Floating aortic arch thrombus involving the left common carotid artery complicated with ischemic stroke associated with cocaine use

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Abstract

Background Floating aortic thrombi (FLOAT) are rare, with very few cases attributed to cocaine use. We report a new case of FLOAT involving the left common carotid artery due to cocaine use, for the first time, complicated with acute ischemic stroke.

Methods We present in detail our case report, and then, a literature search in PubMed and Scopus was performed up to March 20, 2022, to review the reported cases of aortic thrombus associated with cocaine use.

Results A 39-year-old man with a history of smoking and daily cocaine use was admitted to our stroke unit for acute left-hemispheric symptoms due to carotid-Sylvian occlusion. CT angiography of the supra-aortic trunks showed FLOAT involving the left common carotid artery. The thrombus was removed successfully by endovascular thrombectomy with recanalization of carotid-Sylvian occlusion.

Our literature search yielded seven reported cases of aortic thrombus due to cocaine use revealed by lower limb ischemia (3 patients), renal infarction (1 patient), abdominal pain (1 patient), bowel ischemia (1 patient), and lower limb ischemia with renal infarction (1 patient).

Conclusion Aortic thrombus should be suspected in patients without overt cardiovascular risk factors but with a recent history of cocaine use who presents with acute ischemic stroke.

Keywords Aorta · Ischemic stroke · Cocaine use · Floating thrombus

Introduction

FLOAT are rare and mainly diagnosed after an embolic event such as acute lower limb ischemia, renal infarction, and bowel ischemia [1–3]. FLOAT are mainly secondary to atherosclerotic disease of the aortic wall [2]. However, a very few cases of FLOAT have been attributed to cocaine use. Here, we report a new case of FLOAT involving the left common carotid artery (CCA) due to cocaine use, for the first time, complicated with acute ischemic stroke (AIS).

Methods

We present in detail our case report. Besides, we performed a systematic literature review (SLR) of the reported cases of aortic thrombus due to cocaine use.

The present study was a routine care study, and approval by an ethics committee was not required. The patient provided written informed consent to publish all the information contained in this study.

Results

Current case report

A 39-year-old man with a history of smoking and daily cocaine use was admitted to our stroke unit for acute speech disorders and right-sided weakness. Neurological examination at 473 min (7.88 h) from symptom onset to arrival found complete right-sided hemiplegia, right homonymous lateral
hemianopsia, deviation of the head and eyes to the left-sided, and severe global aphasia with a LAST (Language Screening Test) of 0/15 and an NIHSS (National Institutes of Health Stroke Scale) of 21.

The 1.5 T cerebral MRI, performed at 493 min (8.2 h) from symptom onset to imaging or 20 min from arrival to imaging, showed AIS of left middle cerebral artery territory due to carotid-Sylvian occlusion with slight visibility of ischemic lesions on the lenticular caudate (Fig. 1a, b, c, d, e, f). The 80-bar computed tomography angiography (CTA) showed a FLOAT involving the left CCA (Fig. 1g, h).

Intravenous thrombolysis was not performed first because of the FLOAT with a high risk of fragmentation and distal embolization, and second, the slight visibility of ischemic lesions on the lenticular caudate with risk of hemorrhagic transformation. The FLOAT was removed successfully by endovascular thrombectomy with recanalization (TICI 3) of carotid-Sylvian occlusion 600 min (10 h) after the symptom onset or 107 min (1.8 h) after imaging.

Cardiac exploration (echocardiography and cardiac telemetry on 4 days) was normal. Antinuclear antibodies, anti-double-stranded DNA, antiphospholipid, and anti-neutrophil cytoplasmic antibodies were all negative. PCR COVID-19 test was negative. The search for metabolites of cocaine in urine was strongly positive. The diagnosis of AIS revealing FLOAT involving the left CCA due to cocaine intake was retained.

The patient improved partially, and upon discharge from the hospital on the 17th day, he had complete right-sided hemiplegia, right homonymous lateral hemianopsia, and severe aphasia without comprehension disorders with a LAST of 8/15 and an NIHSS of 17.

**Systematic literature review**

We performed a literature search in PubMed and Scopus up to March 20, 2022, using the combination of the following keywords: “Aorta” OR “Aortic” and “Thrombosis” OR “Thrombus” OR “Cocaine.” We found seven reported cases of aortic thrombus due to cocaine use [3–8], and their baseline characteristics are presented in Table 1. Six of the seven patients were cocaine users, while the 7th patient was exposed to cocaine in utero. The clinical presentation included acute lower limb ischemia, renal infarction, abdominal pain, bowel ischemia with peritonitis by mid-jejunal perforation, and acute lower limb ischemia associated with renal infarction. The therapeutic strategy was essentially surgical thrombectomy.

