik ödemle uyumlu olduğu düşünülen Bonzai suistimali olgusunun kranial görüntüleme bulgularını sunduk. Ek olarak FLAIR görüntülemeye korpus kollozumda sinyal artışı ve kanama odakları izlendi.

**Anahtar kelimeler:** Bonzai, Pres, RcvS, Magnetik rezonans görüntüleme

and cheapness between adolescence. SC are referred as “Spice” in Europe, “K2” in USA, on the other hand “Jamaika” or “Bonzai” in Turkey [1]. These are herbal smoking mixtures that consist of lots of chemical ingredients such as JWH compounds. These types of herbal drugs are psychoactive that can affect central nervous system and drug abuse or extensive misuse can cause neurovascular complications, psychiatric and metabolic side effects even death can occur [2-3]. Imaging abnormalities related to drug abuse and its complications can be evaluated via either/both magnetic resonance imaging (MRI) or/and computed tomography (CT). It is

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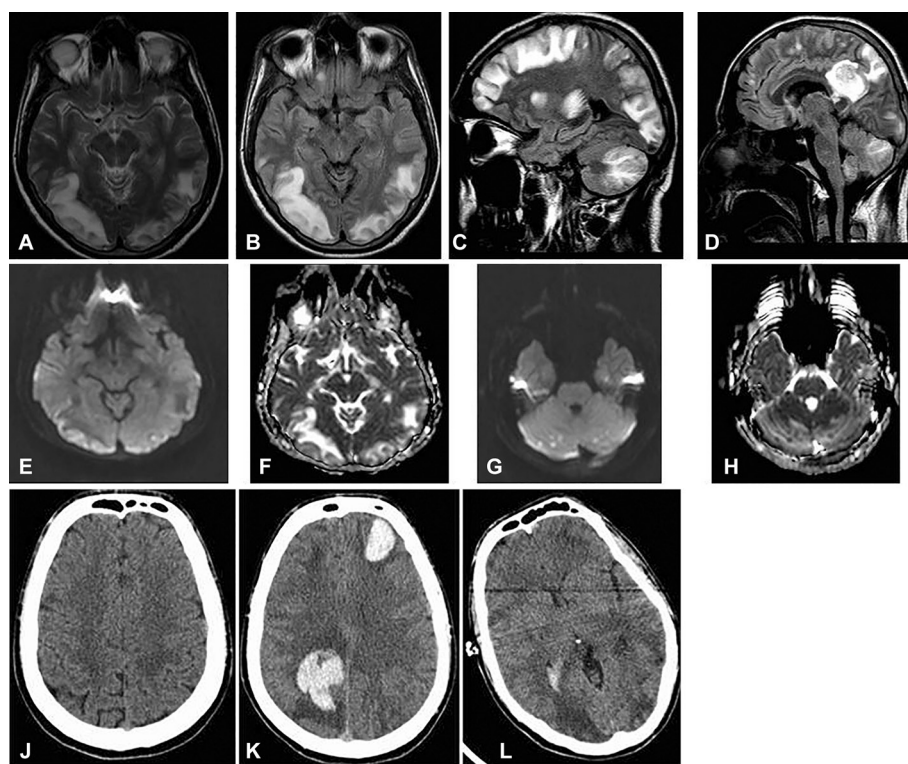
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important for a radiologist to be aware of findings of diagnostic imaging modalities at drug related complications. In this publication, we present the neuroimaging findings of a case related to 'Bonzai' abuse and its complications which is uncommon in literature.

## CASE

A 24 year old man with history of Bonzai abuser presented with acute renal and respiratory failure. On initial examination his blood pressure was elevated at 220/120 mmHg, his heart rate was 110 per minute. He had severe episodic headaches and mild tachycardia. On clinical follow-up, his neurologic physical examination and status worsened and neurologic diagnostic imaging performed by CT and MRI, respectively. CT showed bilaterally fronto-temporo-parietal, basal ganglia and cerebellar hypodense areas may be related to ischemia. MR im-

aging demonstrated at T2 weighted (T2W) and fluid attenuation inversion recovery (FLAIR) sequence hyper-intensities in those areas (Figure 1A, 1B, 1C). On the other hand at diffusion weighted images (DWI) and apparent diffusion coefficient (ADC) are compatible with vasogenic edema (Figure 1E, 1F). Corpus callosum splenium has a signal increase at FLAIR sequence and multifocal intra-parenchymal hematomas has peripherally edema are shown (Figure 1D). Addition these findings, bilateral cerebellar hemisphere, basal ganglia, fronto-parietal diffusion restricted areas are seen (Figure 1G, 1H). Follow up CT showed new parenchymal hemorrhage focuses opened to the lateral ventricle (Figure 1J, 1K, 1L). All the findings impressed as posterior reversible encephalopathy syndrome (PRES), reversible cerebral vasoconstriction syndrome (RCVS) and parenchymal -intraventricular hemorrhage related to Bonzai abuse and its complications.



