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Case Report

Cardiac Complications in Hemorrhagic Strokes: Insights from a Unique Bigeminy Rhythm Presentation

Hemorajik İnmenin Kardiyak Komplikasyonu: Benzersiz Bigemine Ritim Varlığının Analizi

Alper Resit Gunduz [1*], **Serkan Emre Eroglu**[1], **Serdar Ozdemir** [1]

[1]Department of Emergency, SBU Ümraniye Training and Research Hospital, University of Health Sciences, Ümraniye Training and Research Hospital, Istanbul/Türkiye

Abstract

During the acute phase of subarachnoid hemorrhage, cardiac rhythm disturbances are frequently observed, affecting 50% to 100% of patients. Although benign arrhythmias like sinus tachycardia, sinus bradycardia, premature atrial contractions, and premature ventricular contractions are common, clinically significant arrhythmias such as ventricular tachycardia or atrial tachyarrhythmias manifest in only 1-4% of patients. This case report delves into the intricate connection between cardiac complications and neurological emergencies, using a distinctive bigeminy rhythm presentation in a 43-year-old male patient with aneurysmal subarachnoid hemorrhage**.**

Keywords: Hemorrhagic Stroke, Ventricular Premature Complexes, Subarachnoid Hemorrhage

ÖZ

Akut subaraknoid kanama evresinde, kardiyak ritim bozuklukları sıkça gözlemlenmekte olup hastaların %50 ila %100'ünü etkileyebilmektedir. Sinüs taşikardisi, sinüs bradikardisi, prematür atriyal kontraksiyonlar ve prematür ventriküler kontraksiyonlar gibi zararsız aritmiler yaygın olarak görülmektedir; ancak klinik açıdan önemli aritmiler, örneğin ventriküler taşikardi veya atriyal taşiaritmiler, hastaların sadece %1 ila %4'ünde ortaya çıkmaktadır. Bu vaka raporu, bir anevrizmalı subaraknoid kanama geçirmiş 43 yaşındaki erkek bir hastada, özgün bir bigemini ritim sunumu kullanarak kardiyak komplikasyonlar ile nörolojik acil durumlar arasındaki karmaşık ilişkiye derinlemesine odaklanmaktadır.

Anahtar kelimeler: Hemorajik İnme, Ventriküler prematür kompleksler, Subaraknoid kanama

Highlights

- Prolonged QTc intervals, frequently observed in SAH patients, are associated with increased ventricular myocardial excitability irregularities, contributing to the development of ectopic rhythms.
- The evolution of artificial intelligence (AI) may enhance the monitoring of ECG changes in SAH patients, enabling earlier detection of arrhythmias and improved patient outcomes.
- Atrial flutter, atrial fibrillation and ventricular arrhythmias are the most frequent arrhythmias in post-SAH patients.

***Corresponding author: :** Alper Resit Gunduz, SBU Ümraniye Training and Research Hospital, University of Health Sciences, Ümraniye Training and Research Hospital, Elmalıkent, 34764, Istanbul/ TURKİYE E-mail**:** alpergunduz93@gmail.com

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Introduction

Hemorrhagic strokes account for approximately 20% of all stroke cases, with half of these attributed to subarachnoid hemorrhages (SAH). The predominant cause of spontaneous SAHs is the rupture of saccular aneurysms (1). The acute phase of SAH is frequently accompanied by cardiac rhythm disturbances, manifesting in 50% to 100% of patients. While benign arrhythmias such as sinus tachycardia, sinus bradycardia, premature atrial contractions, and premature ventricular contractions are prevalent, clinically significant arrhythmias like ventricular tachycardia or atrial tachyarrhythmias occur in only 1-4% of patients (2,3). This case report sheds light on a patient with aneurysmal subarachnoid hemorrhage who presented with a distinctive electrocardiographic (ECG) manifestation, namely the bigeminy rhythm, serving as an initial and noteworthy finding. The discussion of this case aims to contribute to the broader understanding of the diverse cardiac complications that can accompany SAH, emphasizing the significance of recognizing less common arrhythmias in the acute phase of this neurological emergency.

