



Case Reports

Thrombotic Microangiopathy And Hypertensive Emergency After Cocaine Use: A Case Report

José Manuel Moreno-Mirón, MD¹, Juan de Dios Alfonso, MD², Tyler White, MD³, Ali Mehdi, MD, MEd⁴, Moises Auron, MD³

¹ Facultad de Medicina, Universidad Panamericana,

² Department of Internal Medicine, Hospital Central, Mendoza,

³ Division of Hospital Medicine, Cleveland Clinic,

⁴ Division of Nephrology, Cleveland Clinic

Keywords: hypertensive emergency, cocaine, thrombotic microangiopathy, eculizumab, TMA

Journal of Brown Hospital Medicine

Vol. 5, Issue 2, 2026

Article Information

Keywords: hypertensive emergency, cocaine, thrombotic microangiopathy, eculizumab, TMA

<https://doi.org/10.56305/001c.159219>

Submitted: November 18, 2025 EDT

Accepted: March 06, 2026 EDT

Published: April 01, 2026 EDT

Abstract

A patient in her early 60s presented with hypertensive emergency, microangiopathic hemolytic anemia, thrombocytopenia, and non-oliguric acute kidney injury (AKI) after recent cocaine use. The evaluation demonstrated schistocytes, a Coombs-negative hemolysis pattern, and preserved ADAMTS13 activity, making TTP unlikely. Kidney biopsy confirmed acute thrombotic microangiopathy (TMA) and excluded alternative intrinsic renal pathologies. Autoimmune and infectious workup was unrevealing. Although cocaine exposure temporally preceded presentation, malignant hypertension and complement activation may represent overlapping and potentially synergistic mechanisms rather than a single unifying etiology. Blood pressure control improved hemodynamics, but kidney function continued to worsen, and soluble C5b-9 (sC5b-9) was elevated. Eculizumab was initiated empirically after appropriate vaccination due to persistent renal dysfunction despite blood pressure optimization, recognizing that sC5b-9 is not specific for atypical HUS and may be elevated in secondary TMAs. Renal function subsequently stabilized, and the patient remained dialysis-free at three-month follow-up.

BACKGROUND

Thrombotic microangiopathies (TMA) comprise syndromes characterized by microangiopathic hemolytic anemia, consumptive thrombocytopenia, and organ injury due to microvascular thrombosis.¹ TMA may be primary (e.g., severe ADAMTS13 deficiency) or secondary to conditions such as infection, autoimmune disease, medications/toxins, pregnancy, and malignant hypertension. In hypertensive emergencies, acute end-organ injury distinguishes emergencies from urgencies.²

Cocaine can precipitate hypertensive emergency through sympathetic stimulation and vasoconstriction and has been associated with endothelial injury and pro-thrombotic effects (e.g., platelet activation, increased von Willebrand factor, increased fibrinogen, and impaired endothelial nitric oxide signaling).³⁻⁵ Cocaine exposure, malignant hypertension, and complement activation can coexist; complement activation may be primary (complement-mediated TMA/aHUS) or secondary to endothelial injury in severe hypertension-associated TMA.^{6,7} This report describes biopsy-confirmed renal TMA after cocaine use presenting as hypertensive emergency, and it

discusses the rationale for empiric complement blockade in the setting of persistent renal dysfunction.

CASE PRESENTATION

A woman in her early 60s with a history of cocaine and tobacco use presented to the emergency department with 14 days of upper abdominal pain (initially described as right upper quadrant discomfort) and lower extremity myalgias after recent recreational cocaine use. She had no known prior diagnosis of hypertension and reported no prescription or over-the-counter medication use. She denied recent travel and had no personal or family history of autoimmune disease or sickle cell disease/trait.