**Figure 1.** MR imaging demonstrated at axial T2 weighted (T2W) (A), axial (B) and sagittal (C) fluid attenuation inversion recovery (FLAIR) sequence bilaterally frontotemporoparietal, basal ganglia and cerebellar hyper intensities. Corpus callosum splenium has a signal increase at sagittal FLAIR sequence (D) and multifocal Intraparenchymal hematomas has peripherally edema are shown. Diffusion weighted images (DWI) (E) and apparent diffusion coefficient (ADC) (F) are compatible with vasogenic edema. Bilateral cerebellar hemisphere diffusion restricted areas are seen (G, H). Initial CT (J) first day showed no parenchymal hemorrhage, but follow up CT (7. day) (K, L) showed new parenchymal hemorrhage focuses opened to the lateral ventricle.

## DISCUSSION

Cannabinoids are one of the mostly abused-drug worldwide [4]. The major psychoactive compound is tetrahydrocannabinol that activated cannabinoid receptors in the brain [2]. Cannabinoid receptors are

mainly localized in central nervous system such as basal ganglia, cerebellum, limbic cortices [4]. Tetrahydrocannabinol in drugs can be used therapeutically (for example pain conditions), whereas new genera-

tion JWH compound illicit synthetic cannabinoids are chemically heterogenous abused cause of easy accessibility and cheapness [3]. Publicly known Bonzai recently popular in Turkey is one of SC smoking herbal drug. It is heterogeneous mixture of JWH compound chemical substance [1,3]. Lack information on the adverse effect of these SC make diagnostic delays. Bonzai abuse can also cause neurovascular, psychiatric, cardiovascular and metabolic complications as the known drugs such as cocaine, heroin, amphetamines. Therefore, diagnostic imaging modalities such as CT and MRI has a key role in the recognition and on time management of drug-related complications for both radiologist and clinicians. Drug related complications such as encephalopathy, atrophy, changes in corpus callosum can be recognized both MRI and CT.

Cognitive dysfunction, hypertension, tachycardia, memory loss and disorientation can be seen clinically [1,2]. Also usage of alcohol, tobacco and cannabis together make the situation complicated and patient may become intoxicated. Most intoxicated patients have increased activity which prone to risk of rhabdomyolysis, increased creatine kinase and acute renal failure [1]. In our patient, hypertension, tachycardia and renal failure clinically occurred.

In toxic patients, vasospasm can be seen in relation to reversible cerebral vasoconstriction syndrome (RCVS). RCVS is a clinic-radiological entity that consists of severe headaches, with or without neurologic deficits or seizures, sometimes associated with ischemic or hemorrhagic stroke and constriction of cerebral arteries which resolves 1-3 months spontaneously [5-6]. Exposure to psycho/vasoactive substances is one of the potential etiological or predominance factor to RCVS. Vasospasm increases vascular resistance and decreases brain perfusion. Therefore, endothelial injury occurs that causes vasogenic edema in related to posterior reversible encephalopathy syndrome (PRES). PRES is one of the RCVS related complications that can be seen cannabis intoxicated patients [5-6]. The others can be ischemic strokes, intra-parenchymal hemorrhage and cortical subarachnoid hemorrhage. In our patient history he had headache attacks. MR showed broad signal intensities associated with va-

sogenic edema related to PRES. In addition to this, at his clinical course intra-cerebral hemorrhage and diffusion-restricted focus were seen in his diagnostic studies.

Corpus callosum changes can be occurred intoxicated patients. MR is very useful for determination of these changes. At our patient MRI corpus callosum increased FLAIR sequence signal intensity at splenium was demonstrated.

When all the findings are evaluated, the clinical and neuro-radiological findings are impressed as a Bonzai abuse and its complications.

In conclusion, Bonzai has recently popular herbal-drug in Turkey which abuse increasingly, not very well known about its complications and neuro-radiological findings in literature. As a result of this it is substantial for radiologist be aware of neuro-radiological findings such as ischemic strokes, vasogenic edema, intra-parenchymal hematomas at different stages, signal increase at corpus callosum splenium that may be related to Bonzai or Bonzai like SC complications and thought as a differential diagnosis at unknown or indeterminate patient history.

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