Case report

A 43-year-old male patient presented to the emergency department with complaints of dizziness and syncope that had commenced thirty minutes prior to admission. The patient denied experiencing headache, nausea, or vomiting, and there was no history of trauma or known chronic illnesses. Upon admission, vital signs were measured as follows: blood pressure 177/127 mmHg, heart rate 84 beats per minute, oxygen saturation 95%, and temperature 36.7 degrees Celsius (°C). An ECG revealed a bigeminy rhythm **(Figure 1).**

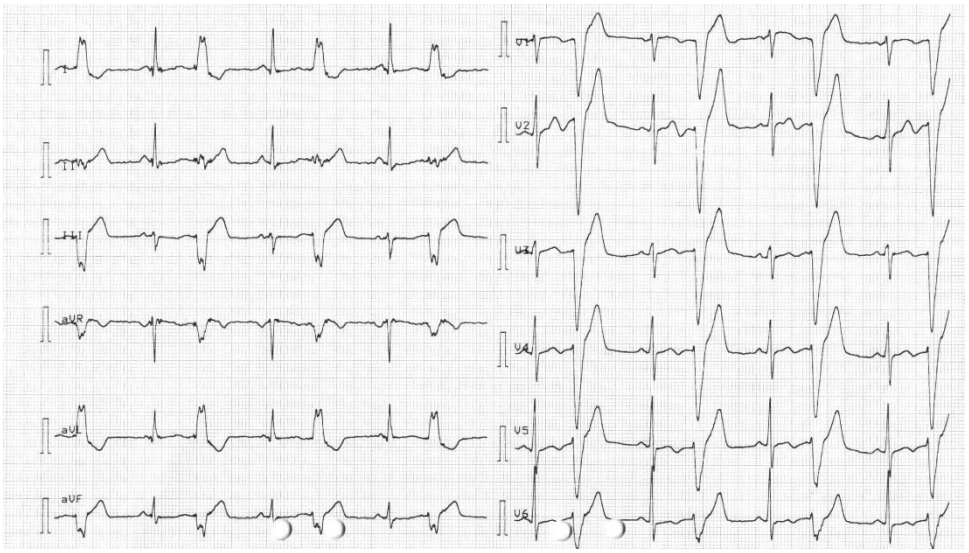

Figure 1. An ECG reveales a bigeminy rhythm

During the physical examination, the patient exhibited a Glasgow Coma Scale score of 15, was oriented and cooperative, and displayed isochoric pupils with a reactive light reflex. No focal neurological deficits, nystagmus, or neck stiffness were observed. Other systemic examinations yielded normal findings. Despite the normal neurological examination and the presence of bigeminy rhythm on ECG, cardiac causes were initially considered in the etiology of syncope. However, cranial imaging was planned to investigate the possibility of intracranial events related to cardiac arrhythmias. Investigations revealed a high-sensitivity troponin T level of 12.360 ng/L, white blood cell count of 12.81 x 103/uL, hemoglobin of 17 g/dL, platelet count of 287 x 103/uL, C-reactive protein of 1.73 mg/L, creatinine of 1.13 mg/dL, activated partial thromboplastin time of 26.1 seconds, prothrombin time of 13.5 seconds, INR of 1.01, potassium of 4.41 mEq/L, chloride of 102.6 mEq/L, calcium of 8.1 mg/dL in blood gas analysis; pH of 7.34, pCO2 of 35.1 mmHg, anion gap of –3.7 mmol/L, bicarbonate of 20.4 mmol/L, lactate of 3.1 mmol/L. Contrast-free brain tomography revealed SAH areas in bilateral frontal and temporal sulci, And contrasted brain tomography angiography showed a 4.5-millimeter saccular aneurysm observed at the level of the anterior communicating artery **(Figure 2).** According to the Hunt & Hess classification, it was classified as grade 1. The patient underwent surgery performed by the neurosurgery team and was subsequently monitored in the intensive care unit (ICU) post-operation. During the patient's ICU follow-up, no cardiac arrhythmias were observed, and echocardiography revealed no structural heart disease. The patient was transferred from the ICU to the neurosurgery service after a week and was discharged after 11 days of neurosurgical service follow-up

without any neurological deficits.

