

## Hemorrhagic Stroke Due to Cocaine Overdose: Case Report and Literature Review

Taqui, O. Lmejjati, O\*. Maghrabi M.A Fehdi, B. Aggoug, A. Dafir, M. Moussaoui, M. Mouhaoui

Emergency Department, Ibn Rochd University Hospital

\*Corresponding author: Maghrabi O, Intensive Care Department P17 at Ibn Rochd University hospital Casablanca. Email: maghrabi.othman@gmail.com

**Citation:** Taqui O. Lmejjati O, Maghrabi MA, Fehdi B, Aggoug A, et al. (2024) Hemorrhagic Stroke Due to Cocaine Overdose: Case Report and Literature Review. Annal Cas Rep Rev: ACRR-399.

**Received Date:** 06 July, 2024; **Accepted Date:** 16 July, 2024; **Published Date:** 22 July, 2024

### Abstract

**Introduction:** Cocaine is an addictive psychostimulant and is one of the most commonly abused drugs worldwide. It is an alkaloid extracted from the plants *Erythroxylum coca* and *Erythroxylum novogranatense*. Cocaine is characterized by its multiple ways of consumption. The sympathomimetic effects of cocaine have been proved to lead to vascular complications including ischemic and hemorrhagic strokes/ intracerebral hemorrhages (ICH), as well as subarachnoid hemorrhages. This case report and literature review aim to describe the clinical features and outcome, as well as different management methods of hemorrhagic strokes occurring in the context of cocaine overdose.

**Case report:** We report the case of a 54 old male, who presented to the emergency department with an altered mental status following a recent consumption of cocaine, reported by his friends. The patient had a history of nasal and intravenous cocaine consumption. No trauma was reported. Upon admission, the patient was comatose and showed signs of respiratory distress. Physical examination showed diffuse coarse crackles in both lungs. The initial treatment included rapid sequence intubation and large bore venous access. Laboratory findings included elevated blood CK, cocaine and benzoylecgonine (BZ) as well as the presence of myoglobin, BZ and cocaine in the urinalysis. Head CT scan was positive for a temporo-occipital hematoma, associated with a grade IV subarachnoid hemorrhage and a chronic subdural hematoma.

Management included non-specific neuro reanimation and the discussion of a neurosurgical evacuation of the hematoma. The patient had an unfavorable outcome and passed away shortly after admission before any surgery could be performed.

**Discussion:** Cocaine was directly responsible for over 27 569 deaths in 2022 (1). Strokes are the second leading cause of death and result in 50% of the survivors being chronically disabled

(2). Cocaine related strokes are characterized by increased odds of mortality, vasospasm and seizures. For that, all strokes, especially in young patients should start an active research for illicit drugs in the blood and urine.

Our case report is particularly interesting due to the rarity of such an event in our context and the complexity of its management.

**Keywords:** cocaine; stroke; hemorrhagic stroke; subdural hematoma; subarachnoid hemorrhage.

### Introduction

Of the 600 000 drug users in Morocco, around 18 000 are believed to be using cocaine (3). Furthermore, with the introduction of “pufa”, a low-grade synthetic cocaine made from cocaine or crystal methamphetamine waste that is cut with additives such as battery acid, engine oil, shampoo, salt, baking soda and ammonia. Cocaine usage has dramatically increased since 2020.

Cocaine is an alkaloid extracted from the leaves of plants *Erythroxylum coca* and *novogranatense*. It is rapidly absorbed through mucosal layers and reaches the plasma within 5 to 10 min of usage. Its maximal plasmatic concentration is reached within 50 to 90 min.

Cocaine is known for its psychological and physical effects. Those are explained by the inhibition of reuptake of dopamine in the nucleus accumbens (4, 5). It also functions as a sympathomimetic substance by increasing the release of serotonin, epinephrine and norepinephrine (4,6). This results in transient elevated blood pressure with a tendency to vasospasm. On the cellular level, cocaine impairs the function of platelets, is responsible for endothelial damage and the activation of the inflammation and coagulation cascades.

Psychological effects include, in the short term, hallucinations, agitation, aggressiveness and suicidal tendencies. In the long term, cocaine is a highly addictive drug, with three usages enough to lead to dependence. It has

also been associated with depression, paranoia and schizophrenia.