On arrival, blood pressure was 209/110 mmHg. Physical examination was notable for focal epigastric tenderness without peritoneal signs. Laboratory evaluation demonstrated progressive anemia and thrombocytopenia with non-oliguric AKI. On admission, hemoglobin was 10.9 g/dL (reference 11.5–15.5), platelets $99 \times 10^3/\mu\text{L}$ (reference 150–400), and serum creatinine 2.83 mg/dL (baseline 0.8 mg/dL). LDH was 908 U/L (reference 135–214), haptoglobin <10 mg/dL (reference 31–238), and high-sensitivity troponin T was 42 ng/L (reference

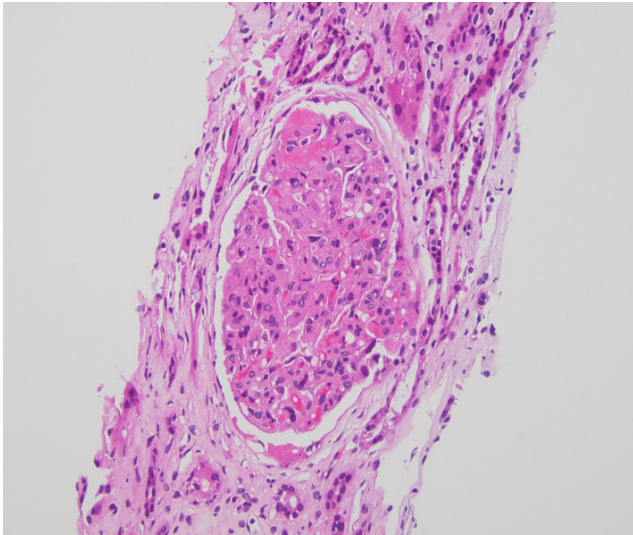


Figure 1. Right kidney biopsy findings showing acute thrombotic microangiopathy involving glomeruli and small to medium caliber vessels, tubular atrophy, interstitial fibrosis and severe arteriosclerosis

<12). Urinalysis showed 3+ blood, 1+ protein, and granular casts (4–10 per low-power field). Urine toxicology was positive for cocaine. Echocardiography was unremarkable.

The following day, hemoglobin decreased to 8.8 g/dL and platelets to $53 \times 10^3/\mu\text{L}$. Direct antiglobulin (Coombs) testing was negative. ANA testing was negative and complement C3/C4 levels were within reference ranges. Peripheral smear demonstrated schistocytes. Hematology assessed a low likelihood of TTP given a PLASMIC score of 3 and ADAMTS13 activity of 51% (not severely reduced). Given persistent AKI with suspected TMA, the nephrology team proceeded with a right kidney biopsy. Biopsy demonstrated acute thrombotic microangiopathy involving glomeruli and small-to-medium vessels, with tubular atrophy/interstitial fibrosis and severe arterio- and arteriolosclerosis (**Figure 1**). Key diagnostic findings are summarized in **Table 1**, and relevant laboratory findings are provided in the supplementary material. Blood pressure normalized with nifedipine 60 mg daily and carvedilol 25 mg twice daily.

Despite blood pressure control, kidney function worsened during hospitalization (creatinine rose to 4.4 mg/dL). Soluble C5b-9 was elevated at 315.6 ng/mL (reference <256), indicating terminal complement activation but not establishing a primary complement-mediated etiology. Given biopsy-proven TMA and persistent renal dysfunction despite blood pressure optimization, empiric complement blockade was initiated with eculizumab after prophylactic vaccination against meningococcus serogroups A/C (MenQuadfi) and B (Bexsero) and pneumococcus (Pneumovax 20). After eculizumab administration, renal function stabilized without further deterioration. The patient did not require renal replacement therapy during the index hos-

pitalization and was discharged to continue outpatient eculizumab every 2 weeks with creatinine 4.4 mg/dL.

Six weeks after discharge, she was rehospitalized for acute heart failure with preserved ejection fraction, presenting with dyspnea, pulmonary edema, and marked lower-extremity edema. She improved with intravenous diuretics and afterload reduction and was discharged on torsemide 20 mg orally twice daily. An angiotensin receptor blocker was deferred because kidney function remained stable but had not improved. The plan was to continue eculizumab for 6–12 months with close outpatient follow-up. At three months, she remained dialysis-free with stable renal function and preserved urine output.