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**Fig. 1 a, b** Diffusion-weighted MR showing ischemic stroke of left middle cerebral artery territory. **c, d, e** Fluid-attenuated inversion recovery showing slow flows in the left hemispheric sulci with slight visibility of ischemic stroke on the lenticular caudate. **f** Time-of-flight MR angiography showing left carotid-Sylvian occlusion. **g, h** CT angiography showing floating aortic arch thrombus involving the left common carotid artery.
Table 1  Systematic literature review of reported cases of aortic thrombus associated with cocaine use

| Year | First author | Country | Sex/Age (years) | Past medical history | Clinical presentation | Diagnostic tool | Location | Treatment |
|------|--------------|---------|----------------|----------------------|-----------------------|-----------------|----------|-----------|
| 2017 | Poon et al. [3] | England | M/41 | Cocaine use, Goodpasture syndrome, heavy smoking | Bowel ischemia with mid-jejunal perforation and peritonitis | CTA | Ascending aorta | ST |
| 2013 | Paulin Vera et al. [4] | Spain | M/35 | Current smoking; cocaine use | Acute lower limb ischemia | CTA | Subrenal aorta | Revascularization surgery, aortobifemoral bypass Dacron graft, anticoagulation with LMWH and antiplatelet therapy |
| 2004 | Zhou et al. [5] | U.S.A | M/26 | Cocaine Intranasal inhalation | Acute lower limb ischemia | CTA | – | ST |
| 2003 | Mochizuki et al. [6] | U.S.A - | Cocaine use | Renal infarction | – | – | – | – |
| 1999 | Webber et al | U.S.A | M/34 | Smoking crack cocaine | Acute lower limb ischemia, renal infarction | Aortography | Subdiaphragm abdominoaorta | ST |
| 1999 | Webber et al. [7] | U.S.A | F/39 | Smoking crack cocaine | Abdominal pain | Aortography | Sub-diaphragm abdominoaorta | ST, anticoagulation with heparin sodium |
| 1996 | Wardle et al. [8] | England | F/Newborn | Cocaine use in the mother throughout pregnancy | Respiratory distress, absent femoral pulses | Intraoperative diagnosis | Ascending aorta | ST |

*F* indicates female, *M* male, *USA* United States of America, *CTA* computed tomography angiography, *ST* surgical thrombectomy, *LMWH* low-molecular-weight heparin
Discussion

We report the first case of FLOAT involving the left CCA due to cocaine use complicated with AIS in a young Caucasian. An exhaustive diagnostic workup has been carried out and permitted to rule out other causes.

Cocaine is a potent vasoconstrictor due to its sympathomimetic action, which is susceptible to inducing vasospasm of small and medium caliber arteries causing AIS or myocardial infarction [9, 10]. However, the exact pathophysiologic mechanism by which cocaine causes thrombosis formation in the large arteries such as the aorta, iliac arteries, or carotid arteries remains uncertain. A study demonstrated that cocaine exposure could induce platelet activation, platelet alpha granule release, and the formation of platelet-containing microaggregates [11]. That is possible because cocaine exposure could induce alteration in endothelial antithrombotic activity by increasing the production of prostaglandins, with a disproportionate increase in thromboxane relative to prostacyclin. Another potential mechanism is that long-term cocaine exposure increases adventitial mast cells and atherosclerosis [12], favoring platelet activation and arterial thrombosis formation.

CTA of the aorta is the noninvasive diagnostic tool most used to diagnose aortic thrombus. Surgical thrombectomy was the main therapeutic strategy according to our SLR (see Table 1). In our patient, the aortic thrombus extending into the left CCA was removed successfully by endovascular thrombectomy.

Conclusion

Aortic thrombus should be suspected in patients without overt cardiovascular risk factors but with a recent history of cocaine use who presented AIS. For this purpose, it is substantial to perform a CTA of the supra-aortic trunks descending to the ascending aortic because prompt diagnosis and appropriate treatment, possibly endovascular, could avoid other embolic complications.

Author contribution Moussa Toudou-Daouda designed the study, conducted a literature search, and wrote the first draft of the manuscript. Gary Quanounoun, Manvel Aghasaryan, Nana-Rahamatou Aminou-Tassiou, Djibril Soumah, Leila Bentamra, Léonard Smadja, and Tony Altarcha performed data acquisition and revised the manuscript. Nicolas Chausson and Didier Smadja critically revised the manuscript for important intellectual content. All the authors read and approved the final version of the manuscript.

Declarations

Conflict of interest The authors declare no competing interests.

Ethical approval The present study was a routine care study, and approval by an ethics committee was not required.

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