Physical effects include hyperthermia, tachycardia, hypertension, nausea and vomiting. In the long term, cocaine has been associated with myocardial infarction and cardiac arrhythmias (7), ischemic and hemorrhagic strokes including ICH, intraventricular hemorrhage and subarachnoid hemorrhage (5, 6, 7, 8)

**Case report**

We report the case of a 54 years old male patient who presented to the emergency department with an altered mental status following the consumption of sniffed cocaine. Medical history was clear of any cardiovascular disease or diabetes. Surgical history showed no past interventions. Drugs and allergies included a history of cocaine and tobacco consumption since adolescence. It was noted that there has been an increase in inhaled and injected doses of cocaine 3 days previous to admission.

On admission, the patient was comatose (GCS= 6/15), with normal vital signs. Physical examination found bilateral semi-mydriasis and diffuse coarse crackles in both lungs. Initial management included rapid sequence intubation using midazolam, propofol and rocuronium. It also included vascular access using a large gauge IV cannula.

Toxicological profile was positive for cocaine and BZ (Figure 1)

Blood laboratory values are shown in table 1.

Parameter	Result
Hemoglobin	13.6 g/dL
Leucocytes	14 561 /mL
Neutrophils	12 358 /mL
Platelets	402 000
PT	102 %
Creatine Kinase (CK)	1458 U/L
Glucose	1.7 g/L
Sodium	139 mmol/L
Potassium	4.1 mmol/l
Creatinine	21 mg/L
C reactive protein	51.4 mg/dL

**Table 1:** Laboratory findings (urinalysis and toxicological profile not included)

Urinalysis is presented in **Table 2**

Parameter	Result
Color	Orange
Myoglobin	72 mg/ dL
Culture	Sterile

**Table 2:** Urinalysis.



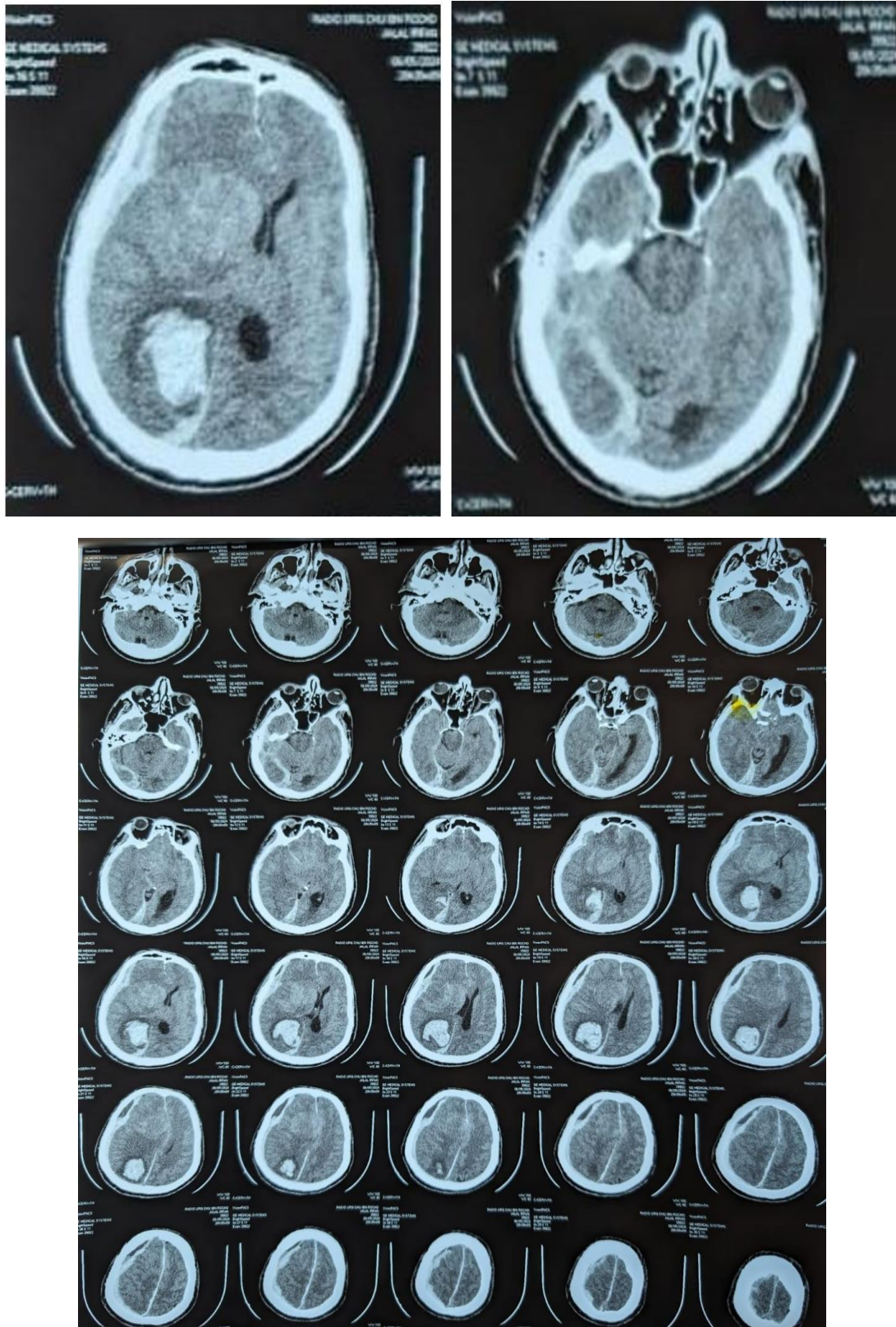
ID: <input type="text"/>
NE: <input type="text"/>
Age: 56 ans
Diagnostic: <input type="text"/>