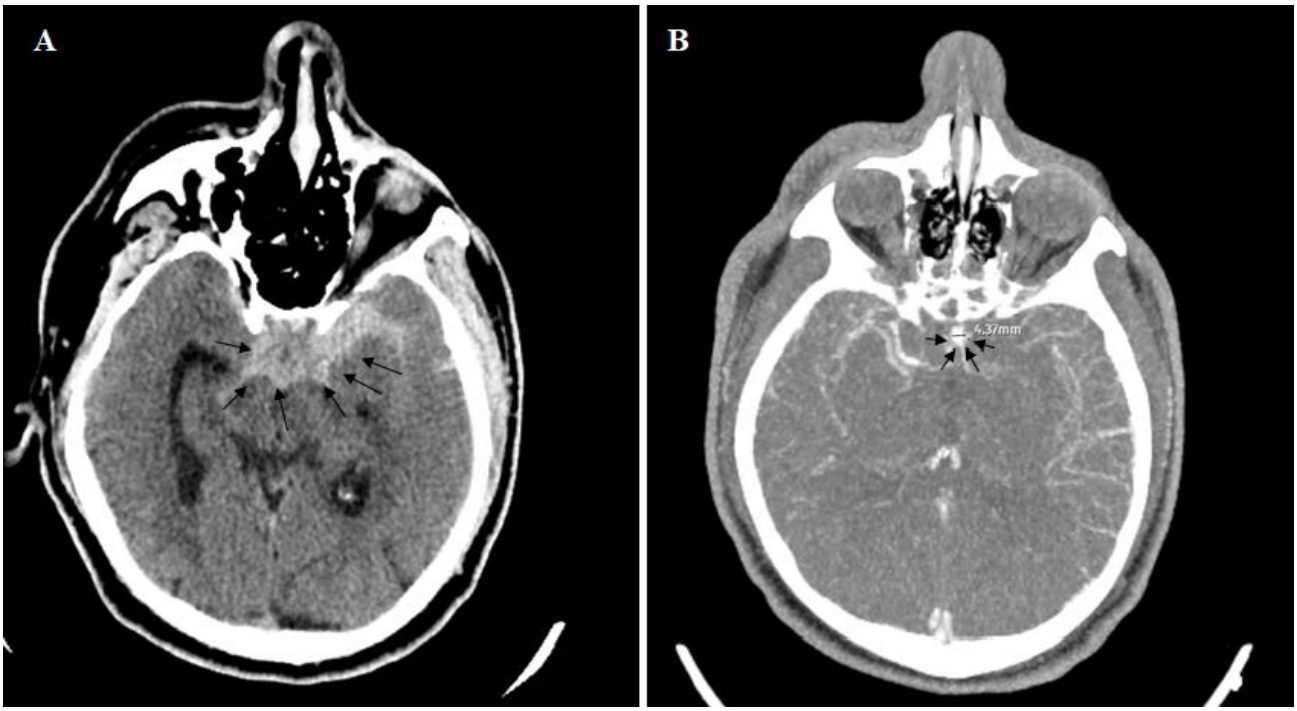

Figure 2. A. Contrast-free brain tomography. The arrows show subarachnoid hemorrhage areas. **B.** Contrasted brain tomography angiography. The arrows show 4.5-millimeter saccular aneurysm observed at the level of the anterior communicating artery.

Discussion

Aneurysmal SAH stands as one of the most catastrophic neurological events, carrying a mortality rate of up to 50%. The classical presentation of SAH involves a severe headache, often accompanied by an abrupt loss of consciousness, with vomiting being another prominent feature. Depending on the severity and localization of the hemorrhage, focal neurological symptoms may manifest (4). Notably, even in the absence of structural heart disease following acute cerebrovascular events, a high prevalence of ECG abnormalities and arrhythmias is observed. Such abnormalities are identified in 90% of patients experiencing ischemic stroke, intracerebral hemorrhage, or SAH. Moreover, up to 25% of patients without prior ECG abnormalities may exhibit new arrhythmias (5). Research indicates that approximately 5% of post-SAH patients encounter serious cardiac arrhythmias, with atrial flutter and atrial fibrillation being the most common (76%), followed by ventricular arrhythmias (16%) (6). ECG alterations subsequent to SAH, such as ST-T wave changes, are primarily associated with myocardial infarction. Additional frequently observed changes encompass high R wave (19%), ST depression (15%), U wave (47%), prolonged QTc intervals (23%), and broad flattened or notched T waves (32%) (7). The presence of a prolonged QTc interval has been correlated with the temporal dispersion of the recovery rate of ventricular myocardial cell excitability, a phenomenon contributing to ectopic rhythm development (8,9). The irregularity in ventricular myocardial excitability recovery increases with bradycardia and sympathetic nervous system stimulation. Both vagal and sympathetic stimulation have been identified in cases of intracranial bleeding, potentially leading to ectopic beats observed in SAH patients. The observed changes in rhythm, such as the bigeminy rhythm in our case, are believed to stem from this mechanism primarily associated with prolonged QTc intervals. With artificial intelligence (AI) evolution we believe ECG changes will be checked more regularly so we will be more aware of the arrhythmias (10). Advanced age, a history of arrhythmias, and abnormal ECG at admission emerge as independent risk factors for morbidity in aneurysmal or traumatic SAH patients. arrhythmias seen in SAH patients have been linked to potential complications (hyperglycemia, brainstem herniation, myocardial infarction), prolonged ICU stays, and unfavorable outcomes (6).

Conclusion In patients presenting with syncope, ECG findings offer vital diagnostic insights. Although initially suggestive of a cardiac etiology, the detection of arrhythmias should prompt clinicians to investigate potential intracranial events, even in the presence of a normal neurological examination.

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