DISCUSSION

This case illustrates biopsy-confirmed renal TMA presenting with hypertensive emergency after cocaine use. Importantly, cocaine exposure, malignant hypertension-associated endothelial injury, and complement activation may represent overlapping and potentially synergistic mechanisms rather than a single unifying cause. Cocaine can trigger severe hypertension and endothelial dysfunction, while malignant hypertension itself can cause TMA through shear stress-mediated endothelial injury and fibrinoid necrosis.^{8,9} In parallel, complement activation can be primary (complement-mediated TMA/aHUS) or secondary to endothelial injury in severe hypertension-associated TMA, and complement abnormalities have been described in hypertension-associated TMA.^{6,7}

Distinguishing hypertension-associated TMA from complement-mediated TMA has major therapeutic implications. In hypertension-associated TMA, hematologic abnormalities often improve with blood pressure control, and any complement activation is generally viewed as secondary.⁹ In contrast, complement-mediated TMA is characterized by dysregulated complement activation, and organ dysfunction may persist despite hemodynamic stabilization.^{10,11} The Jodele diagnostic criteria for transplant-associated TMA include laboratory evidence of microangiopathy in conjunction with hypertension and proteinuria.¹² Elevated soluble C5b-9 and multiorgan dysfunction were subsequently identified as high-risk features associated with clinically significant complement activation and adverse outcomes.^{12,13} Biomarkers of complement activation (including sC5b-9) may indicate complement involvement but are nonspecific and can be elevated in secondary TMAs.^{7,14} Therefore, sC5b-9 elevation should be interpreted in the clinical context rather than as definitive proof of primary complement-mediated disease. A key distinguishing feature in this case is the kidney biopsy, which confirmed acute TMA and helped rule out other intrinsic renal pathologies that could significantly change management.

Table 1. Key diagnostic findings

Parameter	Result (time course)	Interpretation
Blood pressure	209/110 mmHg on arrival	Hypertensive emergency
Hemoglobin	10.9 → 8.8 g/dL	Microangiopathic hemolysis pattern (with MAHA workup)
Platelets	99 → 53 × 10 ³ /μL	Consumptive thrombocytopenia consistent with TMA
Creatinine	Baseline 0.8 → 2.83 mg/dL (admission) → 4.4 mg/dL (during hospitalization/discharge)	Persistent non-oliguric AKI
LDH	908 U/L	Supports hemolysis/ischemic injury
Haptoglobin	<10 mg/dL	Supports hemolysis
Direct antiglobulin test (DAT/Coombs)	Negative	Not immune hemolysis
Peripheral smear	Schistocytes present	MAHA consistent with TMA
ADAMTS13 activity	51%	Not severely reduced; TTP unlikely
PLASMIC score	3	Low risk for severe ADAMTS13 deficiency
Complement C3/C4	Within reference	

In patients with suspected TMA and notable kidney injury, obtaining a tissue diagnosis can meaningfully narrow the differential and enhance diagnostic certainty.

In the present case, blood pressure control stabilized hemodynamics, yet kidney function continued to worsen (creatinine increased from 0.8 mg/dL baseline to 2.83 mg/dL on admission and to 4.4 mg/dL during hospitalization). Given biopsy-proven TMA, persistent renal dysfunction despite blood pressure optimization, absence of alternative etiologies (including TTP and autoimmune disease), and evidence of terminal complement activation, the treating team initiated eculizumab empirically. Eculizumab is a humanized monoclonal antibody that binds complement protein C5, inhibiting cleavage into C5a and C5b and thereby preventing formation of the terminal complement complex C5b-9.¹⁵ Because terminal complement blockade increases susceptibility to invasive meningococcal disease, vaccination and infection-risk counseling are essential prior to treatment. In this patient, renal function stabilized after eculizumab initiation and she remained dialysis-free at three months, suggesting a complement-mediated component may have contributed to ongoing injury beyond isolated hypertension-associated TMA. It should be emphasized that the use of eculizumab in this case should be viewed as an empiric therapeutic approach for persistent organ dysfunction in a high-risk clinical setting, rather than as definitive evidence of primary complement-mediated TMA.