Examen	Resultats
<u>Analyse toxicologique du sang et des urines</u>	
Antidépresseurs tricycliques	Négatif
Barbituriques	Négatif
Cannabis	Positif
Amphétamines	Négatif
Cocaine	Positif
Benzoylécgonine	Positif
Benzodiazépines	Négatif
Morphine	Négatif
Opium	Négatif

**Figure 1:** Blood and urine toxicological profile.

CT imaging of the brain was performed and showed a temporo-occipital hematoma, associated with a grade IV subarachnoid hemorrhage and a chronic subdural hematoma. All the lesions were responsible for a deviation

of the falx cerebri and the collapse of the right lateral ventricle responsible for the beginning of a downward right cerebellar (tonsillar) herniation.



**Figure 2, 3 and 4: CT scans**

With these results in hand, it was concluded that the bleeding was a cerebrovascular complication of acute cocaine intoxication.

Management included blood pressure control using IV nicardipine, the use of compression socks to prevent thrombosis and the management and prevention of secondary brain injury of systemic origin (SBISOs). Neurosurgery was discussed but not performed. The patient had an unfavorable outcome and passed away shortly from brain herniation.

**Discussion**

Cocaine is currently the most used narcotic drug in the West, it is also the leading cause of emergency hospitalisations and drug-related deaths in the USA (8).

Cocaine is commonly used in its variety: cocaine hydrochloride. It is a white powder that can be inhaled, ingested or injected.

Cocaine exerts effects at the local and systemic levels.

At the cutaneous level, it acts as a local anesthetic by inhibiting sodium channels, thus inhibiting the reuptake of

norepinephrine and dopamine and altering synaptic transmission.

The cardiovascular system is also affected by cocaine. Cocaine blocks sodium channels in the myocardiocyte leading to a state of arrhythmogenicity. The sympathomimetic effect of cocaine is responsible for increased blood pressure, vasoconstriction and arrhythmias leading to sinus tachycardia, ventricular tachycardia and ultimately ventricular fibrillation. Furthermore, it could be responsible for. Cases of endocarditis have also been described, being caused by the frequent usage of intravenous cocaine injections.

At the cerebral and cerebrovascular levels, cocaine reduces cerebral vascularisation by promoting vasospasm. One of the most common cerebrovascular complications of cocaine usage are intraparenchymal cerebral hemorrhages/hémorrhagic strokes, mostly due to vasculitis and the acute elevation of blood pressure.