CONCLUSION

Cocaine exposure, hypertensive emergency, and complement activation can coexist in patients presenting with TMA, and these mechanisms may be overlapping rather than singular. This case highlights the importance of a thorough substance-use history and emphasizes kidney biopsy as a high-yield diagnostic tool to confirm TMA and exclude alternative renal pathologies. In selected pa-

tients with biopsy-proven TMA and persistent organ dysfunction despite blood pressure optimization, empiric complement blockade may be considered with appropriate counseling and infection prophylaxis, while acknowledging diagnostic uncertainty and the nonspecific nature of complement activation biomarkers.

Disclosures/Conflicts of Interest

None

Corresponding author

Moises Auron, MD
Department of Hospital Medicine
Cleveland Clinic
Cleveland, Ohio, USA
Email: auronm@ccf.org

Supplementary material. Relevant laboratory findings.

	Latest Ref Range	
Protein, Total	6.3 - 8.0 g/dL	7.4
Albumin	3.9 - 4.9 g/dL	3.9
Calcium	8.5 - 10.2 mg/dL	9.2
Bilirubin, Total	0.2 - 1.3 mg/dL	1
Alkaline Phosphatase	34 - 123 U/L	58
AST	13 - 35 U/L	26
ALT	7 - 38 U/L	9
Glucose	74 - 99 mg/dL	100 (H)
BUN	7 - 21 mg/dL	27 (H)
Creatinine	0.58 - 0.96 mg/dL	2.97 (H)
Sodium	136 - 144 mmol/L	134 (L)
Potassium	3.7 - 5.1 mmol/L	4
Chloride	98 - 107 mmol/L	98
CO2	22 - 30 mmol/L	21 (L)
Anion Gap	8 - 15 mmol/L	15
eGFR	≥ 60 mL/min/1.73m ²	18 (L)
Magnesium	1.7 - 2.3 mg/dL	2.2
Phosphorus	2.7 - 4.8 mg/dL	3.6
WBC	3.70 - 11.00 k/uL	5.02
RBC	3.90 - 5.20 m/uL	2.77 (L)
Hemoglobin	11.5 - 15.5 g/dL	8.5 (L)
Hematocrit	36.0 - 46.0 %	26.3 (L)
MCV	80.0 - 100.0 fL	94.9
MCH	26.0 - 34.0 pg	30.7
MCHC	30.5 - 36.0 g/dL	32.3
RDW-CV	11.5 - 15.0 %	15.2 (H)
Platelet Count	150 - 400 k/uL	105 (L)
MPV	9.0 - 12.7 fL	10.4
Absolute nRBC	<0.01 k/uL	<0.01
Platelet Estimate		Decreased
Polychromasia		Slight
Anisocytosis		Present
Acanthocyte		Few
RBC Fragments	None Seen	Few !
PTT LA Screen	30.2 - 43.0 Seconds	28.5 (L)
PTT LA Mix	31.5 - 38.3 Seconds	30.7 (L)
Platelet Neut	<1.9 Seconds	0
DRVVT Screen	32.0 - 45.7 seconds	33.8
DRVVT Confirm Ratio	<1.32	1
DRVVT 1:1 Mix	32.0 - 45.7 seconds	33.6
Hex Phase Screen	34.0 - 51.8 seconds	32.8 (L)
Hex Phase Confirm	34.2 - 47.9 seconds	30.1 (L)
Hex Phase Delta	<7.1 delta seconds	2.7
APTT Screen	24.0 - 35.1 seconds	24.8
Thrombin Time	<18.6 seconds	<16.8
Anti Xa Inhib Assay	<0.10	<0.10
Phencyclidine, Urine	Negative	Negative
Benzodiazepines, Urine	Negative	Negative
Cocaine, Urine	Negative	Positive
Amphetamines, Urine	Negative	Negative