Thus, hemorrhagic strokes and ICH in regular consumers of cocaine are amongst the most frequent complications due to cocaine.

The initial literature research included 9 articles investigating ICH and cocaine usage.

Study	Number of patients	% Male	Mean age in years
Garg et al, 2021 (9)	118	24%	48
Aleksic et al, 2021 (10)	26	76%	34
AlMaghrabi et al, 2019 (11)	8	63%	54
Tormoehlen et al, 2017 (12)	21	62%	-
Bajwa et al, 2013 (13)	20	80%	51
Toossi et al, 2010 (14)	96	51%	61
Martin-Schild et al, 2010 (15)	45	60%	50
Giraldo et al, 2010 (16)	93	66%	49
Qureshi et al, 2001 (17)	101	61%	39.2

**Table 3:** Characteristics of studies including ICH and cocaine usage.

**Epidemiology:**

Cocaine use is associated with an increased risk of hemorrhagic stroke and ICH (OR=3.2) it has also been documented that patients with a recent usage of cocaine presenting with ICH were younger than patients presenting with ICH due to other etiologies.

Study	Outcome	OR
(9, 11, 17)	Risk of stroke	5.4
(12, 15)	Risk of intraventricular hemorrhage (IVH)	1.79

**Table 4:** risk of stroke and IVH in cocaine users.

**Clinical presentation**

Recent use of cocaine was found to be associated with an important increase in the risk of ICH/ hemorrhagic stroke.

The presence of cocaine and cocaine metabolites, especially BZ, is directly correlated to the risk of ICH. Though, the severity of the ICH/ hemorrhagic stroke wasn't different between cocaine users and non-users.

Brain CT and angiography showed

**Outcome**

ICH occurring in cocaine users were characterized with higher mortality compared to non-users. Neurological morbidity showed no differences between the two categories.

Study	Outcome	OR
(9, 12, 13, 15)	Mortality	1.81
(9, 11, 13, 15, 17)	Neurological morbidity	1.62

**Table 5:** clinical outcome of strokes in cocaine users.

### Conclusion

Cocaine consumption and associated mortality have risen over the years.

Our case report and literature review found that cocaine usage is strongly correlated to ICH and hemorrhagic stroke. Cocaine and BZ concentrations were moderately to strongly correlated to the risk of stroke. Cocaine induced strokes were associated with higher risks of vasospasm and death. The abundance of cocaine trafficking and consumption has made it vital for practitioners to recognize the frequency of its association with strokes and how neurovascular diseases present in this population.

### References

1. <https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates>
2. Donkor ES. Stroke in the 21st Century: A Snapshot of the Burden, Epidemiology, and Quality of Life. *Stroke Res Treat.* 2018 Nov 27;2018: 3238165. doi: 10.1155/2018/3238165. PMID: 30598741; PMCID: PMC6288566.
3. <https://en.hespress.com/60534-cocaine-use-among-moroccan-teenagers-surged-over-the-past-year-unodc.html>
4. Peacock A, Tran LT, Larney S, Stockings E, Santo T Jr, Jones H, Santomauro D, Degenhardt L. All-cause and cause-specific mortality among people with regular or problematic cocaine use: a systematic review and meta-analysis. *Addiction.* 2021 Apr;116(4):725-742. doi: 10.1111/add.15239. Epub 2020 Sep 21. PMID: 32857457; PMCID: PMC7914269.
5. W. Meza-Ruiz, G. Zuniga-Escobar. Cerebral intraparenchymatous and ventricular hemorrhage after cocaine consumption: a case report.
6. I. Aleksic, J. Dzambas. Subarachnoid and intracerebral hemorrhage in cocaine abusers. DOI: <https://doi.org/10.2298/VSP191229034A>
7. Richards JR, Le JK. Cocaine Toxicity. [Updated 2023 Jun 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-.
8. Treadwell SD, Robinson TG. Cocaine use and stroke. *Postgrad Med J.* 2007 Jun;83(980):389-94. doi: 10.1136/pgmj.2006.055970. PMID: 17551070; PMCID: PMC2600058.

**Copyright:** © 2024 Maghrabi O. This Open Access Article is licensed under a [Creative Commons Attribution 4.0 International \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.