	Latest Ref Range	
Cannabinoids, Urine	Negative	Negative
Opiates, Urine	Negative	Positive
Barbiturates, Urine	Negative	Negative
Ethanol, Urine	<11 mg/dL	<11
Oxycodone, Urine	Negative	Negative
c-ANCA Fluorescence	Negative	Negative
p-ANCA Fluorescence	Negative	Negative
Iron	41 - 186 ug/dL	62
TIBC	232 - 386 ug/dL	250
Transferrin Saturation	15.0 - 57.0 %	24.8
Creatinine, Ur Random (UCRR)	20.0 - 300.0 mg/dL	55.8
Creatinine, Ur Random (UCRR)	20.0 - 300.0 mg/dL	56.4
Albumin, Urine Random	mg/L	213
Albumin/Creatinine Ratio	<30 mg/g	378 (H)
HIV 12 Combo (Ag/Ab)	Nonreactive	Nonreactive
d Dimer	<500 ng/mL FEU	1,150 (H)
PT Sec	9.7 - 13.0 sec	10.4
PT INR	0.9 - 1.3	<0.9 (L)
ADAMTS13 Activity (%)	60 - 121 %	51
DNA Antibody	<=200 IU/mL	4
Syphilis Treponemal Screen	Nonreactive	Nonreactive
Hep B Surface Ab, Qual		Negative
Hep B Surf Ab Quant	mIU/mL	<8.00
Ethanol	<11 mg/dL	<11
Ferritin	14.7 - 205.1 ng/mL	998.0 (H)
Folate	>4.7 ng/mL	13.5
Vitamin B12	232 - 1,245 pg/mL	464
LD	135 - 214 U/L	908 (H)
Haptoglobin	31 - 238 mg/dL	<10 (L)
Sodium, Urine Random	14 - 216 mmol/L	72
Pro C Fun	76 - 147 %	119
Antithrombin Assay	84 - 138 %	120
ANA Scr Qual	Negative	Negative
C3	86 - 166 mg/dL	130
C4	13 - 46 mg/dL	22
APTT	23.0 - 32.4 sec	20.8 (L)
Cardiolipin Ab, IgA	<12.0 APL	<9.0
Cardiolipin Ab, IgG	<15.0 GPL	<9.0
Cardiolipin Ab, IgM	<12.5 MPL	<9.0
Beta 2 Glycoprotein, IgG	<20 SGU	<9
Beta 2 Glycoprotein, IgM	<20 SMU	<9
Rheumatoid Factor	<16 IU/mL	11
ADAMTS13 Activity	60 - 121 %	51 (L)
Proteinase 3 Antibody	<1.0 AI	<0.2
SC5b-9 Level	<256 ng/mL	315.6 (H)
Complement Factor H	15.8-37 mg/dL	29
Complement Factor B	19-50 mg/dL	64.2
Complement Factor I	1.6-3.7 mg/dL	3.9
GBM IgG Ab, (Bead)	0 - 19 AU/mL	1
Cryoglobulin, Qualitative	Negative	Negative
Hep C Antibody IA	Negative	Negative

	Latest Ref Range	
Hep B Surface Ag	Negative	Negative
Hep B Core Ab, Total	Negative	Negative



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-NC-4.0). View this license's legal deed at <https://creativecommons.org/licenses/by-nc/4.0> and legal code at <https://creativecommons.org/licenses/by-nc/4.0/legalcode> for more information.

REFERENCES

1. Leisring J, Brodsky SV, Parikh SV. Clinical Evaluation and Management of Thrombotic Microangiopathy. *Arthritis Rheumatol*. 2024;76(2):153-165. doi:[10.1002/art.42681](https://doi.org/10.1002/art.42681)
2. Jolly H, Freel EM, Isles C. Management of hypertensive emergencies and urgencies: narrative review. *Postgrad Med J*. 2023;99(1169):119-126. doi:[10.1136/postgradmedj-2021-140899](https://doi.org/10.1136/postgradmedj-2021-140899)
3. Dejman A, Alavi SN, Thomas DB, Stefanovic A, Asif A, Nayer A. The potential role of complements in cocaine-induced thrombotic microangiopathy. *Clin Kidney J*. 2018;11(1):26-28. doi:[10.1093/ckj/sfx061](https://doi.org/10.1093/ckj/sfx061)
4. Wilbert-Lampen U, Seliger C, Zilker T, Arendt RM. Cocaine Increases the Endothelial Release of Immunoreactive Endothelin and Its Concentrations in Human Plasma and Urine. *Circulation*. 1998;98(5):385-390. doi:[10.1161/01.CIR.98.5.385](https://doi.org/10.1161/01.CIR.98.5.385)
5. Pereira J, Sáez CG, Pallavicini J, et al. Platelet activation in chronic cocaine users: Effect of short term abstinence. *Platelets*. 2011;22(8):596-601. doi:[10.3109/09537104.2011.578181](https://doi.org/10.3109/09537104.2011.578181)
6. Timmermans SAMEG, Abdul-Hamid MA, Vanderlocht J, et al. Patients with hypertension-associated thrombotic microangiopathy may present with complement abnormalities. *Kidney Int*. 2017;91(6):1420-1425. doi:[10.1016/j.kint.2016.12.009](https://doi.org/10.1016/j.kint.2016.12.009)
7. Palomo M, Blasco M, Molina P, et al. Complement Activation and Thrombotic Microangiopathies. *Clin J Am Soc Nephrol*. 2019;14(12):1719-1732. doi:[10.2215/CJN.05830519](https://doi.org/10.2215/CJN.05830519)
8. van den Born BJH, Honnebier UPF, Koopmans RP, van Montfrans GA. Microangiopathic Hemolysis and Renal Failure in Malignant Hypertension. *Hypertension*. 2005;45(2):246-251. doi:[10.1161/01.HYP.0000151620.17905.ee](https://doi.org/10.1161/01.HYP.0000151620.17905.ee)
9. Khanal N, Dahal S, Upadhyay S, Bhatt VR, Bierman PJ. Differentiating malignant hypertension-induced thrombotic microangiopathy from thrombotic thrombocytopenic purpura. *Ther Adv Hematol*. 2015;6(3):97-102. doi:[10.1177/2040620715571076](https://doi.org/10.1177/2040620715571076)
10. Noris M, Remuzzi G. Atypical Hemolytic–Uremic Syndrome. *N Engl J Med*. 2009;361(17):1676-1687. doi:[10.1056/NEJMr0902814](https://doi.org/10.1056/NEJMr0902814)
11. Fakhouri F, Zuber J, Frémeaux-Bacchi V, Loirat C. Haemolytic uraemic syndrome. *Lancet*. 2017;390(10095):681-696. doi:[10.1016/S0140-6736\(17\)30062-4](https://doi.org/10.1016/S0140-6736(17)30062-4)
12. Jodele S, Davies SM, Lane A, et al. Diagnostic and risk criteria for HSC-T-associated thrombotic microangiopathy: a study in children and young adults. *Blood*. 2014;124(4):645-653. doi:[10.1182/blood-2014-03-564997](https://doi.org/10.1182/blood-2014-03-564997)
13. Jodele S, Dandoy CE, Lane A, et al. Complement blockade for TA-TMA: lessons learned from large pediatric cohort treated with eculizumab. *Blood*. Published online January 2020. doi:[10.1182/blood.2019004218](https://doi.org/10.1182/blood.2019004218)
14. Cole MA. Update in the diagnosis of complement-mediated thrombotic microangiopathy/atypical hemolytic uremic syndrome. *Hematology*. 2025;2025(1):164-175. doi:[10.1182/hematology.2025000702](https://doi.org/10.1182/hematology.2025000702)
15. Davis J. Eculizumab. *Am J Heal Pharm*. 2008;65(17):1609-1615. doi:[10.2146/ajhp080043](https://doi.org/10.2146/ajhp080043)